Planning and
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Environmental Impact Assessment Report

Proposed Lifetime Extension of Ballywater Windfarm

Volume 1: Non-Technical Summary and Environmental Impact Assessment Report (Chapter 1 to 16)

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Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

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NON-TECHNICAL SUMMARY

Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by MKO on behalf of Ballywater Windfarm Ltd (the Applicant), who intend to apply to Wexford County Council (WCC) for planning permission to extend the operational period of the existing Ballywater Wind Farm and the existing Ballywater 110kV Substation for an additional 10 years to 2035 after the expiry of their current planning permissions in 2025.

Ballywater Wind Farm and Ballywater 110kV Substation are located on the coast of Co. Wexford, approximately 4 km northeast of Kilmuckridge village.

For the purposes of this EIAR, where the 'Project' is referred to, this relates to all components which make up the existing Ballywater Wind Farm and are assessed within this EIAR, namely the existing Ballywater Wind Farm, the existing onsite Ballywater 110kV Substation, and the existing Underground Grid Connection cabling route that connects the electricity generated by the wind farm to the national grid at Crane 110kV electrical substation in Co. Wexford. Where the 'Proposed Development' is referred to, this relates to all of the project components described in detail in Chapter 4 of this EIAR, which are being proposed under the accompanying planning application. Where the 'existing wind farm and substation' is referred to, this relates to the existing Ballywater Wind Farm and Ballywater 110kV Substation. While the Underground Grid Connection is assessed as part of this EIAR, it does not form part of the accompanying planning application. Individual topics for assessment purposes, i.e. each chapter, indicate the study area used for that topic. The actual site boundary for the purposes of the planning permission application (i.e. Red Line Boundary) occupies a smaller area relative to the EIAR site boundary.

No construction activities or alterations to the existing wind farm or substation are proposed as part of this planning application, beyond the extension of routine maintenance of the turbines and electrical infrastructure during the operational phase of the Project.

The EIAR complies with the EIA Directive of 2011/92/EU. The Environmental Impact Assessment (EIA) of the proposed development will be undertaken by Wexford County Council as the competent authority.

Applicant

The Applicant for the continued operation of the Proposed Development is Ballywater Windfarm Ltd, an associated company of CGN Europe Energy (CGNEE). CGNEE, the parent company of Ballywater Windfarm Ltd, established their European headquarters in Paris in 2014. Following that, CGNEE opened their Irish office, based in Dublin, in January 2018. CGNEE oversee wind farms across Ireland, Wales, England, and the Netherlands with a total capacity of 422MW. CGNEE oversee and manage 2.4GW of renewable energy throughout Europe. CGNEE invest €117k every year into local Community Benefit Funds across Ireland.

Brief Description of the Proposed Development

Planning permission is sought for the continued operation of the existing Ballywater Wind Farm, as permitted by Wexford County Council under WCC Pl. Ref. 2001/0458, for a further period of 10 years from the date of expiry for 21 no. of the turbines (June 2025) per Condition no. 3 of the original planning consent issued, with decommissioning of the wind farm at the end of the proposed extension period (June 2035). In addition, permission is being sought for the existing Ballywater 110kV Substation, as permitted under WCC Pl. Ref. 2004/2901. There are no alterations to the existing wind farm and substation infrastructure proposed as part of this Planning Application and EIAR.

The full description of the Proposed Development, as per the public planning notices, is as follows:

(i) 21 no. existing Enercon E70 wind turbines with a maximum overall blade tip height of 99 metres (m), including hardstands;
(ii) Existing 1 no. onsite 110 kilovolt (kV) electrical substation which includes 1 no. control building, security fencing, external lighting, underground cabling, and all associated infrastructure and associated electrical plant and apparatus;
(iii) All existing associated electrical and communications cabling connecting the turbines to the onsite Ballywater 110kV Substation;
(iv) Existing gated site entrances from the R742 and an unnamed local road;
(v) Existing internal access tracks; and,
(vi) All existing ancillary infrastructure.

There are 35 no. residential properties located within 500m of an existing turbine. Of these 35 no. properties, 1 no. is a derelict property, 33 are third-party dwellings, and 1 no. is under the ownership of the participating landowner.

While the Proposed Development is described above, it is important to note that all elements of the Project (i.e. the Proposed Development and associated Underground Grid Connection) have been assessed as part of this EIAR.

Need for the Proposed Project

Ireland faces significant challenges to its efforts to meet EU targets for renewable energy by 2030 and its commitment to transition to a low carbon economy by 2050. Further detail can be found in Chapter 2 of this EIAR.

The Proposed Development therefore represents an opportunity to continue to harness Ireland's significant renewable energy resources, with valuable benefits to air quality and in turn to human health. The consumption of fossil fuels for energy results in the release of particulates, sulphur dioxide and nitrogen dioxide to our air. The use of wind energy, by providing an alternative to electricity derived from coal, oil or gas-fired power stations, results in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide SO_2, thereby resulting in cleaner air and associated positive health effects.

Economic Benefits

In addition to helping Ireland avoid significant fines and reducing environmentally damaging emissions, the Proposed Development will have significant economic benefits.

The Proposed Development is potentially capable of providing power to an estimated 18,411 Irish households with electricity per year, using the calculated electricity as produced by the Proposed Development based on the average Irish household using 4.2 MWh of electricity, therefore produce sufficient electricity for the equivalent of approximately 31% of all households in Co. Wexford. At a Regional Level, the Proposed Development will help to supply the rising demand for electricity, resulting from renewed economic growth.

Several significant long-term benefits for the local economy from the Proposed Development will continue, including the provision of jobs, landowner payments, local authority commercial rate payments, and Community Benefit Scheme.

Should the Proposed Development receive planning permission, there are substantial opportunities available for the local area in the form of Community Benefit Funds. Based on the current proposal, the proposed Community Benefit Fund would attract a community contribution of €30,000/year starting in 2025, and continuing until the windfarm ceases operation, to be used by the local community over the lifetime of the Proposed Development. The value of this fund will be made available to support and facilitate projects and initiatives in the local area of social and environmental benefit.

Purpose and Structure of this EIAR

The purpose of this EIAR is to document the current state of the environment in the vicinity of the Project and to quantify the likely significant effects of the continued operation of the Proposed Development and the Project on the environment and in accordance with the requirements of the EIA Directive, as amended. The compilation of this document served to highlight any areas where mitigation measures may be necessary in order to protect the surrounding environment from the possibility of any significant negative impacts arising from the Proposed Development.

The EIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of wind energy developments and in their relevant area of expertise. Each chapter of this EIAR has been prepared by a competent expert in the subject matter.

The chapters of this EIAR are as follows:

1. *Introduction*
2. *Background and Policy*
3. *Consideration of Reasonable Alternatives*
4. *Description of the Project*
5. *Population and Human Health (including Shadow Flicker)*
6. *Biodiversity (including Birds)*
7. *Land, Soils, and Geology*
8. *Hydrology and Hydrogeology (Water)*
9. *Air & Climate*
10. *Noise and Vibration*
11. *Cultural Heritage*
12. *Landscape and Visual*
13. *Material Assets (including Traffic and Transport, Telecommunications and Aviation)*
14. *Major Accidents and Disasters*
15. *Interaction of the Foregoing*
16. *Schedule of Mitigation Measures*

Background and Policy

This chapter of the EIAR presents the policies and targets which have been put in place at the various levels of Government including international, national, regional and local in relation to planning, renewable energy and climate change which are relevant to the Proposed Development. The details below set out the need for the Proposed Development as it seeks to continue aiding Ireland in meeting its national targets and European commitments in relation to climate change and decarbonisation.

It summarises the EIAR Scoping exercise, the Pre-planning and Community Consultation undertaken and the Cumulative Impact Assessment process.

This chapter also provides a summary of the planning policy context relevant to the Proposed Development and should be read in conjunction with the Planning Report which accompanies the planning application.

The Proposed Development, which is for the continued operation of the existing 21 no. turbine Ballywater Wind Farm and existing Ballywater 110kV Substation for a further period of 10 years from the date of expiry of the current planning permissions (June 2025), is being brought forward in response to local, regional, national and European policy regarding Ireland's transition to a low-carbon economy, associated climate change policy objectives and to reduce Ireland's dependence on imported fossil fuels for the production of electricity.

As detailed in Section 1.1 in Chapter 1, for the purposes of the EIAR, the various project components are described and assessed using the following references: 'Project', 'Proposed Development', 'existing wind farm and substation', 'Underground Grid Connection'. Please see Section 1.1 of the EIAR for further details. A detailed description of the Proposed Development is provided in Chapter 4 of the EIAR.

Local Planning Policy

It is considered that the Proposed Development is consistent with the policies and objectives of the Wexford County Development Plan 2022-2028.

Wexford County Development Plan 2022-2028

The Wexford County Development Plan 2022-2028 (WCDP) was adopted by the Elected Members of Wexford County Council (WCC) on Monday, 13th June 2022 and came into effect on Monday 25th July 2022. The plan sets out the policies and objectives for the development of the County over the 6 year plan period.

In Chapter 2 of the Plan outlines the council's vision to facilitate a transition to a low carbon economy. **Objective CA01** aims to enable *'the decarbonisation of the country's economy and reduces the county's carbon footprint in support of national targets for climate mitigation and adaption objectives as well as targets for greenhouse gas emissions reductions'.*

It is recognised that renewable energy developments play a key role in the County's transition to a low carbon economy. **Objective CA16** seeks *'to support change across business, public and residential sectors to achieve reduced greenhouse gas emissions in accordance with current and future national targets, improve energy efficiency and* ***increase the use of renewable energy*** *sources across the key sectors of* ***electricity supply****, heating, transport and agriculture'.*

Objective CA04 aims to '*implement the Energy Strategy contained in Volume 10 of the Wexford County Development Plan to facilitate the transition to a low carbon county'.* The vision of the Energy Strategy is *'to maximise Wexford's renewable energy potential and its transition to becoming a more energy secure, low carbon county in line with national energy targets whilst balancing the need to protect the environmental, social and heritage assets of the county'.* The provisions of the Energy Strategy are outlined in the following section.

Wexford County Development Plan 2022-2028 Energy Strategy

Volume 10 of the WCDP comprises an 'Energy Strategy' which details the policies and objectives for the County relating to renewable energy, including wind, for the period of the Development Plan. It includes an energy expectation for the County to 2027 which includes "*A reduction in demand for non-renewable energy sources, such as coal, oil and gas, and an increased demand for electricity from all sectors, leading to cleaner, more sustainable energy usage across the county.*" Onshore wind is noted as the main source of renewable energy within the County. The Strategy acknowledges the role extension of life and repowering of existing wind farms will play in meeting targets. The most pertinent objectives are set out as follows:

- **Objective ES07**: Ensure the security of energy supply by supporting the development of wind energy resources in County Wexford at appropriate scales and in appropriate locations, subject to compliance with normal planning and environmental criteria and the development management standards contained in Section 5.7.
- **Objective ES08:** Aim to achieve the target set out in the Renewable Energy Strategy, to enable County Wexford to make the initial steps toward a low carbon economy by 2027.
- **Objective ES09:** Facilitate wind energy development on appropriate sites in the county and work with the relevant agencies to encourage investment in research and technology associated with wind farms and other renewable energy technology.
- **Objective ES10:** Favourably consider proposals for the development of infrastructure for the production, storage and distribution of electricity through the harnessing of wind energy in appropriate sites and locations, subject to relevant policy, legislation and environmental considerations and the development management standards contained in Section 5.7.
- **Objectives ES15:** Consider the re-powering (by replacing existing wind turbines) and extension of existing wind farms. Applications on such sites will each be assessed on their

merits, demonstrate that the equipment is upgraded to the best available technology and will be subject to the development management standards contained in Section 5.7 (see Table 8).

The Energy Strategy sets renewable energy targets based on the most likely energy scenario modelled in Ireland's National Energy and Climate Plan (NECP) 2021-2030. Installed capacity and future projects are also considered in the targets. It is noted that the targets are based on the national target for RES-E of 70% set in the Climate Action Plan 2019, which was in place at the time the analysis. The current RES-E target is 80%.

The relevant targets are as follows:

- **RES-E:** The Strategy sets a target of 100% renewable energy by 2031 which is to be met through a combination of renewable energy developments. To achieve this target, it is projected that county Wexford would need to have an installed onshore wind energy capacity of 193.09 MW by 244.22 MW by 2031. As of 2021, the county had an installed capacity of 182.46MW.

The WCDP divides the County into the following three areas for the purposes of wind energy development: Acceptable in Principle, Open for Consideration and Not Normally Permissible. The Ballywater Wind Farm site is zoned as '***Not Normally Permissible***' in the WCDP. These areas are considered to be generally unsuitable for new wind farm development due to significant environmental, heritage and landscape constraints, housing density, distance from the grid and/or wind speed. The Wind Energy Methodology implemented by the Planning Authority in preparing their Energy Strategy included:

> "*an analysis of key environmental, landscape, technical and economic criteria. GIS was utilised to examine a range of factors relating to wind energy development including wind energy potential (through the Wind Speed Atlas), grid infrastructure, natural heritage designations, urban settlements, landscape sensitivity and the location of existing and permitted wind farms. Each of these criteria were mapped and overlaid on GIS in order to determine the most suitable locations for wind farm development. The strategies of adjoining authorities were also examined to ensure consistency across boundaries.*"

In relation to existing wind farms, the Energy Strategy states that special cognisance has been taken of the existing operational and permitted wind farms and investments made by private developers, the ESB and EirGrid in terms of site access roads, electricity transmission and distribution infrastructure and appropriately sited substations.

In relation to the north of the County, the Energy Strategy states that:

> "*due to the number of existing wind farms, and having regard to the areas open for consideration for wind farm development in adjoining counties, it is considered that the north-west of the county has reached capacity in terms of wind farm development. Further wind farm development in this area may have potential adverse cumulative impacts. This area is also designated as 'Uplands' in the Landscape Character Assessment and is identified as having limited capacity to absorb development. The north-east of the county is also mainly designated as 'Uplands' and there are a number of settlements in this area which make it less suitable for wind farm development. The north of the county has therefore been included in the Not Normally Permissible area*".

In relation to the repowering and the extension of life of existing Wind Farms in areas identified as *'Not Normally Permissible'*, the Energy Strategy states that applications will be assessed on a *'case-by-case basis* and will be subject to the development management standards contained in Section 5.7. Further, the Energy Strategy states that '*any such applications should include details of how best available techniques are to be used to keep noise impacts to a minimum*'.

In relation to the Planning Authority's assessment of the proposal against the relevant development management standards, the Planning Authority will have *'particular regard to the reasons why the area was identified as 'Not Normally Permissible'*. As outlined in the above, the main reason for the *'Not Normally Permissible'* zoning designation is the fact that the north-west of the county is deemed to have reached capacity in terms of wind farm development. As an existing wind farm, it is therefore submitted that the extension of operational life of the Ballywater Wind Farm does not directly conflict with the *'Not Normally Permissible'* wind energy zoning designation and associated policy.

A full assessment of the Proposed Development against the WCDP policies and objectives, Energy Strategy policies and objectives and Energy Strategy Wind Farm Development Management Standards are set out in Tables 6-2, 6-3 and 6-4, respectively, of the accompanying Planning Report.

Wind Energy Development Guidelines

The *'Wind Energy Development Guidelines for Planning Authorities'* (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) (the Guidelines) were the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments were outlined in the document Draft Revised Wind Energy Development Guidelines (Department of Housing, Planning and Local Government (DHPLG), 2019) (the draft Guidelines). A consultation process in relation to the draft Guidelines closed on 19th February 2020. The proposed changes presented in the draft Guidelines give certain focus on the setback distance from residential properties (four times the proposed maximum tip height), along with shadow flicker and noise requirements relative to sensitive receptors.

At time of writing the draft Guidelines are not yet finalised and are not in force, with the relevant guidelines for the purposes of Section 28 of the Act remaining those published in 2006. Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects it is possible that an updated version of the draft Guidelines may be finalised during the consideration period for the current Proposed Development. Should the draft Guidelines, in their current form, be adopted in advance of a planning decision being made on this application, the Proposed Development will be capable of achieving the requirements of the draft Guidelines as currently proposed in relation to any revised noise and shadow flicker requirements, which can be achieved by implementing mitigation through use of the turbine control systems, where necessary.

Planning History

A planning search was carried out through WCC's and An Bord Pleanála's (the Board) online planning portal in October 2024 for relevant planning applications lodged that fall within the planning application boundary of the Proposed Development.

A planning search was carried out to establish permitted, operational and proposed wind energy developments within 25km of the proposed turbines for the purposes of informing the potential cumulative effects. The search was carried out using the relevant local authority, the Board and EIA planning portals in October 2024 for relevant planning applications. In total, 7 no. applications relating to wind energy were identified within 25km of the proposed turbines.

Scoping and Consultation

Chapter 2 Section 2.7 of the EIAR presents detail of the EIA Scoping undertaken with regards to the Proposed Development. A scoping document, providing details of the Proposed Development, was prepared by MKO and circulated in September 2023. MKO requested the comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the EIAR process. Telecommunications operators were contacted in January 2024 in order to determine the presence of telecommunications links either traversing or in close proximity to the Wind Farm site.

Chapter 2 Section 2.8.2.1 of the EIAR includes details of the pre-planning meeting undertaken prior to the planning application being lodged with WCC under the provisions of Section 247 of the Planning and Development Act, 2000 (as amended) (the Act). The design team gave a PowerPoint presentation which included an introduction to the project team and the client, the site location was outlined, and the existing layout of the Proposed Development was discussed. A brief history of the site was presented and the rationale behind the forthcoming application was also discussed. An overview of the EIAR process and the planning application was also presented and ongoing consultation and survey efforts to date were presented to the Council.

Community engagement has been undertaken by the applicant, details of which can be found in Appendix 2-2 of the EIAR. Public consultation began in January 2024 through engagement with nearby residents, local representatives, and local community groups. This included door-to-door engagement in the form of a letter drop with near neighbours within a 1.5km radius of the wind farm. The letter contained all the main points and details of the project with a contact email and phone number for locals to avail of. A Public Information event was held at Ballygarrett Realt GAA Club on the 5th of March 2024. The objective of the consultation was to ensure that the views and concerns of all were considered as part of the Proposed Development design and EIA process. A Community Engagement Report has been prepared to accompany the planning application and is included at Appendix 2-2 of the EIAR. The report outlines the consultation and community engagement initiatives undertaken by the applicant prior to the submission of the planning application. It also outlines the main issues identified during this process, how the final proposal reflects community consultation and the steps taken to ensure that the Proposed Development will be of enduring economic benefit to the communities concerned.

The Proposed Development will provide an enduring economic benefit to the communities surrounding the Proposed Development as outlined in Appendix 2-2 of the EIAR, through the community benefit package for residents and community groups, employment during the operation Proposed Development and through the annual rates payable to the local authority.

Cumulative Impact Assessment

The EIA Directive and associated guidance documents state that as well as considering any direct, indirect, secondary, transboundary, short-, medium-, and long-term, permanent and temporary, positive and negative effects of a project (all of which are considered in the various chapters of the EIAR), the description of likely significant effects should include an assessment of cumulative impacts that may arise. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to a project. The factors to be considered in relation to cumulative effects include population and human health (including Shadow Flicker), biodiversity, ornithology, land, soil and geology, water, air, climate, noise and vibration, material assets, landscape, cultural heritage and major accidents and natural disasters as well as the interactions between these factors.

To gather a comprehensive view of cumulative impacts on these environmental considerations and to inform the EIA process being undertaken by the consenting authority, each relevant chapter within the EIAR includes a cumulative impact assessment where appropriate.

The potential for cumulative impacts arising from other plans and/or projects has therefore been fully considered within the EIAR. The cumulative impact assessment of projects has three principle aims:

- To establish the range and nature of existing and approved plans and/or projects within the cumulative impact study area of the Proposed Development.
- To summarise the relevant plans and/or projects which have a potential to create cumulative impacts.
- To identify the plans and/or projects that hold the potential for cumulative interaction within the context of the Proposed Development and discard plans and/or projects that will neither directly or indirectly contribute to cumulative impacts.

Assessment material for this cumulative impact assessment was compiled on the relevant plans and/or projects within the various cumulative impact study areas of each discipline for the Proposed Development. The material was gathered through a search of relevant online Planning Registers, reviews of relevant EIAR (or historical EIS) documents, Planning Registers and EIA Portal, planning application details and planning drawings, and served to identify past and future plans and/or projects, their activities and their environmental impacts.

Geographical boundaries within which there may be potential for cumulative impacts to arise, relative to each individual EIAR topic (i.e. each chapter) is set out within the Chapter. To gather a comprehensive view of cumulative impacts within the cumulative study areas for each discipline and to inform the EIA process being undertaken by the competent authority, each relevant chapter within the EIAR addresses the potential for cumulative effects where appropriate and within the context of their identified cumulative study area. A long list of all plans and/or projects considered by each of the different disciplines in their cumulative impact assessment are included in Appendix 2-3 of the EIAR.

The cumulative impact assessments carried out in each of the subsequent chapters of this EIAR consider all potential significant cumulative effects arising from relevant projects, plans and land uses within the cumulative study area and within the vicinity of the Proposed Development. These include ongoing agricultural practices.

Additional detail in relation to the potential significant cumulative effects arising and, where appropriate, the specific suite of relevant mitigation measures proposed are set out within each of the relevant chapters of this EIAR.

Consideration of Reasonable Alternatives

This chapter of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the Proposed Development and its specific characteristics and provides an indication of the main reasons for the option chosen, taking into account the environmental effects. The consideration of alternatives includes alternative design, technology, size and scale. A 'Do-Nothing Scenario', i.e., an outline of what is likely to happen to the environment, should the Proposed Development not be implemented, is also included.

The initial design of the existing Ballywater Wind Farm and Ballywater 110kV Substation, prior to their construction and commencement of operations in 2005, was an informed and collaborative process, involving designers, developers, engineers, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. This proposal for the extension of operation of the wind farm was informed by site-specific information and experience gained during the operational history of the wind farm.

The proposed extension of the operation of the existing wind farm and substation does not include any significant alterations to the existing site design or layout. The aim of the current multidisciplinary Project Team in extending the lifespan of the existing wind farm and substation is to continue from the past successful operation of the wind farm, whilst ensuring that any new processes or methods to reduce the potential for environmental effects are incorporated into the future operation.

It is considered appropriate to extend the operational phase of the existing wind energy development at the current site for a number of reasons, including the successful operational history at its current location since 2005. The site has proven to have reliably good wind speeds and maintained a good generating capacity. In addition, the existing wind turbine models can continue to operate efficiently for a further 10 years without a significant loss in the total generating capacity of c.42 megawatts (MW).

The Applicant, Ballywater Windfarm Ltd, has collected a significant amount of site-specific data relating to the characteristics of the site and the local area, and this information was used during the development's operational review process, in particular in considering the feasibility of alternative renewable technologies, such as solar energy.

The Proposed Development can contribute to the achievement of national energy targets and can continue to provide significant social and economic benefits for the local area (direct and indirect employment, community development fund, recreational amenity) and the wider region.

During the proposed decommissioning phase, the processes required on site have evolved from what was conditioned under the original wind farm and substation planning permissions. The proposed Decommissioning Plan (Appendix 4-4) is seen as the most environmentally prudent option, as to remove the structures and return the site to its original condition would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. The decommissioning phase mitigation measures proposed follow current technologies, methods and best practice thus further alternative mitigation measures are not considered necessary.

Having been previously permitted by Wexford County Council, the principle for wind energy development at this site is already well established and has been proven to be in accordance with the proper planning and sustainable development of the area.

It is noted that of the total current wind farm development lands, (i.e. EIAR Site Boundary = c.472 hectares), the development footprint accounts for approximately 16.2 hectares or 3% of the total area. The remainder of the site is currently either used for agricultural use. The existing agricultural uses can and will continue in conjunction with this proposed use of the Proposed Development site.

Description of the Project

This section of the Environmental Impact Assessment Report (EIAR) describes the development and its component parts which are the subject of a proposed application for planning permission to Wexford County Council ('the Proposed Development').

The Proposed Development is limited to an extension of the operational life of the existing wind farm and substation. As such, there are no changes proposed to the existing development components. The various elements of the existing wind farm and substation will remain in their current condition and will be subject to ongoing routine maintenance. The Proposed Development consists of;

- (i) *21 no. existing Enercon E70 wind turbines with a maximum overall blade tip height of 99 metres (m), including hardstands;*
- (ii) *Existing 1 no. onsite 110 kilovolt (kV) electrical substation which includes 1 no. control building, security fencing, external lighting, underground cabling, and all associated infrastructure and associated electrical plant and apparatus;*
- (iii) *All existing associated electrical and communications cabling connecting the turbines to the onsite Ballywater 110kV Substation;*
- (iv) *Existing gated site entrances from the R742 and an unnamed local road;*
- (v) *Existing internal access tracks; and,*
- (vi) *All existing ancillary infrastructure.*

The existing wind turbines have a tip height of 99m, a hub height of 64m, rotor diameter of 70m, and a ground to lowest blade swept path of 29m. The wind turbines that are installed on the site are conventional three blade turbines, that are geared to ensure that the rotors of all turbines rotate in the same direction at all times. The existing wind turbines at Ballywater Wind Farm were manufactured by Enercon and are the E70 model, each capable of producing 2 megawatts (MW), resulting in an estimated calculated maximum installed capacity of 42 MW.

Each wind turbine is secured to reinforced concrete foundation that has been installed below the finished ground level. The turbine foundation transmits any load on the wind turbine into the ground. The existing turbine foundations are circular in plan, typically measuring 30m^2 in area.

Hardstanding areas consisting of levelled and compacted hardcore are in place around each turbine base, to facilitate access and maintenance and generally provide a safe, level working area around each turbine position. The hardstanding area is intended to accommodate a crane if necessary, during maintenance works. There will be no changes to the existing hardstanding areas, required as part of the Proposed Development. Turbine hardstand areas vary at each of the turbines, with an average of approximately 2100m^2.

No changes are proposed to the existing site access roads and tracks of approximately 5.8km in total length, which provide vehicular access to all turbines. Site roads are constructed of consolidated gravel with a running width of 4m. Access to the southern site cluster for general traffic, such as maintenance vehicles, is via the current existing entrance at the R742 Regional Road, which runs along the western side of the site boundary. Access to the northern cluster of the site is via the Cahore Local Road which runs along the northern side of the site boundary, off the R742 Regional Road. No changes to these site entrances are proposed.

Each turbine is connected to the onsite electricity substation through 20kV underground cabling. The electricity and fibre-optic cabling are direct-buried at a depth of approximately 2 metres beneath the ground surface. The cables are laid within the sides of or underneath the internal roadways, and also underneath some of the agricultural fields within the site.

There are no groundworks involved in the operational phase of the Proposed Development, and therefore no existing drainage features will be altered and there will be no direct or indirect discharges to watercourses.

The existing Ballywater Wind Farm is connected to the National Grid via the existing Ballywater 110kV Substation, which connects via underground cabling to Crane 110kV Substation, which is located approximately 18km west of the Proposed Development. The length of the cable connecting the existing Ballywater 110kV Substation to Crane 110kV Substation is approximately 21km long. As detailed in Section 2.1 of Chapter 2: Background and Policy, the onsite substation was permitted under a separate planning permission to the existing wind turbines, (WCC Pl. Ref. 2004/2901). The Underground Grid Connection travels mostly through the public road network, with smaller sections of the cable travelling through private farm access roads and agricultural fields. The Project includes the Proposed Development and the Underground Grid Connection.

During decommissioning of the wind farm, it is intended to limit groundworks other than to rehabilitate constructed areas such as turbine bases and hardstanding areas. This will be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation. Electrical cabling connecting each turbine to onsite substation will remain in-situ. This is considered the most environmentally prudent option because the site cabling is direct-buried and not within any ducting which would allow the cables to be pulled through and with only limited groundworks.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance. The existing Ballywater 110kV substation will also require periodic maintenance. The wind farm manager will therefore continue to attend the site regularly to perform inspections and oversee maintenance works.

Decommissioning of the existing wind farm and substation is required to be carried out in June 2025, i.e. 10 years from the grant of permission for 21 no. of the turbines, under the current planning permission. The Proposed Development would extend the operation of the existing wind farm and substation for a further 10 years, thereby postponing decommissioning until 2035. The existing planning permission for Ballywater Wind Farm would mean that decommissioning would look at returning the site to its original condition and would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. A more environmentally sensitive Decommissioning Plan is presented in Appendix 4-4 of this EIAR.

It is proposed to leave the turbine foundations in place underground and to cover them with earth and reseed as appropriate. It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going access to agricultural holdings. If it were confirmed that the roads were not required in future for any other purpose, they could be removed where required, however, this is not envisaged at this time. It is proposed to leave underground cables in place where they are below a level likely to be impacted by typical agricultural works. Decommissioning of the onsite substation will involve the stripping-out and removal of steel, conductors, switches and other materials and equipment. These materials will then be reconditioned and reused or recycled. A soft strip of the building shall ensure that all fixtures and fittings are removed prior demolition, which will take place using conventional demolition works. During decommissioning, it may be possible to reverse some of the potential impacts caused during the initial construction of the Proposed Development by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by allowing these areas to naturally revegetate and regenerate which reduces run-off and sedimentation. It is not proposed to decommission the Underground Grid Connection.

Population and Human Health

One of the principal concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the construction and operation of a development. The key issues examined in this section of the EIAR relate to population and human health and incorporate population statistics, employment and economic activity, land-use, residential amenity (shadow flicker, noise, visuals and telecommunications), community facilities and services, tourism, property values, accidents/natural disasters, health and safety and other environmental hazards such as water contamination, air pollution, traffic and flooding.

In order to assess the population in the vicinity of the Project, the Population Study Area for the Population section of this EIAR was defined in terms of the Electoral Divisions (EDs) where the Project site is located, and where relevant, nearby EDs which may be affected by the Project. The existing Ballywater Wind Farm and Ballywater 110kV Substation lies within one ED: Cahore, while other EDs within the EIAR Site Boundary which the Underground Grid Connection passes through are also considered; Ballygarrett, Ford, Kilenagh, Wells, Monamolin, Kilcormick, Tinnacross and The Harrow as shown in Figure 5-1. All these EDs will collectively be referred to hereafter as the Population Study Area for this chapter. The Population Study Area has a population of 6,815 persons, as of 2022 and comprises a total land area of 178.4 km^2 (Source: CSO Census of the Population 2022).

A total of 128 no. properties are located within 1km of the existing turbine locations. Of these, 123 no. are inhabitable dwellings, 1 no. is derelict, and 3 no. have been granted planning permission. 1 no. property belongs to the Participating Landowner of the existing wind farm and substation. 90 no. properties exist within 700m of the existing turbine locations, within the Shadow Flicker Study Area (700m), further defined in Section 5.8.5 below.

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 Wexford grew by 9.5% to a 163,919 populace. Other population statistics for the State, County Wexford, and the Population Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-1. The data presented in Table 5-1 shows that the population of the Population Study Area increased by 12.6% between 2016 and 2022. There is a significant increase in population growth for the Population Study Area and the population growth rate is above that of County Wexford and the State

The population density of the Population Study Area recorded during the 2022 Census was 38.2 persons per km^2. This figure is significantly lower than the national population density of 73.27 persons per km^2 and the Wexford County population density of 69.25 persons per km$^{2.}$ These findings indicate that the Population Study Area has a low population density.

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 in Chapter 5 of this EIAR. Although there have been no empirical studies carried out in Ireland on the effects of wind farms on property prices, it is a reasonable assumption based on the available international literature that the provision of a wind farm at the proposed location would not impact on the property values in the area.

Shadow flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in a nearby property. Shadow flicker is an indoor phenomenon, which may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine's blade. Shadow flicker effect lasts only for a short period of time and happens only in certain specific combined circumstances. Current guidelines recommend that shadow flicker at neighbouring dwellings within 700 metres (ten times the rotor diameter) of a proposed turbine location should not exceed a total of 30 hours per year, or 30 minutes per day.

The study area for the shadow flicker assessment is ten times rotor diameter from each turbine as set out in the Wind Energy Development Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government, 2006). All residential properties located within ten rotor diameters, i.e., 700 metres, have been included in the assessment. There is a total of 90 No. residential dwellings located within 700 metres of the existing turbine locations. The closest dwelling to the Proposed Development is located approximately 324m from the nearest existing turbine (T21). The nearest derelict property, which is under the ownership of a participatory landowner is located 87 metres from the nearest turbine, T8.

The WindPRO computer software was used to model the predicted daily and annual shadow flicker levels in significant detail, identifying the predicted daily start and end times, maximum daily duration and the individual turbines predicted to give rise to shadow flicker. Of the 90 no. properties modelled, it is predicted that 26 no. properties, may potentially experience daily shadow flicker in excess of the DoEHLG guideline threshold of 30 minutes per day, in the absence of mitigation measures. Of the 26 no. properties, 1 no. is derelict, and 1 no. is owned by the participatory landowner and no mitigation is required. This prediction is assuming worst-case conditions (i.e., 100% sunshine on all days where the shadow of the turbines passes over a house, wind blowing in the correct direction, no screening present, etc.) and in the absence of any turbine control measures.

It is worth noting that in reality, the 'estimated actual' shadow flicker is considered conservative and likely to be significantly less than predicted in Table 5-10 as the following items are not considered by the model:

- Receivers may be screened by cloud cover and/or vegetation/built form i.e., hedging, adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions onto the wind farm;
- At distances, greater than 500-1000 m '*the rotor blade of a wind turbine will not appear to be chopping the light, but the turbine will be regarded as an object with the sun behind it. Therefore, it is generally not necessary to consider shadow casting at such distances*[1]'.

Section 5.10.3.10 outlines the mitigation strategies which may be implemented at the potentially affected properties to ensure the daily and annual shadow flicker threshold will not be exceeded.

The presence of the existing the 20 kilovolt (kV) underground electric cables required at the Proposed Development to connect the turbines to the substation is common practice, throughout the country, and does not give rise to any specific health concerns. The extremely low frequency (ELF) and electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF, as 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.

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 operational phase is limited. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health, such as the bulk storage of hydrocarbons or chemicals and storage of waste materials, are limited.

Impacts on human beings during the operational phase of the Project are described in Chapter 5, in terms of health and safety, employment and investment, population, land-use, noise, dust, traffic, tourism, residential amenity, renewable energy production, and reduction in greenhouse gas emissions, and interference with communication systems. Where a negative impact was identified, the appropriate mitigation measures will be put in place to ensure that there will be no adverse impacts on human health in the surrounding area.

Following the consideration of the residual effects (post-mitigation), the Project will not result in any significant effects on population and human health. Provided that the Proposed Development is operated in accordance with current best practice, and mitigation measures that are described within this application are implemented, significant effects on population and human health are not anticipated at local, county, national or international scale.

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[1] *Danish Wind Energy Association, 2003* http://xn--drmstrre-64ad.dk/wp-content/wind/miller/windpower%20web/en/tour/env/shadow/shadow2.htm

Biodiversity (including Birds)

This section of the EIAR was prepared by Blackstaff Ecology Ltd.

Biodiversity

1. The study methodology for the Ecological Impact Assessment included both desktop and field survey methods in order to assess the potential impact on the local ecology and nature conservation interest of the site and surrounding area. The purpose of an ecological survey is to identify 'valued ecological receptors', those species and habitats that are valued in some way for their ecological function, their contribution to biodiversity or are protected by specific legislation. The following specialist surveys were undertaken; both within the site within the appropriate buffer zones:

    - Bat (Chiroptera spp) survey (2022 & 2023)
    - Breeding bird survey (2023)
    - Wintering bird surveys (2023/24)
    - Carcass search surveys (2022-24)

Desk Study

2. A desk study was completed to identify potential ecological receptors within the site, and within the wider area of potential influence. The desk study focussed on the following study areas, which vary according to the value of the resource, and the potential for effects on birds and bats: Within the site and up to 15km beyond the boundary for designated areas of international and national importance for nature conservation i.e. Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs).

3. Features of conservation interest and importance were recorded and their locations were one of the key criteria that affected the Project. The location of the wind farm infrastructure avoids habitats and species of conservation interest, as the tracks, turbines and substation are all already in-situ. Mitigation measures have been incorporated into the Project in order to balance any detrimental impact.

4. The principal habitats on the site are extensive areas of arable cropland and improved grassland bounded by native hedgerows. There are also a number of blocks of planted woodland and scrub. Immediately adjacent to the site is a large area of marsh, polders and sand dunes (Cahore Marshes SPA). Overall, the habitats within the boundary of the site are of lower conservation value, while the adjacent SPA is of high value.

5. Ecological constraints determined from extensive site surveys have been used to evolve the layout and design of the Development. The impact assessment is therefore based on a wind farm design that already includes a number of important mitigation measures.

6. The Development will not result in the loss of any habitats. However, permanent and direct effect of medium to high magnitude on receptors of high value and sensitivity has been assessed.

7. After implementation of the mitigation measures proposed in this chapter it is assessed that there would be no significant residual adverse effects on any EU priority species or habitats as a result of the Project.

Field Surveys (Birds & Bats)

8. Hundreds of hours of static monitoring for bats were completed across the site (and survey effort was rotated to ensure all turbines were monitored during the surveys). In addition to this, dozens of carcass searches (for both bats & birds) were also carried out.

9. A total of ten bat casualties were found during 2024 search season, with the last search date on 05/09/24. These comprised single Leisler's bat, two common pipistrelle, three soprano pipistrelle and three pipistrelles unidentified to species level; a further unidentified bat.

10. Overall, there were moderate levels of bat activity experienced during surveys; therefore, a BMMP (Bat Monitoring Mitigation Plan) has been recommended as a precaution.

11. Given that high collision risk was recorded at median and peak activity levels, an adaptive monitoring and mitigation strategy (i.e., the BMMP) has been devised in line with the NatureScot (2021) Guidance and based on the site-specific data.

12. Following consideration of the residual effects (post-mitigation) it is considered that the Proposed Development will not result in any significant effects on bats.

13. Breeding & wintering bird surveys were carried out (including carcass searches for bird casualties). This data (along with historical bird data) was also used to inform an Appropriate Assessment Stage 1 Screening on the potential impact of the 10-year lifetime extension of the designation features of the Cahore Marshes SPA.

14. Carcass searches between October 2023 and September2024 provided evidence of 103 likely casualties within the wind farm. Modelling that takes into account removal of casualties by scavengers and detectability of casualties suggests that up to 369 bird fatalities could occur at the Ballywater Wind Farm site, most, if not all, likely to be the result of collision with turbine rotors. This equates to an average of around 17.5 casualties per turbine per year. However, the distribution of detected casualties suggests that there is likely to be wide variability of collision risk between individual turbines.

15. With regard to birds, management of the wind farm shall continue to maintain the current habitats that support breeding and wintering birds.
    - In recognition of the relatively high mortality associated with T11, 15, 16 and 24 it is proposed that these turbines will be stopped for an hour at dawn and dusk, periods of high flight activity when many birds are actively commuting from and to roost in low light conditions and when turbines are consequently likely to be least visible.
    - Dog-based fatality monitoring will be carried out on a monthly basis between 15 April and 15 October each year of the LTE. Annual reports will be prepared and submitted for the attention of the local authority and NPWS.

Appropriate Assessment

16. This Appropriate Assessment Screening, based on the best available scientific information, found that the Project does not pose a further risk of significant effects on Natura 2000 sites and that the proposal does not require progression to a Stage 2 appropriate assessment. Therefore, it is concluded that will it not have a significant effect on the conservation objectives or integrity of any Natura 2000 sites.

Conclusions

17. The potential effects of the Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a minor adverse or neutral effect that would not adversely affect the ecological integrity of the site and the wider area.
18. An assessment of cumulative impacts on the habitats, ornithology and fauna of the area was also undertaken, and it was concluded that there will be no significant effects.

Land, Soils and Geology

The existing Ballywater Wind Farm and Ballywater 110kV Substation are situated on a relatively flat, lowland coastal area of agricultural land, approximately 4km northeast of Kilmuckridge village, Co. Wexford. The Underground Grid Connection runs underground, mostly in the public road network, with small portions also running through third-party land.

The Environmental Impact Assessment Report (EIAR) Study Area for the Project is approximately 472ha hectares (ha), while the total development footprint of the Proposed Development (i.e., the existing wind farm, hardstandings, site roads, and substation footprint) is approximately 7.52ha. The vast majority of the EIAR study area is under agricultural use, split between agricultural grassland and tillage throughout the site. Surrounding land uses along the grid connection route include agriculture, low density housing, recreational amenity, and the wider road network

The topography across the site of the Proposed Development is relatively flat and slopes downwards in an easterly direction towards the coast. The Proposed Development site ranges slightly in elevation, measuring approximately between 5 and 30 metres above Ordanance Datum (mAOD). The area surrounding the existing Ballywater Wind Farm is comprised of pastureland with scattered one-off housing and small developments, and inland marshes and beaches to the east. The underground grid connection ranges from approximately 20 to 90 metres above mOAD.

According to GSI Mapping (www.gsi.ie) the site of the Proposed Development is dominated by poorly drained Carboniferous Limestone till of Irish Sea Basin origin (IrSTLs). Two other soil types also occur in smaller pockets of the site: Marine or Estuarine sediments comprised mainly of silts or clays (Mesc) and undifferentiated gravelly Alluvium (A). To the east of the site towards the coast. a band of windblown sands in dunes (Wsd) also occurs. Between the onsite substation and the Crane 110kV substation, the soil type along the grid connection is dominated by Shale till (TLPS) and poorly drained Carboniferous Limestone till of Irish Sea Basin origin (IrSTLs). The cable also runs through smaller areas of Alluvium undifferentiated (A) and Bedrock at surface (Rck).

GSI mapping for the site indicates that the site and surrounding area is underlain by thick bedded grey-green greywackes and slates of the Cambrian period.

The Teagasc soils map (http://gis.teagasc.ie/soils/map.php) identifies the predominant soil associated with the site of the Proposed Development as being poorly drained fine loamy over clayey calcareous Irish sea till (700a) to a depth of greater than 0.8m. This soil is poorly drained and not well suited to intensive agricultural practices, unless accompanied with the use fertilizers regularly, with land use defined as improved grassland. Previous investigation of the site provided in the original EIS prepared for Ballywater Wind Farm noted that soil as a generally sandy clay with few fieldstones or boulders, of a homogenous nature, possibly due to heavy cultivation. The local subsoils map is shown on Figure 7-2.

It was noted during the site walkover that the majority of the site is under intensive agricultural use for pasture and arable activities. Low levels of soil erosion are likely due to farm machinery action.

Based on the GSI bedrock map of the region, the majority of the site of the Proposed Development is underlain by the Newtown Formation (CANEWT) consisting of a succession of grey-green greywackes and associated green and purple shales and slates, and the Cahore Point Formation (CACAPT) consisting of pale coloured quartzites and interbedded slaty mudstones. Both the Newtown Formation and the Cahore Point are defined as Cambrian Metasediments formed during the Cambrian Period. Both formations are classified as Poor Aquifers (Pl) which are generally unproductive except for local zones.

There is one Geological Heritage Site within the Project EIAR Site Boundary, the Cahore Polders and Dunes (WX009), which is located to the east of the Proposed Development, with a section of this site within the EIAR Site Boundary. The site consists of a ridge comprising individual sand dunes at varying depositional stages extending for over 4km along the east coast, which grade westward into polder grassland and wetland. There are a number of designated sites (both national and EU Natura 2000 sites) located within proximity of the Project, as shown in Figure 7-4.

There are no requirements for construction works or reinstatement works with regard the proposed extension of life (i.e. operation). During the operational phase occasionally construction vehicles or plant may be necessary for maintenance of access roads, drainage networks and hardstands along with some minor landscaping works. None of these activities have the potential for significant effects on Land, Soils and Geology, as they are of such small scale and also of an intermittent nature. There will be adherence to the Operational and Environmental Management Plan (Appendix 4-3) with regard the use of oils and fuels on the Proposed Development site.

The potential effects associated with decommissioning of the Proposed Development will be similar to those associated with construction but of much reduced magnitude due to the new proposed environmentally sensitive Decommissioning Plan.

It is proposed to leave turbine foundations in place underground and to cover them with soil and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option as excavation works can be avoided. Cables will be left in where they are unlikely to be impacted by typical agricultural works. It is proposed that the site roadways will be left in-situ, as appropriate, to facilitate ongoing access for agricultural lands.

During decommissioning, it will be possible to reverse or at least reduce some of the potential impacts during construction by rehabilitating construction areas such as turbine bases, hard standing areas.

No Significant Effects to the land, soil and geology at the site have occurred, or are anticipated, as a result of the Project, including the Proposed Development's continued operation and decommissioning phases.

Hydrology and Hydrogeology (Water)

This chapter assesses the likely significant effects that the Project may have on hydrology and hydrogeology. The water environment within the EIAR site Boundary has been characterised through both the use of available desk study information and through site walkovers completed in September 2023 and February 2024. Particular attention was paid to the existing site hydrological/drainage features, watercourses, potential surface water drainage flow paths between the existing infrastructure and adjacent SAC/SPA downstream to the east and any other notable hydrological features within the site of the Proposed Development.

No new construction or significant project alterations are proposed beyond routine operation and maintenance activities. As there is no excavation or construction activity associated with the Project, discharges to water or groundwater quality impacts are not anticipated.

The Proposed Development is situated on a relatively flat area of agricultural land on the southeast coastline, approximately 1.6km from Cahore Point and 4km from Kilmuckridge village in the southwest. It is in a low-lying coastal area, with the topography across the site undulating with gentle to moderate slopes that fall in a general easterly direction towards the Cahore Polders and Dunes SAC, Cahore Marshes SPA and the Cahore Polders and Dunes pNHA. Also, locally towards the two main watercourses that drain easterly through the site.

The site has a maximum elevation of approximately 20 metres Ordnance Datum (mOD) in the west of the site, and a minimum elevation of approximately 2 mOD in the east. The Underground Grid Connection, as part of the Project along with the Proposed Development, runs predominantly through the public road network, with smaller sections of the cable travelling through private farm access roads and agricultural fields. The topography of the grid connection route is relatively undulating with its elevation increasing slowly over a long distance, from approximately 20 mOD in the east, at the existing wind farm and substation site, to a maximum of approximately 100m mOD further inland.

Regionally, the site lies within the Southeastern River Basin District, while the Proposed Development is located within the Owneavorragh catchment and the wider Project also within the Slaney and Wexford Harbour catchment. There are two watercourses located within the Proposed Development site boundary, the Cahore River and the Bog and Warren River, which drain directly to the Irish Sea. There are a number of watercourses which are encountered along the grid connection, to the east of the EIAR Site Boundary, which are tributaries of the Owenavorragh River which drains into the Irish Sea near north of the site near Courtown. The grid connection route also crosses two more watercourses, which are tributaries of the Tinnacross Stream, which further downstream enters the River Slaney. Most of the existing wind farm and substation infrastructure is surrounded by well-established grassland that comes right up to the edge of the hardstand areas in a well-kept and graded manner, and the soils and subsoils within the site appear to be reasonably well-drained with an overall absence of manmade field drainage. Surface water runoff on the Proposed Development site typically drains in an easterly direction due to the sloping topography along the coastline, east of the site.

The Proposed Development is underlain by the poorly productive (PP) Cahore Point Ground Water Body (GWB). Within the wider Project EIAR Site Boundary, the grid connection route is underlain by the northern section of the poorly productive (PP) Castlebridge North GWB, and moving further west towards Crane 110kV Substation, is underlain by the productive fissured bedrock (Fl) within the Enniscorthy GWB. The majority of the Proposed Development falls under the category of low groundwater vulnerability.

The status of the surface waterbodies within the Proposed Development site has been identified as having significant issues excess of nutrients, and organic matter, the associated pressures of agricultural activities and domestic wastewater treatment. The continued operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation to date has not had any long-term impact on the water quality of these waterbodies. As the Proposed Development does not involve any excavation or construction activity, no impact is anticipated for waterbodies in the area.

There will be no soil disturbance or use of machinery during the operational phase. Furthermore, since there was no deep excavation associated with the Project there is no potential for impacts on groundwater flow during the operational phase. The operation of the existing wind farm and substation does not require on-site storage of significant quantities of materials or liquids likely to cause a pollution incident, however small quantities of hydrocarbons may be required from time to time in order to operate/maintain machinery. There will be no ground disturbing works associated with the operational phase, no drainage features will be altered and there will be no direct or indirect discharges to watercourses during the continued operation of the Project.

During decommissioning, it is intended to limit groundworks other than to rehabilitate, constructed areas such as turbine bases and hard standing areas. This will be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation allowing these areas to naturally regenerate and revegetate naturally. The new proposed Decommissioning Plan is more environmentally sensitive than the current decommissioning conditions. The relatively localised and small-scale nature of the decommissioning phase works will not have the potential to affect the status of downstream waterbodies, as worst-case surface water quality effects (i.e. even in the absence of mitigation) will not be significant. There are no likely pathways for hydrological effects on these Designated Sites due to the lack of hydrological connectivity between the Project and the Designated Sites.

Air & Climate

Air Quality

This section identifies describes and assesses the potential effects of the continued operation of Ballywater Wind Farm and Ballywater 110kV Substation, and decommissioning, on air quality.

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin
- Zone B: Cork
- Zone C: Other cities and large towns including Limerick, Galway, Mullingar
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Clean Air for Europe (CAFE) Directive (as amended) and the Fourth Daughter Directive. The air quality in the vicinity of the Project site is typical of that of rural areas in the South-East of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland.

Due to the non-industrial nature of the Proposed Development and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR.

As per the original grants of permission for the existing wind farm and substation, if the 'Do-Nothing' alternative was chosen, decommissioning of the Proposed Development would involve the restoration of the site to its original state prior to development. Decommissioning activities have evolved since the original planning applications were submitted and a Decommissioning Plan has been prepared to account for such updates and is included in Appendix 4-4 of this EIAR. The removal of wind farm and substation infrastructure such as turbine foundations under the 'Do Nothing' scenario is not considered to be the most environmentally prudent option. In order to remove this infrastructure, a significant volume of reinforced concrete, over 180m^3, would have to be removed from the ground. This could result in significant environmental nuisance such as dust and/or pollution of surface waters and/groundwaters, soils, traffic, and negative impacts on sensitive habitats within the vicinity of the Project. In addition, the removal of the access roads has the potential to create significant dust issues as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm and substation infrastructure, a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

Exhaust emissions associated with the operational phase of the Project will arise from occasional machinery and Light Goods Vehicles (LGV) that are intermittently required onsite for maintenance. This will give rise to a Medium-Term Imperceptible Negative Effect However, any negative impacts associated with maintenance of the existing turbines will be offset by the continued operation of the wind farm and substation. Based on the assessment above there will be No Significant Direct or Indirect Effects.

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Project has resulted and will continue to result in emission savings of carbon dioxide (CO2), oxides of nitrogen (NO_2), and sulphur dioxide (SO_2) during its operational phase. The production of renewable energy from the Development will have a Medium-Term Significant Positive Impact on air quality.

Climate Change and Carbon Balance Calculations

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing the world today and is primarily the result of increased levels of greenhouse gases in the atmosphere. Increasing human emissions of carbon dioxide and other greenhouse gases cause a positive radiative imbalance at the top of the atmosphere, meaning energy is being trapped within the climate system. The imbalance leads to an accumulation of energy in the Earth system in the form of heat that is driving global warming[2],[3]. Greenhouse gases come primarily from the combustion of fossil fuels in energy use.

CAP 2024[4] was launched in December 2023. Following on from Climate Action Plans 2019, 2021, and 2023, CAP 2024 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030.* CAP 2024 seeks to build on the progress made under Climate Action Plan 2023 by delivering policies, measurements and actions that will support the achievement of Irelands carbon budgets, sectoral emission ceilings, and 2030 and 2050 climate targets; while further enabling the closure of identified emissions gaps and the allocation of unallocated emission savings associated with each carbon budget period.

In March 2023 the European Environment Agency (EEA) published the European Climate Risk Assessment[5]. This assessment states that Europe is the fastest warming continent on the planet and is warming at about the twice the global rate. The average global temperature in the 12-month period between February 2023 and January 2024 exceeding pre-industrial levels by 1.5°C. 2023 was the warmest year on record over more than 100,000 years globally, at 1.48°C above pre-industrial levels, with the world's ocean temperature also reaching new heights.

The Environmental Protection Agency (EPA) publish Ireland's Greenhouse Gas Emission Projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2023-2050'* was published in May 2024. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the Effort Sharing Regulation (ESR).

The Wexford County Council Climate Action Plan 2024-2029[6] (Wexford CCCAP) highlights the current state of climate action in Ireland, and how Wexford County Council intends to deliver and enable climate action for a just transition to a low carbon and climate resilient future within County Wexford. The Wexford CCCAP will help address the mitigation of greenhouse gases, the implementation of climate change mitigation and adaption measures, and will strengthen the alignment between national climate policy and the delivery of effective local climate action.

The Project can assist in reaching national targets not only by fulfilling the implementation of renewable energy (with a generating capacity of c42MW), but it also has the capacity to offset **229,780.8** tonnes of CO_2 in its proposed 10-year operational lifetime, thereby reducing the GHG effect and improving air quality as we transition to cleaner energy industries.

The Project will assist in reducing CO_2 emissions that would otherwise arise if the same energy that the proposed wind farm will generate were otherwise to be generated by conventional fossil fuel plants. This is a Medium term significant positive effect. The overall significance upon climate from the proposed extended operational life of the wind farm was assessed as a direct, medium-term moderate positive effect.

[2] *Hansen, J.; Sato, M.; Kharecha, P. et al. Earth's Energy Imbalance and Implications. Atmospheric Chemistry and Physics 2011, 11 (24), 13421–13449.* https://doi.org/10.5194/acp-11-13421-2011

[3] *von Schuckmann, K.; Palmer, M. D.; Trenberth, K. E. et al. An Imperative to Monitor Earth's Energy Imbalance. Nature Clim Change 2016, 6 (2), 138–144.* https://doi.org/10.1038/nclimate2876.

[4] *Department of the Environment, Climate and Communications (2023) Climate Action Plan 2024. Available at: https://www.gov.ie/en/publication/79659-climate-action-plan-2024/#new-approach-to-the-2024-annex-of-actions*

[5] European Environment Agency (2023) European Climate Risk Assessment <https://climate-adapt.eea.europa.eu/en/eu-adaptation-policy/key-eu-actions/climate_risk_assessment/index_html/>

[6] *Draft Wexford County County Climate Action Plan 2024-2029.* < *https://www.wexfordcoco.ie/sites/default/files/content/Climate%20Action%20Plan%202024-2029%20English.pdf* >

Noise and Vibration

AWN Consulting Limited has conducted an assessment into the likely environmental noise and vibration impacts of the Project.

The relevant guidance in respect of environmental noise for wind energy developments is '*Wind Energy Development Guidelines for Planning Authorities 2006*' (WEDG) with further detail on the methodology in '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' published by the Institute of Acoustics (IOAGPG).

To inform the noise impact assessment, a background noise survey was conducted to establish the existing baseline and background noise levels in the receiving environment. It is important to note that background noise levels are derived without any contribution from the existing wind turbines. In contrast, baseline noise or the existing noise environment, incorporating any contribution from the operation of the existing development.

The noise survey involved simultaneous wind measurements on the site and noise monitoring at four locations over several weeks to capture noise levels over a representative set of wind speeds and directions at each location. Typical background noise levels for day and night periods at various wind speeds have been derived from the measured data in accordance with best practice guidance contained in IOAGPG. Prevailing background noise levels are primarily attributable to local road traffic noise and other agricultural and anthropogenic sources in the area. The results of the background noise survey have been used to derived appropriate operational turbine noise criteria for the development in line with the guidance contained in the WEDG. Since the Project is an existing development, if it is permitted, there will be no change to the existing noise environment.

As the Project is an existing development, there is no construction phase. The assessment considers the potential noise and vibration effects for two stages: the medium-term operational phase and the short-term decommissioning phase.

The assessment of decommissioning noise and vibration and has been conducted in accordance with best practice guidance contained in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise* and *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration.* Subject to good working practices as recommended in the EIAR Chapter, it is not expected that there will be any significant noise and vibration impacts associated with the decommissioning phase as noise from decommissioning activity at the nearest Noise Sensitive Locations (NSL's) is expected to be well below recommended threshold values.

The potential impacts from the continued operation of the 110kV substation have been assessed against best practice guidance, and it was concluded that there will be no significant noise emissions from the continued operation of the substation at any NSL

An assessment of noise from the operation of the turbines in the Project has been undertaken. Turbine noise criteria have been determined and proposed in accordance with current guidance from the WEDG and following best practice guidelines from the IOAGPG. The assessment has confirmed that the residual turbine noise levels will operate within the proposed turbine noise criteria curves. Therefore, it is not considered that a significant effect is associated with the Project.

If the Proposed Development is granted permission, commissioning noise surveys will be undertaken to ensure compliance with any noise conditions applied to the development. 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 Notes will be followed, and relevant corrective actions taken.

No significant vibration effects are associated with the continued operation of the Proposed Development. In summary, the noise and vibration impacts of the Project are not significant considering best practice guidance for wind turbine developments.

Archaeology and Cultural Heritage

An archaeological, architectural and cultural heritage impact assessment of the extension of operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation, County Wexford was undertaken. The application seeks a ten (10) year planning permission for the continuation of the operational life of the existing Ballywater Wind Farm as permitted under the provisions of Wexford County Council (WCC) Pl. Ref 2001/0458 and the existing Ballywater 110kV Substation as permitted under the provisions of WCC Pl. Ref 2004/2901 from the date of expiration (June 2025) of the current permissions. The potential direct and indirect effects of the Project, including the existing grid connection, on the surrounding archaeological, architectural and cultural heritage landscape were assessed. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and a programme of field walking.

Five recorded monuments and a Protected Structure which is also included in the NIAH are located within the existing wind farm and substation site. As the Project comprises the continued operation of the existing wind farm and substation and no works are proposed at the operational stage, no direct or indirect effects to the archaeological, architectural or cultural heritage resource are identified. Similarly, no additional cumulative effects on this resource are identified as a result of the Project. No potential effect as a result of the proposed decommissioning phase of the Project are identified. Potential direct effects to one recorded monument within the site as a result of the 'Do Nothing' alternative are identified with appropriate mitigation measures proposed.

Landscape and Visual

Chapter 12 assesses the likely significant landscape and visual impacts arising as a result of extending the operational lifespan of the existing Ballywater Wind Farm and Ballywater 110kV Substation. Although all elements of the Project are assessed, the chapter focusses upon the turbines and substation, as they are deemed to be the essential aspects of the proposal under assessment from a landscape and visual perspective (see Section 12.2.1). The Chapter describes the baseline landscape and assesses the direct effects on the landscape of the site, as well as effects on landscape character and the impact on sensitive landscape receptors and Landscape Character Units (LCUs). Visibility of the existing turbines was assessed from receptors within a study area extending 20km from the existing turbines; and visual effects were determined from information gathered during multiple site visits as well as other tools such as ZTV mapping and photographic visualisations.

On-site visibility appraisals, ZTV mapping, and visual assessments from viewpoint locations determined that there is limited visibility of the existing turbines beyond 5km, where elevated topographical points of the Distinctive LCUs have visibility of the Proposed Development. The location of the existing turbines within a relatively flat landscape with highly vegetated working fields surrounding the site, largely restricts visual exposure in the wider landscape setting. Visibility of the existing turbines beyond the immediate landscape setting of the Proposed Development site is limited to localised areas of high elevation where open views across the flat and highly vegetated landscape are available from elevated vantage points, which is in general not a common occurrence in the LVIA Study Area.

The site is located in a relatively flat landscape with gentle undulations and is predominantly comprised of and surrounded by agricultural land. The Proposed Development is deemed to have 'Slight' Medium-Term landscape effects on these lands in which is located. The Proposed Development does not materially alter the Cahore marches SPA or Cahore Polder and Dunes SAC and pNHA, therefore resulting in Medium-Term 'Slight' landscape effects. The existing Ballywater Wind Farm is located in the Coastal LCU, which was deemed to have 'Moderate' residual landscape effects as a result of the Proposed Development. The Distinctive Coastal LCU of Cahore Point is deemed to have a 'Slight' residual effect on landscape character as a result of the Proposed Development given that the limited impact on its sensitivities. The residual effect on the landscape character of the Distinctive Hill LCUs were deemed to be 'Not Significant' due to the relative distance from the Proposed Development and visual screening by vegetation where present. The residual effects on the Lowlands LCU landscape character are deemed to be '**Imperceptible**' as a result of the Proposed Development due to the limited visibility of the existing Ballywater Wind Farm.

Visual effects arising as a result of the Proposed Development are localised and have the greatest impact on residential receptors. Receptors around Viewpoint 4 are deemed to have 'Significant' Medium-Term residual visual effects on account of a few residential receptors having views of the existing Ballywater Wind Farm in separate directions. Receptors represented by Viewpoints 2, 3 and 6 are deemed to have 'Moderate' Medium-Term residual visual effects as a result of the Proposed Development. These viewpoints are located on roads that provide access to more scenic amenities, and where some residential receptors have limited visibility of the existing Ballywater Wind Farm due to mature boundary vegetation. Receptors at VP5 are deemed to have 'Sight' Medium-Term residual visual effects as a result of the Proposed Development, as the existing Ballywater Wind Farm has limited impact on their visual amenity. Viewpoint 1 represents views from the scenic amenity of Cahore Point, where it was found that the existing Ballywater Wind Farm has limited effects on its scenic sensitivities, resulting in 'Slight' Medium-Term residual visual effects.

Material Assets

Traffic and Transport

The Existing Ballywater Wind Farm and Ballywater 110kV Substation is located approximately 4km northeast of Kilmuckridge Village and 12km south of Courtown, Co. Wexford. The existing wind farm and substation is located within pastural agricultural lands. The turbines are currently grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines. The larger cluster in the southwest, comprises of 17 no. turbines, as well as the onsite substation, which is located to the west of this cluster. The approximate grid reference location for the centre of the Proposed Development site is ITM E 719598, N 644533. The existing grid connection is predominantly located underground in the local road network, with a short section adjacent to the existing wind farm and substation site running through third-party land.

There are two access points to the Existing Ballywater Wind Farm and Ballywater 110kV Substation for traffic, such as maintenance vehicles. One of the existing entrances is for access to the southern turbine cluster, T03, T05-T20 and substation, located on the R742 Regional Road, which runs in a north-south direction to the west-southwestern border of the Proposed Development site. Alternatively, the northern turbine cluster, T21-T24, can be accessed via Cahore Local Road, which runs west-east in direction on the northern border of the Proposed Development. The individual turbines are accessed via the onsite network of existing wind farm access roads. The Underground Grid Connection is located predominantly within the public road corridor.

As the existing Ballywater Wind Farm and Ballywater 110kV Substation is currently operational, and no changes to the existing wind farm and substation are proposed, there is no construction phase associated with the proposed lifetime extension of the existing wind farm and substation, and existing grid connection. Therefore, there will be no new construction traffic generated by the continued operation of the Project.

During the operational phase, the wind farm and substation will continue to be remotely monitored. Traffic associated with the operational phase of the existing wind farm and substation will be from Ballywater Windfarm Ltd. personnel visiting the onsite substation and control building, and maintenance personnel who will visit individual turbines. The traffic volumes that will be generated by the Project during its continued operation will be minimal. The site will generate monthly maintenance trips, with approximately two maintenance staff travelling to site at any one time. Each turbine is subject to a yearly maintenance schedule which includes yearly master maintenance and visual blade inspections. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes. The wind farm manager will continue to attend the site regularly to perform inspections and oversee maintenance works. There are a number of periodic service and maintenance works which will include some vehicle movement, including during monthly, six-monthly and annual service visits. It is estimated that 1-2 daily visits will be made to the Site for authorised persons and vehicles to undertake minor routine maintenance and inspection, if and when required. The level of activity required for the maintenance of the both the existing Ballywater Wind Farm and existing Ballywater 110kV Substation infrastructure is minimal. Further information regarding maintenance trips and procedures can be found in Section 4.6.2 of Chapter 4: Description of the Project.

During the operational phase of the Project, the majority of maintenance works on the site will be completed by a two-person team travelling in a light goods vehicle. Typically, there are no more than two trips per day to the site made by car or light goods vehicle. An estimated worst-case scenario of 131 truckloads is required trip generation in the Decommissioning Phase. With the implementation of a Traffic Management Plan during future decommissioning works at the site, there will be no significant effect on traffic and transport resulting from the decommissioning phase.

Telecommunications and Aviation

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 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.

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example tower-to-tower microwave communication links, and airborne and ground radar systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach. These effects are generally easily dealt with by detailed micro-siting of turbines in order to avoid alignment with signal paths or by the use of repeater relay links out of line with the wind farm.

The Existing Ballywater Wind Farm and Ballywater 110kv Substation has been operational since 2005. To date, Ballywater Windfarm Ltd. are not aware of any complaints from telecommunications service providers regarding interference to service associated with the existing wind farm.

Scoping responses were received from several bodies (which are included in Appendix 2-1) in early 2024, affirming that the turbines will have no negative effect on their transmission links. Vodafone identified that there was one link operating in the area, but subsequently in a follow up email confirmed that the Project has not interfered with this link.

A scoping response was received from the Irish Aviation Authority (IAA) on 7th December 2023 regarding their position on the Project. In their response, IAA stated that 'Based on the information provided, IAA's Aerodromes Division has no requirements for incorporation into the Environmental Scoping Assessment report'. The Department of Defence issued a scoping response on 16th January 2024 regarding telecommunications services in proximity with the Project, Department of Defence stated that 'I can affirm that the Air Corps currently does not utilise any links within the specified area of interest, and there are no forthcoming plans to build links in that area.'

The Project has been in operation since 2005 and no changes to the existing wind farm and substation infrastructure are proposed. Therefore, no impacts on telecommunications and aviation are anticipated. There will be no significant cumulative effects in relation to telecommunications and aviation associated with the Project in combination with other projects.

Major Accidents and Natural Disasters

This section of the Environmental Impact Assessment Report (EIAR) describes the likely significant effects on the environment arising from the vulnerability of the proposed lifetime extension of the existing Ballywater Wind Farm and Ballywater 110kV Substation (the 'Proposed Development as detailed in Chapter 4) and the existing grid connection that connects the electricity generated by the wind farm to the national grid at Crane 110kV electrical substation in County Wexford (the 'Project' as detailed in Chapter 4 of this EIAR) to risks of major accidents and/or natural disasters.

Major accidents or natural disasters are hazards which have the potential to affect the Project and consequently have potential impacts on the environment. These include accidents during operation and decommission caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or disaster considers all factors defined in the EIA Directive that have been considered in this EIAR, i.e., population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and the landscape.

A desk-study has been completed to establish the baseline environment for which the proposed risk assessment is being carried out. This will influence both the likelihood and the impact of a major accident or natural disaster. Local and regional context has been established prior to undertaking the risk assessment to develop an understanding of the vulnerability and resilience of the area to emergency situations.

Further detail on the baseline environment, i.e. pre-identified risks identified in County Wexford, is provided in Section 14.4 of this EIAR. The scenario with the highest risk score in terms of the occurrence of major accidents and/or disasters was identified to be Industrial Accidents (Fire/Gas Explosions) and Contamination through spillage of hydrocarbons over the operational and decommissioning phases of the Project.

The Proposed Development was designed and built in accordance with the best practice measures set out in the Environmental Impact Statement (EIS) of the original planning application and, as such, mitigation against the risk of major accidents and/or disasters was embedded through the original design.

The risk of a major accident and/or disaster during the operation and decommissioning of the Project is considered low, in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010). It is considered that when the mitigation and monitoring measures outlined in the EIAR and Decommissioning Plan are implemented and adhered to, there will not be significant residual effect(s) associated with the operational and decommissioning phases of the Project. Therefore, the overall vulnerability of the Project to risks of major accidents and natural disasters is considered low.

Interaction of the Foregoing

The preceding Chapters 5 to 14 of this Environmental Impact Assessment Report (EIAR) identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Including Birds), Land, Soils and Geology, Hydrology and Hydrogeology (Water), Air and Climate, Noise and Vibration, Archaeology and Cultural Heritage, Landscape and Visual, and Material Assets (including Roads and Traffic, Telecommunications and Aviation) as a result of the Project. All of the likely significant effects of the Project and the associated mitigation measures are outlined in the relevant sections of this report. However, for any development with the potential for significant environmental effects there, is also the potential for interaction amongst these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect.

A matrix is presented in Table 15-1 of Chapter 15 to identify potential interactions of impacts between the various aspects of the environment already assessed in this EIAR. The matrix highlights the occurrence of potential positive or negative effects of the Project. The matrix is symmetric, with each environmental component addressed in the previous sections of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

Potential interactions have been identified between effects on Population and Human Health and effects on Land, Soils and Geology, Water, Air and Climate, Noise and Vibration, Landscape and Visual and Material Assets. Potential interactions have been identified between effects on Biodiversity (including Birds), on Land, Soils and Geology, Water, Air and Climate, Noise and Vibration, and Landscape and Visual. Potential interactions have been identified between Land, Soils and Geology with effects on Water, Air and Climate, Cultural Heritage, and Landscape and Visual. Furthermore, potential interactions have been identified between effects on Air and Climate and Material Assets (Traffic), and finally potential interactions were identified between effects on Landscape and Visual with effects on Cultural Heritage.

Where any potential interactive negative impacts have been identified in Chapter 15, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5-14) of the EIAR. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual impacts and the significance of effects, is also presented in each relevant chapter.

1. INTRODUCTION

This Environmental Impact Assessment Report (EIAR) has been prepared by MKO on behalf of Ballywater Windfarm Ltd (the Applicant), who intend to apply to Wexford County Council (WCC) for planning permission to extend the operational period of the existing Ballywater Wind Farm and the existing Ballywater 110kV Substation for an additional 10 years to 2035, after the expiry of their current planning permissions in 2025.

Ballywater Wind Farm and Ballywater 110kV Substation are located on the coast of Co. Wexford, approximately 4km northeast of Kilmuckridge village.

This EIAR accompanies the planning application for the Proposed Development submitted to Wexford County Council.

The existing Ballywater Wind Farm became operational in 2010 and is connected to the national electricity grid via the existing onsite Ballywater 110kV Substation, and the existing underground grid connection cabling route from Ballywater 110kV Substation to the existing Crane 110kV substation near Enniscorthy, Co. Wexford. It should be noted that the grid connection does not form part of the accompanying planning application. While it is recognised as an integral part of the Project and assessed within this EIA, it does not form part of the Proposed Development for which planning permission is being sought for.

The planning background for the existing Ballywater Wind Farm and Ballywater 110kV Substation is detailed further in Chapter 2: Background and Policy of this EIAR.

No construction activities or alterations to the existing wind farm or substation are proposed as part of this planning application, beyond the extension of routine maintenance of the turbines and electrical infrastructure during the operational phase of the Proposed Development.

A full description of the Proposed Development for the purposes of the Planning Application and the additional elements that form part of the overall Project, assessed in this EIAR, are contained in Chapter 4: Description of the Project.

1.1 References to the Proposed Development and the Project

For the purposes of this EIAR, where the 'Project' is referred to, this relates to all components which make up the existing Ballywater Wind Farm and are assessed within this EIAR, namely the existing Ballywater Wind Farm, the existing onsite Ballywater 110kV Substation, and the existing 110kV grid connection that connects the electricity generated by the wind farm to the national grid at Crane 110kV electrical substation in Co. Wexford. Where the 'Proposed Development' is referred to, this relates to all of the project components described in detail in Chapter 4 of this EIAR that are being proposed under the accompanying planning application. Where the 'existing wind farm and substation' is referred to, this relates to the existing Ballywater Wind Farm and Ballywater 110kV Substation. Where the 'Underground Grid Connection' is referred to, this relates to the underground grid connection cabling route from Ballywater 110kV substation to Crane 110kV substation. As stated above, while the Underground Grid Connection is assessed as part of this EIAR, it does not form part of the accompanying planning application. Individual topics for assessment purposes, i.e. each chapter, indicate the study area used for that topic. The actual site boundary for the purposes of the planning permission application (i.e. Red Line Boundary) occupies a smaller area relative to the EIAR site boundary.

The Proposed Development is being brought forward in response to local, regional, national and European policy regarding Ireland's transition to a low carbon economy and associated climate change policy objectives.

The EIAR Site Boundary encompasses an area of approximately 472 hectares (ha). The development footprint of the Proposed Development measures approximately 7.52ha, accounting for approximately 1.6% of the primary EIAR Study Area. The planning application boundary is detailed in Appendix 4-2 of this EIAR.

1.1.1 Planning History

The existing Ballywater Wind Farm consists of 21 no. Enercon E70 2 megawatts (MW) turbines with a ground to blade tip height of 99m, and a 110kV substation and control room. The existing Ballywater Wind Farm, which became operational in 2005, was granted by Wexford County Council under the provisions of WCC Pl. Ref. 2001/0458. This grant of permission was subject to a third-party appeal to An Board Pleanála that was later withdrawn (ABP Pl. Ref 26.127455). The Ballywater 110kV Substation was subsequently granted by Wexford County Council under the provisions of WCC Pl. Ref. 2004/2901. As previously stated, an extension to the operation of all 21 no. turbines and associated infrastructure and the onsite 110kV substation, is being applied for as part of this EIAR and Planning Application. The Proposed Development has a total rated capacity of c. 42 MW. The Proposed Development is connected to the national grid via approximately 21.4km of cabling, as part of the Project, that runs underground, predominantly in the local road network, to Crane 110kV substation. The existing wind farm and substation have been in commercial operation since 2005.

All 21 no. of the permitted turbines and onsite substation were constructed in 2005 and remain in place. An Environmental Impact Statement (EIS) was prepared and submitted as part of the initial planning application to Wexford County Council.

Planning condition no. 3 of the existing planning permission for Ballywater Wind Farm states:

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"* (WCC Pl. Ref. 2001/0458).

It is therefore assumed that the planning permission for the turbines expires in June 2025.

The existing Ballywater 110kV Substation was also constructed in 2005. A planning application was submitted to Wexford County Council.

Planning condition no. 2 of the existing planning permission for Ballywater 110kV Substation states:

> *"This planning permission is for construction of a 110kV Substation, perimeter fence, storeroom and incidental site works (to service Ballywater windfarm) only. The proposed development shall be carried out strictly in accordance with the plans and particulars lodged with this planning application, and the terms and conditions of the original planning permission for the windfarm, granted under planning registration number 2001 0458"* (WCC Pl. Ref. 2004/2901).

As per the above condition, Ballywater 110kV substation was granted planning permission under the same conditions as the wind farm, and planning permission for the substation therefore also expires in June 2025.

By 2025, the turbines will have only been in operation for 20 years despite the normal operational life of a turbine typically being 30 years. Therefore, Ballywater Windfarm Ltd intends to apply for planning permission to extend the operational period of Ballywater Wind Farm and Ballywater 110kV Substation (the 'Proposed Development') by 10 years.

1.1.2 Site Location

1.1.2.1 The Proposed Development

The turbines are currently grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines. The larger cluster in the south of the site comprises of 17 no. turbines, as well as the onsite substation, which is located to the west of this cluster. Access to the southern section of the site for general traffic, such as maintenance vehicles, is via the current existing site entrance on the R742 Regional Road, which runs along the western side of the site boundary. Access to the northern section of the site is via the Cahore Local Road which runs along the northern side of the site boundary.

The townlands within which the Proposed Development is located are listed in Table 1-1. A site location map is provided as Figure 1-1.

Table 1-1 Townlands within which the Proposed Development is located.

Element of Proposed Development	Townland
Wind Turbines, site access roads	Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, Templederry
Wind Farm Control Building and Substation	Ballywater Lower

1.1.2.2 The Project

The Project includes the Proposed Development, and the grid connection that originates at the onsite Ballywater 110kV substation. The cable runs underground, mostly in the local road network but also through some private lands, before connecting to the national grid at Crane 110kV substation, located approximately 18km west of the Proposed Development.

The townlands within which the Project is located are listed in Table 1-2. A site location map is provided as Figure 1-2.

Table 1-2 Townlands within which the Project is located

Element of The Project	Townland
Wind Turbines, site access roads	Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, Templederry
Wind Farm Control Building and Substation	Ballywater Lower
Underground Grid Connection from the Proposed Development to Crane 110kV substation	Ballywater Lower, Killannaduff, Raheenlusk, Ballinvunnia, Barnaree, Coolatrindle, Corbally, Boira North, Craan, Greenhall, Ballinvally, Kilpatrick, Ballyrea, Ballyedmond, Ballyshane, Ballynamire, Ballymurragh, Clone West, Raheendarrig, Tomnaboley Lower, Tomnaboley Upper, Tobergal, Knocknaskeagh, Myaugh, Ballydonigan, Tinnacross, Oulartard, Crane

Map Legend

EIAR Site Boundary

N

Drawing Title	Project Site Location
Project Title	Proposed Lifetime Extension of Ballywater Wind Farm
Drawn By: CF	Checked By: RK
Project No.: 230417	Drawing No.: Figure 1-1
Scale: 1:90,000	Date: 2024-09-20

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Map Legend

EIAR Site Boundary

N

Drawing Title	Proposed Development Site Location
Project Title	Proposed Lifetime Extension of Ballywater Wind Farm
Drawn By: CF	Checked By: KB
Project No.: 230417	Drawing No.: Figure 1-2
Scale: 1:26,000	Date: 2024-09-16

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1.2 Legislative Context

1.2.1 Environmental Impact Assessment

The consolidated European Union Directive 2011/92/EU on the assessment and of the effects of certain public and private projects on the environment (the 'EIA Directive'), was transposed into Irish planning legislation by the Planning and Development Acts 2000 (as amended) and the Planning and Development Regulations 2001 to 2022. The EIA Directive was amended by Directive 2014/52/EU which has been transposed into Irish law with recent European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).

Accordingly, this EIAR complies with the EIA Directive as amended by Directive 2014/52/EU. To the extent relevant and necessary, regard has been had to the existing provisions of the Planning and Development Acts 2000 (as amended) and the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

The European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive'), requires Member States to ensure that the competent authority carries out an assessment of the likely significant effects of certain types of projects, as listed in the Directives, prior to development consent being given for the project. The Environmental Impact Assessment (EIA) of the Proposed Development will be undertaken by Wexford County Council as the competent authority.

Article 5 of the EIA Directive as amended by Directive 2014/52/EU provides where an EIA is required, the developer shall prepare and submit an Environmental Impact Assessment Report (EIAR). The information to be provided by the developer shall include at least:

a) *A description of the project comprising information on the site, design, size and other relevant features of the project;*
b) *A description of the likely significant effects of the project on the environment;*
c) *A description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant effects on the environment;*
d) *A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment; and,*
e) *A non-technical summary of the information referred to in points (a) to (d); and (f) any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.*

In addition, Annex IV of the EIA Directive provides further detail on the information to be included in an EIAR. These requirements are transposed under Article 94 and Schedule 6 of the Planning and Development Acts 2000 (as amended) sets out the information to be contained in an EIAR, with which this EIAR complies.

MKO was appointed as environmental consultant on the Proposed Development and commissioned to prepare this EIAR in accordance with the requirements of the EIA Directive as amended by Directive 2014/52/EU.

The relevant classes/scales of the development that require EIA are set out in Schedule 5 of the Planning and Development Regulations 2001 to 2022. The relevant class of development in this case relates to "*installations for the harnessing of wind power for energy production (wind farms) with more than 5 turbines or having a total output greater than 5 megawatts*", as per paragraph 3(i) of Part 2 of

Schedule 5. The Proposed Development exceeds 5 turbines and 5 MW in scale, and therefore is required to be subject to EIA. However, as the Proposed Development is an existing wind farm rather than a new installation, paragraph 15(a) has also been considered which relates to:

> *"Any change or extension of development which would:-*
> *(i) result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and*
> *(ii) result in an increase in size greater than-*
> *- 25 per cent, or*
> *- an amount equal to 50 per cent of the appropriate threshold,*
> *whichever is the greater."*

The Proposed Development seeks to extend the operational period of the existing Ballywater Wind Farm and Ballywater 110kV Substation, no changes to the existing wind farm and substation infrastructure are proposed.

An EIAR has been prepared with respect to paragraph 3(i) of Part 2 of Schedule 5 (i.e., more than 5 turbines and/or a total output greater than 5 megawatts).

The EIAR provides information on the receiving environment and assesses the likely significant effects of the proposed project on it and proposes mitigation measures to avoid or reduce these effects. The function of the EIAR is to provide information to allow the competent authority to conduct the EIA of the proposed project.

All elements of the Project, including the wind turbines and associated infrastructure (substation, site access roads), and grid connection have been assessed as part of this EIAR.

1.2.2 EIAR Guidance

The Environmental Protection Agency (EPA) published its *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (EPA, May 2022), which is intended to guide practitioners preparing an EIAR in line with the requirements set out in the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).

This EIAR has also followed the provisions of the '*Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment*', published by the Department of Housing, Planning and Local Government (DHPLG) in August 2018 to the extent these guidelines are relevant having regard to the enactment of the revised EIA Directive.

The European Commission also published a number of guidance documents in December 2017 in relation to Environmental Impact Assessment of Projects (Directive 2011/92/EU as amended by 2014/52/EU) including '*Guidance on Screening*', *'Guidance on Scoping'* and *'Guidance on the preparation of the Environmental Impact Assessment Report'*. MKO has prepared the EIAR in accordance with these guidelines also.

1.2.3 Wind Energy Development Guidelines for Planning Authorities

This EIAR has followed the relevant considerations under the *'Wind Energy Development Guidelines for Planning Authorities* ((Department of the Environment, Heritage and Local Government (DEHLG), 2006)). These guidelines were the subject of a targeted review in 2013. The proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document *Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review* (December 2013). A consultation process in relation to the document was undertaken by the Department of

Communications, Climate Action and Environment (DCCAE) and as of December 2019, the proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document *Draft Revised Wind Energy Development Guidelines* (December 2019). A consultation process in relation to the 2019 document commenced on the 12th December 2019 and concluded on February 19th, 2020. The final Revised Wind Energy Development Guidelines have yet to be published by the Department of Housing, Planning and Local Government (DHPLG).

At time of writing, the 2019 Draft Guidelines have not yet been adopted, and the relevant guidelines for the purposes of Section 28 of the Planning and Development Acts 2000 (as amended), as amended, remain those published in 2006. Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects and the commitment within the Climate Action Plan 2024 to publish new draft guidelines in 2024 and subsequent finalisation, it is possible that the draft Guidelines may be adopted during the consideration period for the current planning application. Should the draft Guidelines, in their current form, be adopted in advance of a planning decision being made on this application, the Proposed Development site will be capable of achieving the requirements of the draft Guidelines as currently proposed in relation to any revised noise and shadow flicker requirements, which can be achieved by implementing mitigation through use of the turbine control systems, where necessary.

1.3 The Applicant

The Applicant for the continued operation of the Proposed Development is Ballywater Windfarm Ltd, an associated company of CGN Europe Energy (CGNEE). CGNEE, the parent company of Ballywater Windfarm Ltd, established their European headquarters in Paris in 2014. Following that, CGNEE opened their Irish office, based in Dublin, in January 2018. CGNEE oversee wind farms across Ireland, Wales, England, and the Netherlands with a total capacity of 422MW. CGNEE oversee and manage 2.4GW of renewable energy throughout Europe. CGNEE invest €117k every year into local Community Benefit Funds across Ireland.

1.4 Brief Description of the Proposed Development

This section of the EIAR describes the development and its component parts (the 'Proposed Development') including the elements that are the subject of a proposed application for planning permission to WCC. Planning permission is sought for the continued operation of the existing Ballywater Wind Farm, as permitted by Wexford County Council under planning ref 2001/0458, for a further period of 10 years from the date of expiry for 21 no. of the turbines (June 2025) per Condition no. 3 of the original planning consent issued, with decommissioning of the wind farm at the end of the proposed extension period (June 2035). In addition, permission is being sought for the existing Ballywater 110kV Substation, as permitted under WCC Pl. Ref. 2004/2901. There are no alterations to the existing wind farm and substation infrastructure proposed as part of this Planning Application and EIAR.

The full description of the Proposed Development, as per the public planning notices, is as follows:

- *(i)* *21 no. existing Enercon E70 wind turbines with a maximum overall blade tip height of 99 metres (m), including hardstands;*
- *(ii)* *Existing 1 no. onsite 110 kilovolt (kV) electrical substation which includes 1 no. control building, security fencing, external lighting, underground cabling, and all associated infrastructure and associated electrical plant and apparatus;*
- *(iii)* *All existing associated electrical and communications cabling connecting the turbines to the onsite Ballywater 110kV Substation;*
- *(iv)* *Existing gated site entrances from the R742 and an unnamed local road;*
- *(v)* *Existing internal access tracks; and,*
- *(vi)* *All existing ancillary infrastructure.*

There are 35 no. residential properties located within 500m of an existing turbine. Of these 35 no. properties, 1 no. is a derelict property, 33 are third-party dwellings, and 1 no. is under the ownership of the participating landowners.

While the Proposed Development is described above, all elements of the Project (i.e. the Proposed Development and associated Underground Grid Connection) have been assessed as part of this EIAR.

1.5 Need for the Proposed Development

1.5.1 Overview

In July 2021, the Climate Action and Low Carbon Development (Amendment) Act 2021 was signed into law, committing Ireland to reach a legally binding target of net-zero emissions no later than 2050, and a cut of 51% by 2030 (compared to 2018 levels). On this pathway to decarbonisation, the Government published the Climate Action Plan 2024[1] reaffirming the renewable electricity target of 80% by 2030, without compromising security of energy supply. The proposed extension of operation of the Ballywater Wind Farm is key to helping Ireland address these challenges as well as addressing the country's over-dependence of imported fossil fuels.

An EPA report[2] published in July 2024 stated a provisional total of national greenhouse gas emissions in 2023 to be 55.01 million tonnes carbon dioxide equivalent ($MtCO_2eq$), which is 6.8% lower (or 4.00Mt CO2eq) than emissions in 2022 ($59.00MtCO_2eq$) and follows a 1.9% increase on 2021 levels reported in 2022. Ireland's emissions in 2023 were the lowest in three decades with reductions in almost all sectors and were below the 1990 baseline for the first time in three decades. The EPA report noted that *'the increase in renewables combined with the increase in imported electricity from interconnectors caused emissions intensity of power generation to decrease by 23.3%, from 332g CO_2/kWh in 2022 to a historic low of 255g CO_2/kWh in 2023'.* The Proposed Development will help to bridge the gap between the reduction in greenhouse gas emissions in 2023 and the further reductions that are needed to meet Ireland's legally binding commitment to achieving net-zero emissions no later than 2050.

In 2023, the energy industries, transport and agriculture sectors accounted for 73.5% of total greenhouse gas (GHG) emissions. Agriculture is the single largest contributor to the overall emissions, at 37.8%. Transport, energy industries and the residential sector are the next largest contributors, at 21.4%, 14.3% and 9.7%, respectively. The report also states that there was a substantial reduction in coal, oil and natural gas used in electricity generation (-44.2%, -78.2% and -7.2% respectively), and renewables increased from 38.6% in 2022 to 40.7% in 2023. The report highlights that whilst emissions are beginning to reduce, transformative measures will be needed to meet National Climate ambitions.

As such, an extension of the operational life of the Proposed Development is critical to helping Ireland address these challenges. The need for the Proposed Development is driven by the following factors:

1. *A legal commitment from Ireland to limit greenhouse gas emissions under the Kyoto protocol to reduce global warming;*
2. *A requirement to increase Ireland's national energy security as set out in Irelands Transition to a Low Carbon Energy Future 2015-2030;*
3. *A requirement to diversify Ireland's energy sources, with a view to achievement of - national renewable energy targets and an avoidance of significant fines from the EU (the EU Renewables Directive);*

[1] *Department of Environment, Climate and Communications (2023) Climate Action Plan 2024*
[2] *Environmental Protection Agency (July 2024). Ireland's Provisional Greenhouse Gas Emissions (1990-2023). Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Provisional-GHG-Report-Jul24-v6.pdf*

4. *Climate Action Plan 2024 which aims to ensure that Ireland achieves its legally binding target (the Climate Action and Low Carbon Development (Amendment) Act 2021) of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030;*
5. *Provision of cost-effective power production for Ireland which would deliver local benefits;*
6. *Increasing energy price stability in Ireland through reducing an over reliance on imported gas; and*
7. *To facilitate the Government in meeting its ambitious 80% renewable energy target by 2030.*

These factors are addressed in further detail below. Section 2.3 in Chapter 2 of this EIAR on Background and Policy, presents a full description of the international and national renewable energy policy context for the Proposed Development. Section 2.2 addresses climate change, including Ireland's current status with regard to meeting greenhouse gas emissions reduction targets.

In March 2024, the World Meteorological Organisation (WMO) published the State of the Global Climate 2023 Report.[3] The report provides a summary on the state of the climate indicators in 2023 with sections on key climate indicators, extreme events and impacts. The key messages in the report include:

- 2023 was the warmest year on record at 1.45 ± 0.12°C above the pre-industrial average.
- Concentrations of the three main greenhouse gases – carbon dioxide, methane, and nitrous oxide – reached record high observed levels.
- Antarctic sea-ice extent reached an absolute record low in February. The annual maximum extent was around 1 million km2 below the previous record low maximum.
- Extreme weather continued to lead to severe socio-economic impacts. Extreme heat affected many parts of the world. Wildfires in Hawaii, Canada and Europe led to loss of life, the destruction of homes and large-scale air pollution.
- Food security, population displacement and impacts on vulnerable populations continue to be of mounting concern in 2023, with weather and climate hazards exacerbating the situation in many parts of the world.

The State of the Global Climate 2023 report goes on to state that renewable energy generation, primarily driven by the dynamic forces of solar radiation, wind and the water cycle, has surged to the forefront of climate action for its potential to achieve decarbonization targets. There has been a substantial worldwide energy transition, with renewable capacity additions increasing by nearly 50% from 2022, totalling 510 gigawatts (GW).[4] This growth represents the highest rate observed in the past two decades, signalling a significant momentum toward achieving the clean energy goal set at the United Nations Framework Convention on Climate Change (UNFCCC) 28th Conference of the Parties (COP28) meeting in 2023 to triple renewable energy capacity globally to 11,000 GW by 2030.

The recent joint publication of WMO and International Renewable Energy Agency on Climate-driven Global Renewable Energy Potential Resources and Energy Demand in 2022[5] underscores the inherent links between renewable energy resources and weather and climate conditions. It calls for better

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[3] *World Meteorological Organization (2024). State of the Global Climate 2023. Available at: https://wmo.int/publication-series/state-of-global-climate-2023*

[4] *International Energy Authority (2024) Renewables 2023 – Analysis and Forecast to 2028. Available at: https://iea.blob.core.windows.net/assets/96d66a8b-d502-476b-ba94-54ffda84cf72/Renewables_2023.pdf*

1. [5] *WMO and IRENA (2023). 2022 Year in Review: Climate-driven Global Renewable Energy Potential Resources and Energy Demand. Available at: https://library.wmo.int/records/item/68576-2022-year-in-review-climate-driven-global-renewable-energy-potential-resources-and-energy-demand*

integration of climate variability considerations into energy resource operation, management, and planning to enhance effectiveness and sustainability in these regions.

1.5.2 Climate Change and Greenhouse Gas Emissions

At the Paris Climate Conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to avoid dangerous climate change by limiting global warming to well below 2°C above pre-industrial levels. Under the agreement, governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science. The most recent climate change conference took place in Sharm el-Sheikh, Dubai (COP28) in December 2023. It resulted in the first agreement explicitly calling for the transition away from fossil fuels, described as the United Arab Emirates (UAE) Consensus. This text raised concerns over the achievement of limiting warming below 1.5°C, as the prior text to 'phase out as soon as possible inefficient fossil fuel subsidies' does not address energy poverty or the just transition. The UAE Consensus further calls for more explicit near-term goals in the lead up to 2050, calling for the world to cut greenhouse gas emissions by 43% as compared to 2019 levels.

The International Panel on Climate Change (IPCC) put forward its clear assessment in their Fifth Assessment Report[6], that the window for action on climate change is rapidly closing and that renewable energy sources such as wind will have to grow from 30% of global electricity at present to 80% by 2050 if we are to limit global warming to below 2 degrees and in accordance with the COP 21 agreement to limit global warming to well below 2°C above pre-industrial levels. Former Minister for the Environment, Community and Local Government Alan Kelly remarked in 2015 that "*As a nation we must do everything in our power to curb our emissions*".

In February 2022, the International Panel on Climate Change (IPCC) released the report 'Working Group II-Climate Change 2022: Impacts, Adaptation and Vulnerability' regarding the impacts of climate change on nature and human activity. The report states that global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO2 and other greenhouse gas emissions occur in the coming decades. the report identifies four key risks for Europe with most becoming more severe at 2 °C global warming levels (GWL) compared with 1.5 °C GWL. From 3°C GWL, severe risks remain for many sectors in Europe. The four key risks identified are:

- Key Risk 1: Mortality and morbidity of people and changes in ecosystems due to heat.
- Key Risk 2: Heat and drought stress on crops.
- Key Risk 3: Water scarcity.
- Key Risk 4: Flooding and sea level rise

In April 2022, the IPCC released the report '*Working Group-III – Climate Change 2022: Mitigation Of Climate Change*', which assesses literature on the scientific, technological, environmental, economic, and social aspects of mitigation of climate change. The report reflects new findings in the relevant literature and builds on previous IPCC reports, including the WGIII contribution to the IPCC's Fifth Assessment Report (AR5), the WGI and WGII contributions to AR6 and the three Special Reports[7] in the Sixth Assessment cycle. This report outlines developments in emission reduction and mitigation efforts, assessing the impact of national climate pledges in relation to long-term emissions goals in a

[6] IPCC Fifth Assessment Synthesis Report, Intergovernmental Panel on Climate Change AR5 Report

[7] *The three Special Reports are: Global Warming of 1.5°C: an IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018); Climate Change and Land: an IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems (2019); IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019)*

global context.; and states that '*Unless there are immediate and deep emissions reductions across all sectors, limiting global warming to 1.5°C will be beyond reach.*'

In May 2024, the EPA[8] reported, for the 2022 year, that the energy sector contributed to 17% of Ireland's total emissions. Under a With Existing Measures (WEM) scenario, emissions from the energy industries sector are projected to decrease by 57% from 10.1 to 4.4 $MtCO_2eq$; under a With Additional Measures (WAM) scenario, emissions from the energy sector are projected to decrease by 62% from 10.1 to 3.9 $MtCO_2eq$ over the period 2022-2030.

The EPA *'Ireland's Provisional Greenhouse Gas Emissions 1990-2023'* report[9] stated that in 2023, overall electricity generation in Ireland increased by a 2.1% and renewable electricity generation increased from 38.6% in 2022 to 40.7% in 2023, with wind accounting for 33.7% of electricity supply (up from 33.1%). The increase in renewables combined with the increase in imported electricity from interconnectors caused emissions intensity of power generation to decrease by 23.3%, from 332g CO2/kWh in 2022 to a historic low of 255g CO2/kWh in 2023.

The '*National Energy Projections 2023*'[10], published annually by the Sustainable Energy Authority of Ireland (SEAI), state that in 2022, 86% of all energy used in Ireland was from fossil fuels, 13% from renewable sources and the remainder from others such as waste and electricity imports. By 2030, fossil fuels could still provide most of Ireland's energy, ranging from 68% in the WEM scenario to 57% in the most ambitious WAM scenario. The deployment of renewables needs to outpace the growth of energy demand for the absolute reductions in greenhouse gas emissions that are required to be met. However, the SEAI National Energy Projections show that by the end of the second budget period, the total exceedance in the electricity sector is projected to be 20.1 $MtCO_2eq$, or 33%, and 13.8$MtCO_2eq$, or 23%, in the WEM and WAM scenarios, respectively.

It is estimated that Ballywater Wind Farm has a potential maximum output of 42 MW. On this basis, the Project is capable of displacing up to 22,978 tonnes of carbon dioxide per year, which would amount to 229,780.8 tonnes of carbon dioxide over the entire 10-year duration of the Proposed Development. The carbon offsets resulting from the Project are described in detail in Chapter 9: Air and Climate, Section 9.3.4.

1.5.3 Energy Security

At a national level, Ireland currently has one of the highest external dependencies on imported energy sources. In November 2023 the Department of the Environment, Climate and Communications (DECC) published '*Energy Security in Ireland to 2030*'[11] which states that *"Ireland's future energy will be secure by moving from an oil-, peat-, coal, and gas-based energy system to an electricity-led system, maximising our renewable energy potential flexibility and being integrated in Europe's energy systems"*. Ireland is currently one of the most energy import dependent countries in the EU, having imported 77% of its energy supply in 2021 and 82% in 2022.[12] The DECC report proposes a package of a wide range of measures to implement by 2030 to strengthen Ireland's energy security, reduce dependency on imported energy, and reduce vulnerability to energy shocks.

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[8] *Environmental Protection Agency (May 2023) Ireland's Greenhouse Gas Emission Projections 2022-2040. Available at: https://www.rte.ie/documents/news/2024/05/epa-report.pdf*

[9] *Environmental Protection Agency (July 2024): Ireland's Provisional Greenhouse Gas Emissions 1990-2023. https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Provisional-GHG-Report-Jul24-v6.pdf*

[10] *SEAI National Energy Projections 2023 Report. Available at: https://www.seai.ie/publications/National-Energy-Projections-2023.pdf*

[11] *Department of the Environment, Climate and Communications (2023). Energy Security in Ireland to 2030. Available at: < https://assets.gov.ie/276471/2d15ce6d-e555-4ada-a3cf-b325a5d7ba20.pdf.*

[12] *Sustainable Energy Authority of Ireland (2023). Key insights from SEAIs 2022 National Energy Balance. Available at: https://www.seai.ie/data-and-insights/seai-statistics/key-publications/national-energy-balance/Key-Insights-from-2022-National-Energy-Balance.pdf*

EirGrid in their '*All Island Generation Capacity Statement 2022 - 2031*' (October 2022), states that new wind farms commissioned in Ireland in 2021 brought total installed wind capacity to over 4,300MW, contributing to the overall RES-E percentage of 36.4% with wind energy accounting for 32.5%. Prior to 2015, Ireland's import dependency of energy was over 90%, but dropped to 71% in 2016 following the commencement of gas production at the Corrib gas field. Since 2018, Ireland's import dependency has been increasing as the output from the Corrib gas field reduces faster than new renewable sources are being added. In 2022, Ireland's import dependency for energy was 81.6%, compared to the EU average of 57.5%[13] (in 2020).

In January 2024 the SEAI published their '*Energy in Ireland 2023 Report*', stating that in 2022, 49.2% of the electricity generated indigenously in Ireland came from gas, with renewables accounting for a further 38.9%. Coal, oil, non-renewable wastes (NRW), and peat accounted for the remainder of electricity generation in Ireland. The overall renewable energy share for gross final energy consumption for 2022 was 13.1%. 2022 had the lowest energy-related emissions of any year in the last quarter century, except for 2020 which was heavily influenced by the restrictions associated with the COVID-19 pandemic. The SEAI Energy in Ireland 2023 report, using early provisional data from January to September 2023, states that electricity emissions may be significantly reduced from 2022 levels in 2023, and the carbon intensity of the national grid may be down to 259 gCO2/kWh, which, if achieved, will be the lowest carbon intensity value ever reached in Ireland.

Ireland continues to be hugely energy import-dependent, which can results in large energy price fluctuations as a minimum, and the possibility of fuel shortages if a major energy crisis were to occur. The international fossil fuel market is growing increasingly expensive and is increasingly affected by international politics, which can compound price fluctuations. This volatility will be more likely as carbon prices increase in the future. This has implications for every Irish citizen.

The SEAI has stated that our heavy dependence on imported fossil fuels, *"is a lost opportunity in terms of keeping this money here in Ireland and further developing our abundant renewable resources"*[14].

The cost of carbon credits is included in all electricity traded, and the price of electricity generated by coal is particularly vulnerable due to its high carbon emissions per unit of electricity generated. Coal and peat generate almost 5% of Ireland's electricity, while gas generates 51%, but the Climate Action Plan requires Ireland to achieve a 51% reduction in GHG emissions by 2030 (relative to 2018 levels), and net-zero emissions by no later than 2050. The Energy White Paper 2015[15] notes "*There will be a substantial increase in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme*". Any steps to reduce dependence on imported fossil fuels will add to financial autonomy and stability in Ireland. As the White Paper notes:

> *"In the longer term, fossil fuels will be largely replaced by renewable sources".*

1.5.4 REPowerEU

In a Communication from the European Parliament on Joint European Action for more affordable, secure, and sustainable energy, the European Commission proposed an outline of a plan to make Europe independent from Russian fossil fuels well before 2030 in light of Russia's invasion of Ukraine. Commission President Ursula von der Leyen stated:

> "*We must become independent from Russian oil, coal, and gas. We simply cannot rely on a supplier who explicitly threatens us. We need to act now to mitigate the impact of rising energy prices, diversify our gas supply for next winter and accelerate the clean energy*

[13] *Sustainable Energy Authority Ireland (2024) Energy in Ireland – 2023 Report*
[14] *Dr Eimear Cotter, Head of Low Carbon Technologies, SEAI - "Energy Security in Ireland 2015"*
[15] *Department of Communications, Energy & Natural Resources, (2015). Ireland's Transition to a Low Carbon Energy Future 2015-2030.*

> ***transition. The quicker we switch to renewables and hydrogen, combined with more energy efficiency, the quicker we will be truly independent and master our energy system.".***

The European Commission published the REPowerEU Plan[16] in May 2022 in response to energy security concerns surrounding the dependence on imports of Russian fossil fuels, and the subsequent switch to renewable energy alternatives. REPowerEU builds on the full implementation of the Fit for 55 proposals tabled last year without modifying the ambition of achieving at least -55 % net GHG emissions by 2030 and climate neutrality by 2050, in line with the European Green Deal. It will have a positive impact on EU's emission reduction over the decade. However, the fast phasing out of fossil fuel imports from Russia will affect the transition trajectory, or how we reach our climate target, compared to that under previous assumptions. The key outcomes and targets from the REPowerEU Plan include the following;

- Energy Savings – Increasing the 2030 Energy Efficiency target from 9% to 13%;
- Renewable Energy Strategy (RES) – Increasing the 2030 Renewable Energy Directive target from 40% in previous years proposal up to 45%.;
- Member States should as a matter of priority implement the permitting-related Country Specific Recommendations in the European Semester and already adopted Recovery and Resilience Plans. Equally, the full and rapid transposition by all Member States of the Renewable Energy Directive is a matter of urgency to simplify permitting procedures.

In April 2022, the Government published the National Energy Security Framework (NESF) providing a single overarching and initial response to address Ireland's energy security needs in the context of the war in Ukraine. This framework mirrors that of the EU, in which accelerating Ireland's transition from the use of fossil fuel to renewable energy sources is a key objective.

1.5.5 Competitiveness of Wind Energy

While Ireland has a range of renewable resources, as the White Paper[17] states; '[Onshore Wind] *is a proven technology and Ireland's abundant wind resource means that a wind generator in Ireland generates more electricity than similar installations in other countries. This results in a lower cost of support.'*.

In fact, the cost of support is more than offset by the fact that adding large quantities of wind to the wholesale market drives down auction prices in any half hour trading period when the wind is blowing, i.e., for 80% of the hours of the year. Wind is capable of an average capacity factor of approximately 35%, which is its average output throughout the year relative to its maximum output. However, wind is generating power at some level for 80% of the hours of the year. A KPMG report from 2021[18] which details findings on the economic impact of onshore wind in Ireland, estimated the baseline economic impacts of wind energy within the Republic of Ireland, while forecasting the impacts of achieving Climate Action Plan Targets of 8.2MW by 2030[19]. The report found that "if CAP targets are reached in 2030, total economic impacts arising from the required level of capital investments would be nearly €2.7 billion through to 2030." The EU has noted that Ireland has one of the lowest costs of supporting renewables mainly because onshore wind is on a par with the cost of power from conventional generation when a full cost benefit analysis is undertaken.

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[16] *European Commission (2022). REPowerEU: Joint European Action for more affordable, secure and sustainable energy. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2022:108:FIN*
[17] *Ibid.*
[18] *KPMG (2021). Economic impact of onshore wind in Ireland – Prepared for Wind Energy Ireland (WEI). Available at: https://windenergyireland.com/images/files/economic-impact-of-onshore-wind-in-ireland.pdf*
[19] *As this report was released in April 2021, onshore installed capacity projections were based on the CAP 2019 projections of 8.2MW of onshore wind and 3.5 GW of offshore wind. This has since been superseded by the latest CAP 2024, to 9 GW of onshore wind and 8 GW of offshore wind by 2023.*

1.5.6 EU 2020 Renewable Energy Targets

The burning of fossil fuels for energy creates greenhouse gases, which contribute significantly to climate change. These and other emissions also create acid rain and air pollution. Sources of renewable energy that are utilised locally with minimal impact on the environment are necessary to meet the challenges of the future. The EU adopted the Renewable Energy Directive (2018/2001 EU) on the Promotion of the Use of Energy from Renewable Sources in December 2018 which sets EU 2030 Renewable Energy Targets.

The Directive sets a legally binding mandatory national target for the overall share of energy from renewable sources for each Member State. This package is designed to achieve the EU's overall 20:20:20 environmental target, which consists of a 20% reduction in greenhouse gases, a 20% share of renewable energy in the EU's total energy consumption and a 20% increase in energy efficiency by 2020. To ensure that the mandatory national targets are achieved, Member States must follow an indicative trajectory towards the achievement of their target as outlined in Ireland's National Renewable Energy Action Plan (NREAP).

The first Renewable Energy Directive (RED)[20] is legislation that influenced the growth of renewable energy in the EU and Ireland for the decade ending in 2020. From 2021, RED was replaced by the second Renewable Energy Directive (REDII),[21] which continues to promote the growth of renewable energy out to 2030. Ireland's mandatory national target for 2020 was to supply 16% of its overall energy needs from renewable sources. This target covered energy in the form of electricity (RES-E), heat (RES-H) and transport fuels (RES-T). The overall renewable energy share from renewables in 2020 was 13.5% of gross final consumption (GFC), meaning Ireland fell just short of its target. REDII introduced a binding EU-wide target for overall RES of 32% in 2030 and requires Member States to set their national contributions to the EU-wide target. As per the National Energy and Climate Plan (NECP) 2021-2030, Ireland's overall RES target is 34.1% in 2030.

Under RED, the RES-E target was for 40% of gross electricity consumption to come from renewable sources in 2020 The actual RES-E achieved in 2020 by Ireland was 39.1%, falling just short of the national target. Under REDII, Ireland's National Energy and Climate Plan 2021-2030 included a planned RES-E of 70% in 2030, which has been replaced by the 80% by 2030 RES-E target as detailed in the more recent CAP24, which will ensure that renewable electricity continues to form the backbone of Irish renewable energy use for the coming decade and beyond.

In November 2023, a revision of the Renewable Energy Directive (RED III), came into force. RED III increases the EU wide renewable energy target from 32% set under the previous revision of the directive to at least 42.5%, with an ambition to reach 45% by 2030. Article 3(4a) of RED III requires Member States to establish a framework to enable the deployment of renewable energy to a level consistent with its national contribution to the Union's target and at a pace that is consistent with the indicative trajectories in Climate Action Regulation 2018/1999.

1.5.7 2030 Renewable Energy Targets

The Climate Action and Low Carbon Development (Amendment) Act 2021 commits Ireland to reach a legally binding target of net-zero emissions no later than 2050, and a cut of 51% by 2030 (compared to 2018 levels). Under the 2021 Act, Ireland's national climate objective requires the state to pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy.

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[20] European Union (2009). Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Available from: https://eur-lex.europa.eu/legalcontent/EN/ALL/?uri=celex%3A32009L0028

[21] European Union (2018) Directive (EU) 2018/2001 on the promotion of the use of energy from renewable resources (recast). Available from: https://eurlex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L2001

Ireland's statutory national climate objective and 2030 targets are aligned with Ireland's obligations under the Paris Agreement and with the European Union's objective to reduce GHG emissions by at least 55% by 2030, compared to 1990 levels and to achieve climate neutrality in the European Union by 2050.

Given the need to ratchet up the EUs clean energy transition, RED was revised in 2023, and the amending Directive EU/2023/2413 (REDIII)[22] entered into force on 20 November 2023. REDIII amended the EU-wide overall 2030 RES target from 32% to at least 42.5%, and it is assumed that Irelands 2030 RES target will increase accordingly.

In December 2023, the Government published the most recent Climate Action Plan 2024 announcing a renewable electricity target of 80% by 2030 for Ireland. This is in line with the previous target of 80% by 2030, as announced in the Climate Action Plan 2021 and 2023.

The Climate Action Plan 2024 states that in order to meet the required level of emissions reduction by 2030 and the 80% renewable electricity generation target by 2030, the installed generation capacity of onshore wind will need to reach 9GW and at least 5GW of offshore wind. Irelands installed capacity for wind generation at the end of 2022 was 4.54GW[23]. The SEAI provides a provisional estimate of installed wind energy capacity in 2023 based on EirGrid data to the end of August and ESBN data to the end of September; the provisional value of installed wind capacity in Ireland is 4.5GW.[24] As noted previously, Ireland missed it's 2020 renewable energy target of 40% with a renewable share in electricity of 39.1%, and by the end of 2021, Irelands renewable energy share for electricity generation was 32.5%. With a renewable share of electricity generation at 80% in mind and a target of 9GW installed onshore wind by 2030, it is now more critical than ever that we continue to progress renewable energy development in Ireland so that we are successful in meeting our 2030 targets. Further detail on the EU 2030 targets is noted in Chapter 2.

1.5.8 Increasing Energy Consumption

As detailed above, the Climate Action Plan 2024 identifies a need for 9 GW of onshore wind generation in order for Ireland to meet its 2030 targets. In their '*All Island Generation Capacity Statement 2022 - 2031*' (October 2022), EirGrid estimate that installed capacity of wind generation is set to increase to at least 12 GW between onshore and offshore capacity as Ireland endeavours to meet its renewable targets in 2030 and beyond.

Failure to meet Ireland's targets for renewable energy will result in substantial EU sanctions. The Department of Public Expenditure and Reform (DPER) in their report 'Future Expenditure Risks associated with Climate change/Climate Finance' concluded that *'potential costs of purchasing non-ETS GHG compliance for the Irish Exchequer for the 2020 to 2030 period could have a cumulative total in the billions in the absence of any further policy changes'*. If Ireland decided to backfill shortfalls in the RES-H target with additional renewable electricity this could significantly reduce these costs.

In April 2016[25] SEAI estimated the historic build rate for wind energy deployment as 180 MW per year since 2005. If this average build rate over the remaining period between 2018 and 2020 is assumed, then approximately 3.85 GW of wind would be built up to 2020. The SEAI has provided a provisional estimate of wind capacity in Ireland in 2023 to be 4.59GW.[26]

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[22] *European Union (2023).* Directive (EU) 2023/2413 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources and repealing Council Directive (EU) 2015/652. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302413

[23] *Sustainable Energy Authority of Ireland (2024). Energy in Ireland – 2023 Report*

[24] *Ibid.*

[25] *Sustainable Energy Authority of Ireland (April 2016): Ireland's Energy Targets – Progress, Ambitions & Impacts. Available at:* https://www.seai.ie/publications/Ireland___s-Energy-Targets-Progress-Ambition-and-Impacts.pdf

[26] *Sustainable Energy Authority Ireland (2024). Energy in Ireland – 2023 Report. Available at:* Sustainable Energy Authority of Ireland (2024) Energy in Ireland – 2023 Report

In 2015, IWEA commissioned a study '*Data Centre Implications for Energy Use in Ireland*' which concluded that an extra approx. 1 Gigawatt (GW) of electricity demand could materialise between 2015 and 2020 due to growth in data centres. More recently, data available from Bitpower[27] from May 2021 noted that there is currently 70 operational data centres in Ireland, totalling 900MW; with an additional 778MW having received planning approval and 255MW under construction. The increase in growth of data centres means an increase in electricity demand, with many of the proposed data centres committing to using 100% renewable energy which will result in an increased demand for renewable electricity as detailed above.

In the context of increasing energy demand and prices, uncertainty in energy supply and the effects of climate change, our ability to harness renewable energy such as wind power plays a critical role in creating a sustainable future. The Department of the Environment, Climate and Communications have set a target for Ireland of 80% of total electricity consumption to come from renewable resources by 2030, this target forms part of the Government's strategy to make the green economy a core component of its economic recovery plan for Ireland. It is envisaged that wind energy will provide the largest source of renewable energy in achieving this target, with a target of 9 GW onshore wind installed generation capacity and a target of 5 GW offshore wind installed generation capacity.

The Department of Communications, Energy & Natural Resources (DCENR) noted in their Draft Bioenergy Plan 2014, that achieving the anticipated renewable energy usage in the three energy sectors will be challenging, with the 12% for renewable heat being particularly so. SEAI estimate that the shortfall could be in the region of 2% to 4% of the 12% RES-H target. Given that individual member states 2030 targets are set at a more challenging level than 2020, fines could persist for an extended number of years, and so the total cost to Ireland could run to billions. For comparison, the entire wholesale electricity market has an annual value of around €3bn.

In the medium-term, with the introduction of electric vehicles and uptake of smart demand such as storage heating and heat pumps, emissions in the heat and transport sector will be substantially reduced. A high renewables electricity system is the foundation of such a transformation.

The Energy White Paper published by DCENR in December 2015 expanded on the vision set out above. It outlines a radical transition to a low carbon future which will involve amongst other things, *'generating our electricity from renewable sources of which we have a plentiful indigenous supply'* and *'Increasing our use of electricity and biogas to heat our homes and fuel our transport'*.

The DCENR confirmed in the publication of the White Paper '*Ireland's Transition to a Low Carbon Future' 2015 – 2030*, that wind is the cheapest form of renewable energy:

> *"(Onshore wind) is a proven technology and Ireland's abundant wind resource means that a wind generator in Ireland generates more electricity than similar installations in other countries. This results in a lower cost of support."*

EU countries have agreed on a new 2030 Framework for climate and energy, including EU-wide targets and policy objectives for the period between 2020 and 2030. These targets aim to help the EU achieve a more competitive, secure, and sustainable energy system and to meet its long-term 2050 greenhouse gas reductions target. It is noted that a binding EU target of 32% for renewable energy by 2030 has been set by the EU 2030 Framework for Climate and Energy, with Ireland confirming its own targets for 2030 as detailed below.

Ireland will therefore have to meet even more demanding climate change and renewable energy supply obligations in order to play its part in achieving the European climate and energy ambitions. As announced in December 2022, the Irish Government have pledged to generate 80% of the country's

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[27] *Bitpower Consulting (May 2021). Ireland Renewable Energy Report: H1 2021. Available at: https://bitpower.ie/images/Reports/2021_H1_Report.pdf*

electricity supply from renewable sources by 2030. The development of additional indigenous wind energy generating capacity, such as that generated through the Proposed Development, will not only help to reduce carbon emissions but will also improve Ireland's security of energy supply. Such penetration levels of wind are technically and economically feasible once paired with other energy system changes such as increasing electric vehicle penetration and electrification of heat. Further information on the 2030 commitments for Ireland are noted in Chapter 2, Section 2.3.

These sources of '*flexible demand*' allow the system to match intermittent renewable energy resources with minimal extra cost. Additional interconnection is also planned with the UK and France, further assisting in the integration of wind (and in the future solar) on the power system. A number of alternative energy types have been examined when considering how best to meet this renewable energy target.

In January 2024, EirGrid and SONI released their joint all-island '*Ten-Year Generation Capacity Statement 2023-2032*'[28]. The documents acts to support the all-island electricity market, and overall security of supply between both Ireland and Northern Ireland. The report highlights the fact that the electricity industry must find new ways to meet the increasing demand for energy through alternatives to fossil fuels, transitioning to a more robust and resilient energy market. The long-term electricity demand forecast highlights the assumption of high growth in demand due to EU and governmental electrification policies, particularly within the heat and transport sectors.

Underlying drivers of changes in electricity demand include:

- Data centres are forecast to continue to grow by up to ~9 TWh in 2032 (~30% of total demand)
- Transport electricity demand is forecast to grow (~23% p.a.) as a result of fast uptake of EV charging.
- Electrical heating in industry will increase by more than 2.5 times in 2030 from 2017 levels.
- Building energy efficiency improvements from an extensive retrofit programme will moderate the growth in electricity demand from new heat pumps in buildings.

Against this backdrop, the importance of wind energy as the main component of Ireland's renewable energy development is acknowledged, and wind energy is accepted as the main contributor to meeting the Country's national climate change and energy supply obligations. Notwithstanding this, it must also be acknowledged that not every part of Ireland is well endowed with wind resources or suitable sites and therefore, not all counties will be able to deliver wind-based renewable energy. Furthermore, whilst it is accepted that there are other renewable energy technologies in operation, for the foreseeable future many areas will be unable to deliver significant renewable energy output. This primarily applies to the more populous areas.

National and international renewable energy and climate change targets must be achieved, and it is crucial that these are appropriately translated and implemented at regional and local levels. Wind farm development and design involves balancing the sometimes-conflicting interests of constraints (e.g., natural and built heritage, human beings, ecological, ground conditions, hydrological, etc.) with visual amenity and the technological/economic requirements/realities of the specific project and turbines.

1.5.9 Reduction of Air Pollutants of Concern

The production of renewable electricity from the Proposed Development will assist in achieving the Government's and EU's stated goals of ensuring safe and secure energy supplies, promoting an energy future that is sustainable and competitively priced to consumers whilst combating energy price volatility

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[28] *EirGrid (January 2024). Generation Capacity Statement 2023-2032. Available at: https://cms.eirgrid.ie/sites/default/files/publications/19035-EirGrid-Generation-Capacity-Statement-Combined-2023-V5-Jan-2024.pdf*

and the effects of climate change. The Energy White Paper in 2015 outlines an ambitious Greenhouse gas reduction target of between 80% to 95% compared to 1990 levels out to 2050. Furthermore, if national carbon emissions targets are divided out amongst each county, each Local Authority may be responsible for meeting its own targets.

In addition to a reduced dependence on oil and other imported fuels, the generation of electricity from wind power by the Proposed Development will displace approximately 33,920 tonnes of carbon emissions per annum from the largely carbon-based traditional energy mix, the detail of which is presented in Section 11.5.2.1.2 in Chapter 11 of this EIAR.

The World Health Organisation (WHO) in 2022 estimated that ambient air pollution caused 4.2 million deaths worldwide in 2019 (WHO, 2022). The Environmental Protection Agency (EPA) report '*Air Quality in Ireland 2023*'[29] noted that in Ireland, the premature deaths attributable to poor air quality are estimated at 1,600 people per annum. A recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2022 Report*' highlights the negative effects of air pollution on human health. The report assessed that poor air quality in Europe accounted for premature deaths of approximately 238,000 people in Europe in 2021, with regards to deaths relating to $PM_{2.5}$. The estimated impacts on the population in Europe of exposure to NO_2 and O_3 concentrations in 2021 were around 49,000 and 24,000 premature deaths per year, respectively.

Of these numbers, 610 deaths due to poor air quality were estimated in Ireland in 2020 with 490 Irish deaths attributed to $PM_{2.5}$, 50 Irish deaths attributed to nitrogen oxides (NO_2) and 70 Irish deaths attributed to Ozone (O_3). These emissions, along with others, including sulphur oxides (SO_x), are produced during fossil fuel-based electricity generation in various amounts, depending on the fuel and technology used, emissions from industry and power plants, vehicles emissions and transport fuels.

The EPA 2024 report *'Ireland's State of the Environment Report'*[30] states that the pollutants of most concern are: Fine Particulate matter ($PM_{2.5}$.), Nitrogen Dioxide (NO_2) and Ammonia (NH_3). The EPA 2024 report goes on to state that:

> *The planned transition to more renewable energy sources, and away from combustion-sourced heating systems to electrification, is a shift that could see greenhouse gas emissions from industry significantly decrease.*
>
> *As a consequence of meeting these growing demands primarily with oil, natural gas, coal and peat, our energy system is highly dependent on fossil fuels. Ireland has made some progress in transforming the electricity system through the deployment of wind farms, with renewable energy currently providing more than 40% of electricity used. However, electricity represents only one-fifth of Ireland's energy use, and our transport and heating systems remain heavily reliant on fossil fuel systems, with lock-ins that need to be addressed.*
>
> *While Ireland's renewable energy share has increased from 10.7% in 2018 (reported in the last State of the Environment Report) to 13.1% in 2022, this is the lowest level in the EU (well below the EU average of 23.0%), and Ireland is not on track to meet the EU-wide binding target of 42.5% renewable energy share by 2030. Reaching the target of 80% renewable electricity by 2030, while ensuring a stable energy supply, will require new capacity, a more flexible grid and increased interconnectivity (EC, 2024)*
>
> *Established technologies, such as wind energy, solar photovoltaics and bioenergy, will be key in meeting short-term emission reduction targets (i.e. 2030), whereas significant growth in*

[29] *Environmental Protection Agency (2024) Air Quality in Ireland Report 2023. Available at :* https://www.epa.ie/publications/monitoring-assessment/air/Air_Quality_Report_23_v13_flat.pdf
[30] *Environmental Protection Agency (2024) Irelands State of the Environment Report 2024 Available at :* https://www.epa.ie/publications/monitoring-assessment/assessment/state-of-the-environment/EPA-SOE-Report-2024-BOOK-LOWRES-FINALfor-WEB.pdf

offshore wind infrastructure is expected to be the key essential element of future energy systems.

The Clean Air Strategy for Ireland[31] report was published by the Irish Government in April 2023, provides the high-level strategic policy framework necessary to identify and promote the integrated measures across Government policy that are required to reduce air pollution and promote cleaner ambient air, while also delivering on wider national objectives. The strategy details the importance of "non-combustion renewables such as wind and solar power in contributing to both climate and clean air goals. These schemes and supporting actions are supporting a gradual shift away from more polluting forms of power generation (e.g., coal and peat generation); to enable higher shares of renewables alongside gas fired generation".

The Proposed Development therefore represents an opportunity to continue to harness Ireland's significant renewable energy resources, with valuable benefits to air quality and in turn to human health. The consumption of fossil fuels for energy results in the release of particulates, sulphur dioxide and nitrogen dioxide to our air. The use of wind energy, by providing an alternative to electricity derived from coal, oil or gas-fired power stations, results in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide SO_2, thereby resulting in cleaner air and associated positive health effects.

1.5.10 Economic Benefits

In addition to helping Ireland avoid significant fines and reducing environmentally damaging emissions, the Proposed Development will have significant economic benefits. At a national level, Ireland currently has one of the highest external dependencies in the EU on imported sources of energy, such as coal, oil and natural gas. As detailed in the SEAI Report '*Energy in Ireland 2023*'[32] Ireland has a high import dependence on oil and gas and is essentially a price-taker on these commodities. The '*Energy in Ireland 2022 Report*'[33] stated that 2021 was the first year since 2016, in which Irelands indigenous production of energy from renewables (17,500 GWh) exceeded that of indigenous gas (14,600 GWh); however, in 2022 indigenous gas production once again exceeded renewables production. The SEAI estimates electricity emissions to be 7.3 $MtCO_2e$ in 2023, the addition of this best estimate for 2023 to the definitive 2021 and 2022 electricity emissions reported by the EPA identifies a 3-year 2021 - 2023 total of 27.0 $MtCO_2e$. The 5-year 2021-2025 sectoral emission ceiling for electricity is 40 $MtCO_2e$. This means that 13.0 $MtCO_2e$ of budgeted electricity emissions will remain for the last 2 years of the 2021-2025 carbon budget. To remain within its sectoral emission ceiling, electricity emissions would therefore need to remain below an average of 6.5 $MtCO_2e$ in both 2024 and 2025

The SEAI report '*Energy in Ireland 2023*' indicated that renewable electricity (mostly wind energy):

- Accounted for 85.7% of renewable energy generated in 2022
- Capacity at the end of 2023 was 4.59GW, this is a 4.6% increase from wind energy capacity in 2021

The Proposed Development is potentially capable of providing power to an estimated 18,411 Irish households with electricity per year, using the calculated electricity as produced by the Proposed Development based on the average Irish household using 4.2 MWh of electricity, therefore produce sufficient electricity for the equivalent of approximately 31% of all households in Co. Wexford.

At a Regional Level, the Proposed Development will help to supply the rising demand for electricity, resulting from renewed economic growth. The EirGrid Report 'Ireland Capacity Outlook 2022-2031'

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[31] *Government of Ireland (April 2023). Climate Action Plan 2023. Available at: https://assets.gov.ie/255392/efe212df-d9a7-4831-a887-bea2703e2c64.pdf*
[32] *Sustainable Energy Authority Ireland (2023) Energy in Ireland – 2023 Report. Available at: https://www.seai.ie/publications/Energy-in-Ireland-2023.pdf*
[33] *Sustainable Energy Authority Ireland (2022) Energy in Ireland – 2022 Report*

identifies capacity deficits over the ten-year period to 2031 and notes that further new electricity generation will be required to secure the transition to high levels of renewable electricity over the upcoming decades. The analysis in the Report notes that the median energy demand in Ireland is forecasted to increase 37% by 2031.

Several significant long-term benefits for the local economy from the Proposed Development will continue, including the provision of jobs, landowner payments, local authority commercial rate payments, and Community Benefit Scheme.

Should the Proposed Development receive planning permission, there are substantial opportunities available for the local area in the form of Community Benefit Funds. Based on the current proposal, the proposed Community Benefit Fund would attract a community contribution of €30,000/year starting in 2025, and continuing until the windfarm ceases operation, to be used by the local community over the lifetime of the Proposed Development. The value of this fund will be made available to support and facilitate projects and initiatives in the local area of social and environmental benefit.

Further details on the proposed Community Benefit Fund are presented in Appendix 2-2 and in Chapter 4 of this EIAR.

1.5.11 The Circular Economy

The Circular Economy is defined in Irish domestic law by the *"Circular Economy and Miscellaneous Provisions Act 2022"*[34]. The Circular Economy acts as an economic model with specific policies and practices designed to promote economic growth, while decoupling this growth from the extraction and consumption of raw materials and reducing and preventing waste in all stages of a material or products life. The Act also sets out a number of targets for all economic sectors which involve;

> *"(i) reductions in material resource consumption and the use of non-recyclable materials;*
> *(ii) increases in the use of re-usable products and materials;*
> *(iii) increased levels of repair and re-use of products and materials;*
> *(iv) improved maintenance and optimised use of goods, products and materials."*

Ireland's Circular Economy Programme 2021-2027[35] outlines steps in order to achieve sustainable economic growth, using less resources and preventing waste through national-level strategic programmes.

Life Cycle Assessment (LCA) involves the evaluation of the effect a product or material has on the environment based on a number of quantifiable factors, over its entire life period, in order to measure and define resource use and increase efficiency in raw material use. LCA allows for the quantification of a product or materials effect on the environment, while also allowing for this effect to be mitigated by its use over its whole lifetime, while the Circular Economy further promotes the 'useful life' of a product or material, ensuring that the life cycle of products or materials is extended for as long as possible.

Ensuring that products or materials are used to the fullest of their potential ensures that we can achieve both state and European Circular Economy and Waste targets, reduce our reliance on imported materials and reduce carbon and environmental footprints.

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[34] *Government of Ireland (2022). Circular Economy and Miscellaneous Provisions Act 2022. Available at:* https://www.irishstatutebook.ie/eli/2022/act/26/enacted/en/htm

[35] *EPA, Government of Ireland (2021). EPA Circular Economy Programme 2021* https://www.epa.ie/publications/circular-economy/resources/EPA_Circular_Economy_2021_Programme_Apr22_Web.pdf

1.6 Purpose and Scope of the EIAR

The purpose of this EIAR is to document the current state of the environment in the vicinity of the Project and to quantify the likely significant effects of the continued operation of the Proposed Development and the Project on the environment and in accordance with the requirements of the EIA Directive, as amended. The compilation of this document served to highlight any areas where mitigation measures may be necessary in order to protect the surrounding environment from the possibility of any significant negative impacts arising from the Project.

It is important to distinguish the Environmental Impact Assessment (EIA) to be carried out by the Planning Authority, from the EIAR and the accompanying planning application. The EIA is the assessment carried out by the competent authority, which includes an examination that identifies, describes and assesses, in an appropriate manner, in the light of each individual case and in accordance with Articles 4 to 11 of the Environmental Impact Assessment Directive, the direct and indirect effects of the Project on the following:

> a) *Population and Human Health;*
> b) *Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
> c) *Land, Soil, Water, Air and Climate;*
> d) *Material Assets, Cultural Heritage and the Landscape;*
> e) *Major Accidents and Natural Disasters;*
> f) *The interaction between the factors referred to in points (a) to (d)*

The EIAR which will be submitted by the applicant provides the relevant environmental information to enable the EIA to be carried out by the competent authority. The information to be contained in the EIAR is prescribed in Article 5 of the revised EIA Directive described in Section 1.4 above.

1.7 Structure and Content of the EIAR

1.7.1 General Structure

The EIAR uses the grouped structure method to describe the existing environment, the potential impacts of the Project thereon and the proposed mitigation measures. Background information relating to the Project, scoping and consultation undertaken and a description of the Project are presented in separate sections. The grouped format sections describe the impacts of the Projec in terms of population and human health, biodiversity, ornithology, soils and geology, hydrology and hydrogeology, air quality, climate, noise and vibration, landscape and visual, cultural heritage and material assets such as traffic and transportation, together with interaction of the foregoing. The EIAR also describes the Vulnerability of the Project to Major Accidents and Disasters and collates the proposed mitigation measures into a Schedule of Mitigation Measures.

The chapters of this EIAR are as follows:

1. *Introduction*
2. *Background and Policy*
3. *Consideration of Reasonable Alternatives*
4. *Description of the Project*
5. *Population and Human Health (including Shadow Flicker)*
6. *Biodiversity (including Birds)*
7. *Land, Soils, and Geology*
8. *Hydrology and Hydrogeology (Water)*
9. *Air & Climate*
10. *Noise and Vibration*

11. *Archaeology and Cultural Heritage*
12. *Landscape and Visual*
13. *Material Assets (including Traffic and Transport, Telecommunications and Aviation)*
14. *Major Accidents and Natural Disasters*
15. *Interactions of the Foregoing*
16. *Schedule of Mitigation Measures*

The EIAR also includes a non-technical summary, which is a condensed and easily comprehensible version of the EIAR document. The non-technical summary is laid out in a similar format to the main EIAR document and comprises a description of the Project, followed by the existing environment, impacts and mitigation measures presented in a grouped format.

1.7.2 Description of Likely Significant Effects and Impacts

As stated in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022), an assessment of the likely impacts of a proposed development is a statutory requirement of the EIA process. The statutory criteria for the presentation of the characteristics of potential impacts requires that potential significant impacts are described with reference to the extent, magnitude, complexity, probability, duration, frequency, reversibility and trans-frontier nature (if applicable) of the impact.

The classification of impacts in this EIAR follows the definitions provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – May 2022 (EPA, 2022).
- Advice Notes for Preparing Environmental Impact Statements – Draft September 2015 (EPA, 2015).
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003)

Table 1-3 presents the glossary of impacts as published in the EPA guidance documents. Standard definitions are provided in this glossary, which permit the evaluation and classification of the quality, significance, duration and type of impacts associated with a proposed development on the receiving environment. The use of pre-existing standardised terms for the classification of impacts ensures that the EIA employs a systematic approach, which can be replicated across all disciplines covered in the EIAR. The consistent application of terminology throughout the EIAR facilitates the assessment of the proposed development on the receiving environment.

Table 1-3 Impact Classification Terminology (EPA, 2022)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An effect capable of measurement but without significant consequences

	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
	Profound	An effect which obliterates sensitive characteristics
Extent & Context	Extent	Describe the size of the area, number of sites and the proportion of a population affected by an effect
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions
Probability	Likely	Effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
	Unlikely	Effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Duration and Frequency	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effect lasting over sixty years
	Reversible	Effects that can be undone, for example through remediation or restoration

	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Type	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out
	Worst Case'	The effects arising from a project in the case where mitigation measures substantially fail
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents

Each impact is described in terms of its quality, significance, extent, duration and frequency, and type where possible. A 'Do-Nothing' impact is also predicted in respect of each environmental theme in the EIAR. Residual impacts are also presented following any impact for which mitigation measures are prescribed and any interactions between the impacts are assessed. The remaining impact types are presented as required or applicable throughout the EIAR.

1.8 Project Team

1.8.1 Project Team Responsibilities

The companies listed in Table 1-4 were responsible for completion of the EIAR for the Project. Further details regarding project team members are provided below.

The EIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of wind energy developments and in their relevant area of expertise. The qualifications and experience of the principal staff from each company involved in the preparation of the EIAR are summarised in Section 1.8.2 below. Each chapter of this EIAR has been prepared by a competent expert in the subject matter, further details on project team expertise are provided in the Statement of Authority at the beginning of each impact assessment chapter.

Table 1-4 Project Team

Consultants	Project Staff Involved in Project	EIAR Input
MKO	Michael Watson Sean Creedon Colm Ryan Robert Kennedy Keelin Bourke Órla Murphy Ciarán Fitzgerald Natasha Morley Alan Clancy Mike Amiel Mekell Meabhann Crowe Catherine Johnson Edward Ryan Jack Workman Saoirse Fitzsimons Daniel Mulpeter John Hynes Aoife Joyce Padraig Cregg Cathal Bergin Nathan Finn Susan Doran Damian Brosnan Emily Lynch Fergal Connolly Toni Bourke Mark Higgins Jessica Sara Barbara	Project Management, Scoping and Consultation, Preparation of the following Report Sections: 1. *Introduction* 2. *Background and Policy* 3. *Consideration of Reasonable Alternatives* 4. *Description of the Project* 5. *Population & Human Health;* 7. *Geology and Soils* 8. *Water* 9. *Air Quality and Climate* 12. *Landscape & Visual* 13. *Material Assets (including Telecommunications and Aviation)* 14. *Vulnerability of the Project to Major Accidents and Disasters* 15. *Interaction of the Foregoing* 16. *Schedule of Mitigation Measures* Completion of dog-led carcass searches on site.
AWN	Dermot Blunnie Mike Simms	Baseline Noise Survey, Preparation of EIAR Section: 10. *Noise and Vibration*
Tobar Archaeological Services	Miriam Carrol	Preparation of EIAR Section: 11. *Archaeology and Cultural Heritage*
Blackstaff Ecology	Cormac Loughran Brian Sutton	Preparation of EIAR Section: 6. *Biodiversity: Flora and Fauna and Ornithology* Completion of ecology and bird surveys on site (including carcass searches).
CC Ornithology	Cian Cardiff	2023/2024 non-breeding season bird surveys

1.8.2 Project Team Members

1.8.2.1 MKO

Michael Watson – Environmental Director

Michael Watson is Project Director and head of the Environment Team in MKO. Michael has over 18 years' experience in the environmental sector. Following the completion of his Master's Degree in Environmental Resource Management, Geography, from National University of Ireland, Maynooth he worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael's professional experience includes managing Environmental Impact Assessments, EPA License applications, hydrogeological assessments, environmental due diligence and general environmental assessment on behalf of clients in the wind farm, waste management, public sector, commercial and industrial sectors nationally. Michaels key strengths include project strategy advice for a wide range and scale of projects, project management and liaising with the relevant local authorities, Environmental Protection Agency (EPA) and statutory consultees as well as coordinating the project teams and sub-contractors. Michael is a key member of the MKO senior management team and as head of the Environment Team has responsibilities to mentor various grades of team members, foster a positive and promote continuous professional development for employees. Michael also has a Bachelor of Arts Degree in Geography and Economics from NUI Maynooth, is a Member of IEMA, a Chartered Environmentalist (CEnv) and Professional Geologist (PGeo).

Sean Creedon – Associate Environmental Director

Sean Creedon is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

Colm Ryan – Planning Director

Colm Ryan is the Planning Director of MKO, Planning & Environmental Consultants, with over 16 years of experience as a planner in both private practice and public sector combined. Prior to joining MKO, Colm worked as a planner with a UK and Ireland based Renewable Energy developer. Colm has also spent part of his career in local authority as a planner with Laois County Council. Colm has significant experience in a wide range of projects and extensive experience in large scale residential, renewables and marine based developments. Colm currently heads up the Planning Division in MKO with responsibility for Planning, Project Management, Health & Safety and Project Communications. Colm holds BA (Hons) in Geography & Irish and Masters in Civic Design Town & Regional Planning. Prior to taking up his position with MKO in May 2017, Colm worked as a Senior Planner with Lightsource Renewable Energy Ltd. and held previous posts with Partnerships for Renewables, South Kesteven District Council, Planning Aid, Frank O Gallachoir & Associates in Bray and Laois County Council. Colm is a chartered town planner with specialist knowledge in renewable energy, mixed use development and residential. Colm's key strengths and areas of expertise are in large scale renewable energy development particularly in the ground mounted solar, delivery of local community engagement processes on contentious planning applications, management of community and developers interest through the planning process and post or pre-planning due diligence. Since joining MKO as a Senior

Planner Colm has been overseeing and managing a wide range of development projects such as large scale solar applications, site feasibility work for potential wind energy projects, large scale housing and mixed use schemes. Within MKO Colm plays a large role in the management of staff members including several aspects of business development. Colm has proven negotiation skills and stakeholder relationship building across numerous development projects in Ireland and the UK and is a corporate member of the Irish Planning Institute.

Robert Kennedy – Project Environmental Scientist

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects. Robert also played a role in developing MKO's new service offering around Biodiversity Net Gain and other nature-positive mechanisms. Prior to taking up his position with MKO, Robert worked in financial services and gained over six years' experience in different roles in Canada and Ireland, giving him a broad mix of skills and experience to apply to his current role with MKO. Robert also holds a membership with the Institute of Environmental Management and Assessment (IEMA).

Keelin Bourke – Environmental Scientist

Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin. Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Órla Murphy – Senior Environmental Scientist

Órla Murphy is a Senior Environmental Scientist with MKO, with nearly 8 years of experience in private consultancy. Órla holds BSc (Hons) in Geography from Queens University Belfast & a MSc in Environmental Protection and Management from the University of Edinburgh. Prior to taking up her position with MKO in January 2018, Órla worked as an Environmental Project Assistant with ITPEnergised in Scotland. Órla's key strengths and areas of expertise are in Environmental Protection and Management, EIA, Project Management, Renewable Energy and Peatland Management, where she has carried out research projects and site work relating to restoration and management of peatland sites in both Scotland and Northern Ireland. On joining MKO Órla has been involved on a range of renewable energy infrastructure projects. In her role as a project manager, Órla works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Within MKO, Órla plays a role in the management of and sharing of knowledge with junior members of staff and works as part of a large multi-disciplinary team to produce EIA Reports.

Ciarán Fitzgerald – Graduate Environmental Scientist

Ciarán Fitzgerald is a Graduate Environmental Scientist who has been working with MKO since June 2024. Ciarán holds a B.Sc. (Honours) in Marine Science from the National University of Ireland Galway and a PG. Dip in Geographic Information Systems from University College Cork. Ciarán works as part of the Environmental renewables team as well as a larger multidisciplinary team. Ciarán's role involves undertaking tasks such as report writing, EIAR chapter writing, QGIS mapping. Prior to joining MKO Ciarán spent time aboard the Research Vessel "Celtic Explorer" working as part of a team undertaking chemical water data, Pelagic species abundance and sorting, bathymetric GIS mapping, data collection and report writing Ciarán's key strengths lie in GIS mapping and communication. Since joining the company Ciarán has been involved in in a range of wind farm projects, reviewing EIAR chapters and assisting with project development.

Natasha Morley – Graduate Environmental Scientist

Natasha Morley is a Graduate Environmental Scientist with MKO since September 2024. Natasha holds BA (Hons) in Geography & English and a PG. Dip in Environmental Sustainability Implementation. Prior to taking up her position with MKO in September 2024, Natasha interned as a Conservation Assistant with Watch Tower Designs Ltd. Natasha has specialist knowledge in environmental science, sustainability, and renewables. Natasha's key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Within MKO Natasha is a member of the MKO Environmental Renewables Team working as part of a large multi-disciplinary team writing and reviewing EIAR chapters and assisting with project development to produce extensive Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Alan Clancy – Project Planner

Alan Clancy is a Planner with MKO with over 8 years of experience in private practice. Alan holds a BA (Hons) in Geography & History from University of Galway and a Masters in Planning and Sustainable Development from University College Cork. Prior to taking up his position with MKO in February 2022, Alan worked as a Planner for Indigo Telecom Group in Limerick, Ireland where he assisted with management of all planning aspects of new telecommunications network roll out programmes, retentions of existing sites and all aspects of dealing with planning applications and appeals for leading telecommunications operators. Prior to this, Alan worked in the UK with the JTS Partnership LLP, where he gained experience as a graduate planner through to planner level. Alan has experience across a range of sectors including commercial, residential and industrial, as well as having experience with providing development advice and undertaking background research for clients, preparing planning applications of varying sizes as well as planning appeals and conditions compliance and managing all aspects of the planning process for commercial, educational and Infrastructural projects. Alan's key strengths and areas of expertise are in development management, provision of planning advice and project management of small and medium sized projects.

Alan's key strengths and areas of expertise are in development management, provision of planning advice and project management. Since joining MKO, Alan has assisted with various projects including Strategic Infrastructure Developments, lodgement and management of Planning Applications, Development Plan Submissions and preparing Development Potential Reports. Alan is a corporate member of the Irish Planning Institute.

Mike Amiel Mekell – Graduate Planner

Mike Amiel Mekell is a Graduate Planner with MKO having joined the company in June 2024. Mike holds a BA (Hons) in Politics, International Relations and Sociology from University College Dubin and an MSc (Hons) in Planning and Development from Queen's University Belfast. He is a Licentiate of the Royal Town Planning Institute. Prior to taking up his position with MKO, Mike worked as a Graduate Environmental Planner with Roughan and O'Donovan. In this role he prepared Environmental Impact

Assessment Screening and Scoping reports, environmental monitoring and management reports and planning reports for projects involving public and active transport infrastructure and sustainable tourism development.

Since joining MKO, Mike has been involved in a range of renewable energy projects including onshore wind, solar and grid infrastructure developments. His main responsibilities include preparing planning application documents and reports, preparing inputs for Environmental Impact Assessment Reports and liaising with multidisciplinary project teams.

Meabhann Crowe – Senior Planner

Meabhann Crowe is a Senior Planner with McCarthy O'Sullivan Ltd with over 15 years private sector experience. She is a fully chartered member of the Royal Town Planning Institute (MRTPI). Meabhann holds a BA (Hons) in Geography, Sociological and Political Science and a Masters in Urban and Regional Planning. Prior to taking up her position with McCarthy Keville O'Sullivan in October 2018, Meabhann was employed as an Associate Director with Colliers International in their Edinburgh office, prior to which she was employed for several years with Halliday Fraser Munro. In her time in the industry Meabhann has been active on a number of instructions across a broad spectrum of mixed-use, residential, commercial, renewable energy and retail projects.

Meabhann brings particular expertise in initial development feasibility appraisals and development strategies. Her experience in managing large multi-disciplinary teams in the preparation of local and major planning applications across residential, mixed-use and retail developments means she has a wealth of knowledge to draw on in the early stages of development. She has particular experience in preparing and managing project strategies which include both responding to emerging planning policy whilst also preparing and progressing complex planning applications and appeals.

Catherine Johnson – Environmental Scientist

Catherine is an Environmental Scientist and Climate Practitioner with MKO with almost two years of private consultancy experience and expertise in climate and sustainability matters. Catherine holds a BSc in Earth and Ocean Science and a LLM in Global Environment and Climate Change Law. Prior to taking up her position with MKO in October 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise regarding international climate law and policy, earth processes, ocean science, and sustainability/ESG. Since joining MKO Catherine has been involved in a myriad of environmental service offerings at MKO including EIA Screenings and Reports, climate and sustainability related work and renewable energy infrastructure projects. Within MKO Catherine plays a large role in company sustainability and a more focused climate service offering and holds a graduate membership for the Charted Institution of Water and Environmental Management.

Edward Ryan – Environmental Scientist

Edward Ryan is an Environmental Practitioner with MKO with over 4 years of experience in the private sector. Edward holds a B.Sc. (Hons) in Environmental Science from the University of Limerick and a M.Sc. (hons) in Environmental Systems from Atlantic Technological University: ATU (formally GMIT). Prior to taking up his position with MKO in April 2022, Edward worked as an Environmental Scientist with Ryan Hanley Ltd. and held previous posts with the University of Limerick as a Laboratory Research Assistant. Edward exhibits strong analytical and organizational skills from his appraisal of Contractor HSQE submissions as well as compiling information for the companies tender submissions. Edward's key strengths and areas of expertise are in project management, GIS, data analysis, fieldwork and report writing. Since joining MKO, Edward has been involved in a range of wind farm projects and residential and commercial development projects. In his role as an Environmental Scientist, Edward works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Within MKO Edward plays a large role in the Shadow Flicker analysis. Edward is trained in Resoft and Windpro and has carried out shadow flicker analysis for a large number of wind farm projects. Edward is a Member of the Chartered Institute of Water and Environmental Management.

Jack Workman – Landscape & Visual Project Director

Jack is the Landscape & Visual Project Director at MKO and a Technician Member of the British Landscape Institute. Jack is a Landscape and Visual Impact Assessment Specialist with an academic background in the field of Environmental Science and Geography. Jack's primary role at MKO is conducting Landscape and Visual Impact Assessment (LVIA) for Environmental Impact Assessment reports, as well as supporting the MKO graphics, CAD and drone surveying teams. Jack holds a BSc. in Psychology, and an MSc. in Coastal and Marine Environments (Physical Processes, Policy & Practice) where he was awarded the Prof. Máirín De Valéra distinction in science research award. Prior to taking up his position with MKO, Jack worked as a Geospatial Analyst and Research Assistant with the University of Galway and also held previous posts in the coastal engineering sector with Royal Haskoning DHV and Saltwater Technologies. Since joining MKO in February 2020, Jack has conducted and project managed all aspects of LVIA for a broad range of commercial infrastructure developments including wind and solar energy projects, grid infrastructure, extraction industry and Strategic Housing Developments. Jack holds a membership with the Chartered Institute of Water and Environmental Management and is also a member of the Landscape Research Group.

Saoirse Fitzsimons – Project Environmental Scientist – LVIA Specialist

Saoirse Fitzsimons is a Project Environmental Scientist and LVIA Specialist with MKO. Saoirse is an Affiliate Member of the British Landscape Institute. Her primary role at MKO is producing the LVIA chapter of EIA reports for large infrastructure developments. Saoirse holds an MSc. in Coastal and Marine Environments from the National University of Ireland, Galway where she was awarded The Prof Micheál O'Cinnéide Award for Academic Excellence. Since joining MKO, Saoirse has worked widely on renewable energy infrastructure, commercial, recreational, and residential projects. Saoirse holds an A1/A3 and A2 drone licence and is one of the lead drone pilots in MKO.

Daniel Mulpeter – LVIA Graduate

Daniel Mulpeter is a LVIA Graduate with MKO with under 1 year of experience, engaging in LVIA assessments for wind energy and public infrastructure. Daniel holds an MSc in Environmental Science from Trinity College Dublin, where he completed his thesis on "Estimating Peat Depth using Gamma-ray Spectrometry and Photogrammetry". Furthermore, he received a BSc (Hons) in General Science, finishing with Applied Maths and Biology. Prior to taking up his position with MKO in September 2023, Daniel Mulpeter worked as a part time Laboratory Assistant with Oldcastle Laboratories Ltd. Daniel's key strengths include proficiency in GIS tools such as QGIS and ArcGIS, conducting landscape and visual impact assessments, and capturing data through drone surveys and photomontages.

John Hynes – Ecology Director

John Hynes is the Ecology Director at MKO, with over 12 years' professional experience in the public and private sector. John oversees MKO's Ecology, Ornithology, Forestry, Bats, and GIS teams. John holds a B.Sc. in Environmental Science and a M.Sc. in Applied Ecology. John's key strengths and areas of expertise are in Appropriate Assessment of plans and projects, Ecological Impact Assessment, Flora and Fauna survey methods and design, project management and project strategy. John is experienced as a coordinator or large multi-disciplinary teams on complex ecological projects. John has been involved as a lead Ecologist on a range of energy infrastructure, commercial, transport, housing, forestry, biodiversity net gain and nature restoration projects. John is a Full member of the Chartered

Institute of Ecology and Environmental Management, a member of Galway County Council Climate and Biodiversity Special Policy Committee (SPC) and a contributor to the Wind Energy Ireland (WEI) Biodiversity and Sustainability Working Group.

Aoife Joyce – Project Director (Ecology)

Aoife Joyce is a Project Director (Ecology) with MKO Planning and Environmental Consultants with experience in research and consultancy. Aoife is a graduate of Environmental Science (Hons.) at NUI Galway, complemented by a first-class honours MSc in Agribioscience. Prior to taking up her position with MKO in May 2019, Aoife held previous posts with Inland Fisheries Ireland and Treemetrics Ltd. She has a wide range of experience from bat roost identification, acoustic sampling, sound analysis, electrofishing, mammal and habitat surveying to GIS, soil and water sampling, Waste Acceptability Criteria testing, Environmental Impact Assessments (EIAs) and mapping techniques. Since joining MKO, Aoife has been involved in managing bat survey requirements for a variety of renewables planning applications, as well as commercial, residential and infrastructure projects. This includes scope development, roost assessments, remote bat detector deployment, dawn and dusk bat detection surveys, bat handling, sonogram analyses, mapping, impact assessment, mitigations and report writing. Within MKO, she oversees the bat team and works as part of a wider multidisciplinary team to help in the production of ecological reports and assessments. Aoife is a member of Bat Conservation Ireland and CIEEM and holds current Bat Roost Disturbance and bat photography licenses.

Padraig Cregg – Principal Ornithologist

Padraig is a Principal Ornithologist with MKO and has over eleven years of experience working in environmental consultancies. The natural world has been a lifelong passion for Padraig. He has pursued this passion from boyhood through his academic study and career with MKO. In his role, he acts as technical advisor for the ornithology team, helping to take projects through their entire lifecycle, from site selection through survey design, constraints studies, impact assessment and lodgement of the planning application. He is responsible for training the ornithology team and keeping his colleagues updated on all emerging guidance, legislation, policies, initiatives, industry best practices, emerging trends, and market opportunities.

Cathal Bergin – Project Conservation Detection Dog Handler

Cathal is a Project level Ecologist and Conservation Detection Dog Handler and Trainer with MKO having joined the company in June 2020. Cathal holds a BSc (Hons) in Wildlife Biology where he focused his studies on ecology and mammal surveys. Cathal's key strengths and expertise are in mammal surveys (bats, badgers and otters), invasive species surveys, QGIS mapping and report compiling. Since joining MKO, Cathal has been involved in a range of windfarm, solar farm and SHD projects. MKO's Conservation Detection Team is led by Cathal Bergin (B.Sc.). He holds diplomas in Canine Behaviour, Dog Training, Canine Nutrition and Canine First Aid.Cathal is a certified LANTRA accredited conservation detection dog handler. He is also training to become an accredited detection dog trainer with experience in; identification of bird and bat carcasses, plant and habitat identification and has conducted numerous ecological surveys on existing wind farms sites across Ireland.

Nathan Finn – Bat Ecologist

Nathan Finn is a Seasonal Bat Ecologist with MKO. Nathan holds BSc (Hons) in General Science and MSc (Hons) in Environmental Science. Prior to taking up his position with MKO in March 2023, Nathan worked as a Diagnostic Technologist with Abbott Laboratories and previously completed an internship with the Marine Institute Ireland. Nathan's key strengths and areas of expertise are in bats, mammal ecology, population dynamics, environmental science, data analysis and data interpretation. Since joining MKO Nathan has been involved as a Seasonal Bat Ecologist on a significant range of energy infrastructure, commercial, educational and residential projects. Nathan has been contributed to numerous projects via field surveys, consultation, data analysis, and report writing. Within MKO Nathan plays a large role in the management and maintenance of equipment, data, and records. Nathan works as part of a large multi-disciplinary team to produce EcIA and EIAR Reports. Nathan holds a qualifying membership with the Chartered Institute of Ecology and Environmental Management.

Susan Doran

Susan Doran is an Ornithologist with MKO with over 2 years of experience in consultancy and conservation. Susan holds Bsc (Hons) in Ecology and Environmental Biology from University College Cork. Prior to taking up her position with MKO in July 2022, Susan worked as a Senior animal care assistant in Seal Rescue Ireland, managing and coordinating a network of over 800 members as well as the medical care. Susan 's key strengths and areas of expertise are in project and data management, team coordination and development and training. Since joining MKO Susan has been involved as an Ornithological coordinator, focusing on large scale data management and mapping, viewshed analysis and bird surveying. Susan is also responsible for sub-contractor management within the ornithology team. She has experience in carrying out bird surveys using multiple methods. for a variety of proposed windfarm developments, as well as experience in bird monitoring at operational windfarms. Within MKO Susan plays a large role in the training of new members of the ornithology team and works to compile and prepare the ornithological data that goes through to EIARs and AMRs, management of NPWS licencing and conducting various analysis. Susan also holds a BTO ringing licence, and membership to the Botanical society of Britain and Ireland, British Ecological Society, British Trust for Ornithology and Chartered Institute for Ecology and Environmental Management.

Damian Brosnan – Acoustics Project Director

Damian is Project Director Acoustics with MKO, with over 25 years of experience in both private practice and local authority. Damian holds a BSc from University College Cork and an MSc in Applied Acoustics from the University of Derby. He has completed the Institute of Acoustics Post-Graduate Diploma, and now presents tutorials to the next generation of students on Institute courses. Prior to joining MKO, Damian worked as an acoustic consultant, specialising in environmental impact assessment. Previously, Damian worked with Cork County Council's Environment Department. Damian joined MKO in 2023, heading up the new MKO acoustics unit. The unit has extensive experience in assessing noise impacts associated with industry, quarrying, waste management and renewable energy, as well as a wide variety of other projects, through planning applications, SID applications and the EPA licensing system. The unit also manages compliance monitoring programmes and noise management plans for a large number of clients across a range of sectors, and advises clients faced with acoustic issues such as allegations of excessive noise. Damian is a member of the Institute of Acoustics (MIOA), and is Secretary of the Irish Branch. He is also a founding member of the Association of Acoustic Consultants of Ireland (AACI), an industry body founded to promote acoustics best practice in Ireland. Damian has presented acoustic evidence in a number of court hearings and oral hearings.

Emily Lynch – Environmental Scientist

Emily is an Environmental Scientist who graduated with an Honours Degree in Environmental Science from the National University of Ireland, Galway in 2022, and has been working as an Environmental Scientist since then. Since beginning her work with MKO, Emily has been working as part of a multi-disciplinary team conducting tasks such as report writing, shadow flicker assessments, project management, and QGIS mapping. Emily's particular strengths lie in report writing and project management and communication. Emily has been involved in the preparation of Environmental Impact Assessment Screening Reports, Strategic Environmental Assessment Pre-Screening Reports, Planning and Environmental Reports, and Environmental Impact Assessment Reports for a wide range of projects, but mostly focusing on large-scale onshore renewable energy developments. In her role as an Environmental Scientist, Emily has been charged with co-ordinating large multidisciplinary teams in order to assist in the production of robust Environmental Impact Assessment Reports accompanying Planning Applications for various large-scale developments.

Fergal Connolly –Planner

Fergal Connolly joined MKO February 2023. Fergal holds a MSc in Planning, Regeneration and Development from Ulster University where he focused his final year studies on renewable energy development and their social, Environmental and economic impacts. Since joining MKO, Fergal has been involved in a range of infrastructure projects, including onshore wind development, solar developments, grid infrastructure developments and non-renewable developments such as river maintenance programmes. In his role as a Planner, Fergal works with multidisciplinary teams including MKO's Environmental, Ecological and Ornithological teams as well as sub-contractors from various disciplines. Fergal has contributed towards EIAR chapter 2s and the production of planning strategy and planning strategy reports. Fergal holds a licentiate membership with the Royal Town Planning Institute.

Toni Bourke – Director of Project Communications

Toni Bourke is Director of Project Communications with MKO with over 20 years of experience in both private practice and in the semi-state sector. Toni holds a BA (Hons) in Communications Studies from DCU and an MA (Hons) in Journalism from University of Galway. Prior to taking up her position with MKO in September 2022, Toni worked with Uisce Eireann Irish Water for over six years in a range of communications roles from Regional Media Specialist to managing a national team of communications specialists. Before this she worked in the media including newspaper and TV. She has extensive experience working in the media and with the media and throughout her career she has engaged with politicians of all levels, business representative organisations and community groups. Her strengths are in project management, people management, and strategic communications planning. Since joining MKO Toni has led the delivery of community engagement plans for renewable projects including wind, solar and battery storage. She has also worked on Town Centre First plans, residential projects, education sector projects, quarries and healthcare projects. In her role as Director of Project Communications, Toni is growing this new discipline by expanding the portfolio, growing the team, and liaising with all other functions within the company to add value to projects. Toni is a past secretary of the National Union of Journalists Western Branch, she is the current Health and Wellbeing officer of her local GAA Club and is a proud member of the Public Relations Institute of Ireland.

Mark Higgins – Communications Specialist

Mark Higgins is Communications Specialist working in MKO's dedicated Project Communications unit. Mark has ten years of professional experience, having worked as a journalist with the Western People, one of the leading regional newspapers in the West of Ireland, for nearly a decade prior to joining MKO in March 2023. Mark holds a BA (Hons) in English and Sociological & Political Studies, and a Masters in Journalism, both from the University of Galway. Since joining MKO as a Communications Specialist, Mark has worked in community engagement and public consultation on several large-scale renewable energy projects, including on- and off-shore wind farms, solar farms, and battery energy storage systems. Mark's role involves proactively engaging with local communities on behalf of developers, providing information on renewable projects and responding to questions and concerns. Mark has also worked in the area of town planning, running public consultation events on multiple Town Centre First plans. He has also been involved in stakeholder engagement on projects across the residential and educational sectors, as well as projects relating to environmental protection and climate resilience. Prior to joining MKO, Mark worked as a sports journalist for a local newspaper in the West of Ireland, and latterly as a deputy sports editor with responsibility for managing a roster of reporters and photographers. He developed the ability to work to tight, strict deadlines with careful management of time and resources. Mark's key strengths and areas of expertise are in communications, stakeholder consultation and public relations. Mark also has the role of Project Manager on several projects, with responsibility for all aspects of the delivery of communications strategies and programmes of works for public consultations. Mark holds associate membership of the Public Relations Institute of Ireland (PRII).

Jessica Sara Barbara – Conservation Detection Dog Handler

Jessica Sara Barbara is a Conservation Detection Dog Handler with over 5 years of experience in K9 behaviour and training. Jessica holds a BSc. in Natural Science, and a MSc. in Wildlife Management, Conservation and Control. Prior to taking up her position with MKO in May 2023, Jessica worked mainly as Supervisor of the Italian Horse Protection (IHP) Onlus in Italy, and secondarily as a dog trainer. Jessica has specialist knowledge in wildlife husbandry and welfare, animal rehabilitation, environmental enrichments, ethology and dog behaviour modification. Jessica's key strengths and areas of expertise are in strategic planning, wildlife management, and K9 training. Since joining MKO Jessica has been involved as a Conservation Detection Dog Handler on a significant range of wind farms across Ireland. This includes dog handling and training, risk assessments, collision monitoring surveys, bird/bat carcass handling, camera trap deployment and report writing. Within MKO Jessica plays the role, together with her team, of being pioneers and setting standards on the use of Detection Dogs in Ireland; and finding more efficient and reliable methods of monitoring bird and bat casualties at wind farm sites.

1.8.2.2 AWN Consulting Ltd.

Mike Simms

Mike Simms (Principal Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering and is a member of the Institute of Acoustics (MIOA) and of the Institution of Engineering and Technology (MIET). Mike has worked in the field of acoustics for over 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

Dermot Blunnie

Dermot Blunnie of AWN Consulting Ltd. Dermot Blunnie (Principal Acoustic Consultant) holds a BEng (Hons) in Sound Engineering, MSc in Applied Acoustics and has completed the Institute of Acoustics (IOA) Diploma in Acoustics and Noise Control. He has been working in the field of acoustics since 2008 and is a member of the Institute of Engineers Ireland (MIEI) and the Institute of Acoustics (MIOA). He has extensive knowledge and experience in relation to commissioning noise monitoring and impact assessment of wind farms as well as a detailed knowledge of acoustic standards and proprietary noise modelling software packages. He has commissioned noise surveys and completed noise impact assessments for numerous wind farm projects within Ireland.

1.8.2.3 Tobar Archaeological Services

Tobar Archaeological Services is a Cork-based company in its 17th year in business. They offer professional nationwide services ranging from pre-planning assessments to archaeological excavation, and cater for clients in state agencies, private and public sectors.

Tobar's Director Miriam Carroll is licensed by the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs to carry out excavations in Ireland and has carried out work directly for the National Monuments Services of the Department of the Environment, Heritage, and Local Government. Tobar Archaeological Services has a proven track record and extensive experience in the wind farm industry from EIS/EIAR stage through to construction stage when archaeological monitoring is frequently required.

Miriam Carroll

Miriam holds a Degree in Archaeology (1993-1996) and a 2-year Masters in Methods and Techniques in Irish Archaeology (1996-1998) from UCC and has over 20 years' experience in private sector archaeology. Miriam has managed and co-ordinated numerous projects from commencement stage to completion on behalf of numerous small and large companies.

1.8.2.4 Blackstaff Ecology

Ecologists from Blackstaff Ecology can now provide services right from project inception through construction and operation. We can also include long-term bespoke site management solutions for habitat management; allowing valuable development land to be used to the full with compensation and enhancement measures being undertaken off-site on your behalf (and for the lifetime of the required HMP/Planning Conditions).

Our qualified staff provide a complete range of cost-effective practical services to fulfil protected species licencing requirements and planning conditions, and to enhance your site for wildlife in the long-term. We can also work in tandem with your existing site contractors to assist you in meeting any planning obligations which related to ecology.

We have a dedicated specialist in-house tree climber (and support team) to undertake endoscoping surveys for bats in trees, red squirrel dreys and to erect, monitor and maintain bat boxes, pine marten den boxes and barn owl boxes.

Our team are licensed to work with a range of protected species, including bats, barn owl, red squirrel, pine marten, smooth newt and viviparous lizard, and our team is also very experienced in developing and implementing badger mitigation and compensation solutions.

All our staff are committed to safe working practices whilst on site, are Construction Skills Certification Scheme (CSCS) certified and hold all relevant qualifications and insurances.

Cormac Loughran

All surveying and reporting are co-ordinated by Cormac Loughran (CEnv MCIEEM MSc), a Chartered Environmentalist and Full Member of the Chartered Institute of Ecology & Environmental Management with over 20-years' experience. He has coordinated ecological assessments for over 200 projects throughout Ireland, including wind farms, infrastructural projects (overhead power lines, pipelines), and a range of residential and commercial developments.

Brian Sutton

Brian has over 20 years' experience as a professional ecologist. Brian specialises in bird studies, but he is also an experienced habitat surveyor, with experience of most of the habitat types found within Northern Ireland. He has considerable experience in ecological assessments and Environmental Impact Assessment (EIAs).

1.8.2.5 CC Ornithology

Cian Cardiff

Cian Cardiff is an Irish Ornithologist who has studied bird biodiversity and population monitoring methods at University Oxford. Owner of CC Ornithology which specialises in ornithological studies. Cian has been surveying birdlife for at least 6 years across Ireland with a broad range of experience and expertise in the sector. Bird tour leader, published writer, photographer and public speaker also. Leading tours across Ireland for the past 6 years.

1.9 Difficulties Encountered

There were no technical difficulties encountered during the preparation of this EIAR.

1.10 Viewing and Purchasing of the EIAR

Copies of this EIAR, including the Non-Technical Summary (NTS), will be available online, via the Wexford County Council Planning Website. The EIAR and all associated planning documentation will also be available for viewing at the offices of the Wexford County Council. The EIAR may be inspected free of charge or purchased by any member of the public during normal business hours, at the following address:

Wexford County Council
Planning Department
Newtown Rd, Carricklawn,
Wexford,
Y35 WY93

The EIAR will also be available to view online via the Department of Planning, Housing and Local Government's EIA Portal, which will provide a link to the planning authority's website on which the application details are contained. This EIA Portal was set up by the Department as an electronic notification to the public of requests for development consent which are accompanied by an EIAR (https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal).

2. BACKGROUND AND POLICY

This Chapter of the Environmental Impact Assessment Report (EIAR) sets out the international, European and national renewable energy and climate change related policy and targets along with the strategic, national, regional, and local planning policies relevant to the Proposed Development. It also outlines the planning history, and summarises scoping and consultation undertaken, and the cumulative impact assessment process.

2.1 Introduction

This Chapter of the EIAR presents the policies and targets which have been put in place at the various levels of Government, regional, national and international, in relation to renewable energy and climate change. The details below set out the need for the Proposed Development to aid Ireland in meeting its national targets and European commitments in relation to climate change and decarbonisation and elaborates on the 'need for the development' expressed in Chapter 1.

The existing Ballywater Wind Farm hereafter referred to as the 'Proposed Development' consists of 21 no. Enercon E70 model wind turbines with a 99m tip-height and 70m, rotor diameter, existing access tracks, existing 110kV substation (previously granted under Pl.Ref. 20042901) all existing associated electrical and communications cabling connecting the turbines to the onsite substation, existing entrance at R742, existing site drainage and all existing ancillary infrastructure, fencing and signage are located in the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown and Templederry, Co. Wexford.

The Proposed Development seeks to achieve a 10-year planning permission to extend the operational life of the existing Ballywater Wind Farm including the onsite 110kV substation and all associated infrastructure ((ABP Reg Ref. PL26.127455/WCC Reg Ref 20010458 and WCC Reg Ref 20042901)).

The need to decarbonise and reduce emissions has always been imperative, however, in recent years the urgency involved has become clearer to all stakeholders. The Climate Action Plan (CAP) first published by the Government in 2019, and updated in 2021, 2023 and 2024 sets out a roadmap to halve emissions by 2030 and reach net zero no later than 2050. Central to this is the set of measures set out to increase the proportion of renewable electricity to up to 80% by 2030 and a target of 9GW from onshore wind. The CAP places front and centre the facts that without urgent action, global warming is likely to be more than 2˚C above pre-industrial levels, threatening the health and livelihoods of people across the globe. Urgency of action is also a key focus of the CAP.

The site of the Proposed Development is currently an operational wind farm which has been supplying renewable energy to national electricity grid since commission in 2005. The existing wind farm has therefore been contributing to Ireland's energy and climate targets over the past approximately 19 years.

Planning permission is being sought from Wexford County Council (WCC) to enable the existing wind farm and substation to continue operating in their current form for an additional 10 years, beyond the expiry of the current permissions. The primary driver behind extending the operational period of the Proposed Development is the need to provide continued renewable energy to the national grid from a proven source and appropriate site, to offset the use of fossil fuels within the electricity generating sector. Increasing electricity generation from wind power represents the most economical renewable option to reduce emissions within the power generation sector and is the most mature technology available to achieve national targets that have been established for decarbonisation. The current proposal seeks to allow the existing wind turbines to continue to operate, thereby directly contributing towards Ireland satisfying its 2030 and 2050 renewable energy targets.

The review of relevant policy in this Chapter of the EIAR concludes that the Proposed Development is consistent with the overarching planning framework with regard to facilitating the move away from dependency on fossil fuels and the promotion of proper planning and sustainable development.

2.1.1 Statement of Authority

MKO has developed extensive expertise and experience over the last 15 years in preparing Background and Planning Policy Context Chapters for a range of projects, including multiple large scale wind energy development.

This chapter was led by Alan Clancy MIPI with support from Mike Amiel Mekell RTPI Licentiate of MKO. Alan Clancy is a Project Planner with MKO with over 8 years of experience in private practice. Alan holds a BA in Geography & History and Masters in Planning and Sustainable Development. Alan has experience across a range of sectors including commercial, residential and industrial, Alan's key strengths and areas of expertise are in development management, provision of planning advice and project management. Since joining MKO, Alan has assisting with various projects including Strategic Infrastructure Developments, lodgement and management of Planning Applications, Development Plan Submissions and preparing Development Potential Reports. Alan is a member of the Irish Planning Institute.

Mike Amiel Mekell is a Graduate Planner with MKO having joined the company in June 2024. Mike holds a BA (Hons) in Politics, International Relations and Sociology from University College Dubin and an MSc (Hons) in Planning and Development from Queen's University Belfast. He is a Licentiate of the Royal Town Planning Institute. Since joining MKO, Mike has been involved in a range of renewable energy projects including onshore wind, solar and grid infrastructure developments. His main responsibilities include preparing planning application documents and reports, preparing inputs for Environmental Impact Assessment Reports and liaising with multidisciplinary project teams.

This chapter was reviewed by Meabhann Crowe MRTPI. Meabhann Crowe is a Project Director with MKO with over 15 years private sector experience. She is a fully chartered member of the Royal Town Planning Institute (MRTPI). Meabhann holds a BA (Hons) in Geography, Sociological and Political Science and a Masters in Urban and Regional Planning. Meabhann has particular experience in managing large multi-disciplinary teams in the preparation of planning applications across residential, mixed-use, industrial and renewable energy developments.

2.1.2 Renewable Energy Resources

Renewable energy resources are constantly replenished through the cycles of nature, unlike fossil fuels, which are finite resources that are becoming increasingly scarce and expensive to extract. Renewable energy resources offer sustainable alternatives to our dependency on fossil fuels as well as a means of reducing greenhouse gas (GHG) emissions and opportunities to reduce our reliance on imported fuels. These resources are abundantly available in Ireland, yet only a fraction has been tapped so far[1].

A gradual shift towards increasing our use of renewable energy is no longer viable. There is an urgency now to ensure real changes happens. Renewable energy development is recognised as a vital component of Ireland's strategy to tackle the challenges of combating climate change and ensuring a secure supply of energy. Ireland is heavily dependent on the importation of fossil fuels to meet its energy need. 70% of energy used in Ireland is imported from abroad, higher than the European Union (EU) average of almost 60% (National Energy Security Framework 2022). This high dependency on energy imports is highly risky and Ireland is currently extremely vulnerable both in terms of meeting

[1] *Source: Sustainable Energy Authority of Ireland (SEAI) website, www.seai.ie*

future energy needs and ensuring price stability. As such, expanding indigenous renewable energy supply is critical for energy security and price stability.

2.2 Climate Change Policy and Targets

International and national policy consistently identifies the need to reduce GHG emissions and stresses the importance of reducing global warming. The context of international policy has altered over the last 30-years from being of a warning nature to the current, almost universally accepted belief, that there is a climate change emergency occurring both within Ireland and at a broader global scale. The Intergovernmental Panel on Climate Change (IPCC)'s Sixth Assessment Report[2] published in 2021 provides a stark assessment of global climate change and presents evidence that climate changes will increase in all regions of the globe over the coming decades and that much of the damage caused by climate change up to this point is now likely irreversible, such as the rise in sea levels over the 21st century. The Synthesis Report[3] of the IPCC Sixth Assessment Report published in March 2023 summarises the state of knowledge of climate change, its widespread impacts and risks. The Synthesis Report states that *'continued global warming is projected to further intensify the global water cycle, including its variability, global monsoon precipitation, and very wet and very dry weather and climate events and seasons'.*

According to the World Meteorological Organisation's State of the Global Climate Report published on the 19th March 2024 report[4]:

- The global mean near-surface temperature in 2023 was 1.45 ± 0.12 °C above the pre-industrial 1850–1900 average, surpassing the previous joint warmest years, 2016 and 2020.
- Globally, every month from June to December was record warm for the respective month. September 2023 was particularly noteworthy, surpassing the previous global record for September by a wide margin (0.46 to 0.54 °C). July 2023 became the all-time warmest month on record.
- Ocean heat content reached its highest level in 2023, according to a consolidated analysis of data. Warming rates show a particularly strong increase in the past two decades. It is expected that warming will continue – a change which is irreversible on scales of hundreds to thousands of years.
- In 2023, global mean sea level reached a record high in the satellite record (since 1993), reflecting continued ocean warming (thermal expansion) as well as the melting of glaciers and ice sheets.
- Antarctic sea-ice extent reached an absolute record low for the satellite era (since 1979) in February 2023 and remained at record low for the time of year from June till early November. The annual maximum in September was 16.96 million km², roughly 1.5 million km² below the 1991–2020 average and 1 million km² below the previous record low maximum.
- Combining the two main ice sheets (Greenland and Antarctic), the seven highest melt years on record are all since 2010, and average rates of mass loss increased from 105 Gigatonnes per year from 1992–1996 to 372 Gigatonnes per year from 2016–2020. This is equivalent to about 1 mm per year of global sea level rise attributed to the ice sheets in the latter period.

[2] *Climate Change 2021 'The Physical Science Basis' (Intergovernmental Panel on Climate Change, August 2021)* https://www.ipcc.ch/report/ar6/wg1/
[3] *Climate Change 2023 Synthesis Report (IPPC)* https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf
[4] *State of the Global Climate 2023 (World Meteorological Organisation, March 2024)* https://library.wmo.int/records/item/68835-state-of-the-global-climate-2023

Extreme weather and climate events are having major impacts on all continents, as documented in the World Meteorological Organisation's 30th November 2023 report[5]:

- Flooding associated with extreme rainfall from Mediterranean Cyclone Daniel affected Greece, Bulgaria, Türkiye, and Libya with particularly heavy loss of life in Libya in September 2023.
- Tropical Cyclone Freddy in February and March 2023 was one of the world's longest-lived tropical cyclones with major impacts on Madagascar, Mozambique and Malawi. Tropical Cyclone Mocha, in May, was one of the most intense cyclones ever observed in the Bay of Bengal.
- Extreme heat affected many parts of the world. Some of the most significant were in southern Europe and North Africa, especially in the second half of July where severe and exceptionally persistent heat occurred. Temperatures in Italy reached 48.2°C, and record-high temperatures were reported in Tunis (Tunisia) 49.0°C, Agadir (Morocco) 50.4°C and Algiers (Algeria) 49.2°C.
- There was extensive wildfire activity during the summer, particularly in Greece (both on the mainland and islands). A fire in north-eastern Greece in late August and early September that burned 96 000 ha was the largest fire ever observed in the EU.
- Canada's wildfire season was well beyond any previously recorded. The total area burned nationally as of 15 October was 18.5 million hectares, more than six times the 10-year average (2013–2022). The fires also led to severe smoke pollution, particularly in the heavily populated areas of eastern Canada and the north-eastern United States.

In Ireland, extreme weather and climate events driven by climate change are also having major impacts:

- March 2023 was the wettest March on record at four stations in Ireland.
- June 2023 was the hottest June on record in Ireland, with average day and night temperatures above 16 degrees.
- July 2023 brought flash floods in Donegal after 76mm of rain fell on a single day.
- July 2023 was the wettest July on record at 12 weather stations across Ireland.
- September 2023 saw all-time temperatures records broken for fourteen Irish weather stations.

"The Status of Ireland's Climate 2020" produced by MET Eireann[6], similarly reflects on clear and distinct impacts arising from climate change effects within an Irish context:

<u>Greenhouse gas emissions continue to rise:</u>

- Background carbon dioxide (CO2) concentrations reached 414 ppm in 2020 which is approximately a 50% increase compared to pre-industrial levels.
- Methane (CH4) concentrations are at 1940 ppb - which is approximately a 170% increase compared to pre-industrial levels.
- Nitrous oxide (N2O) concentrations are now above 330 ppb - which is approximately a 20% increase compared to pre-industrial levels.

<u>Annual average amounts of precipitation are increasing:</u>

- Annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990. The decade 2006 to 2015 was the wettest on record.

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[5] *Provisional State of the Global Climate 2023 (World Meteorological Organisation, November 2023) https://wmo.int/sites/default/files/2023-11/WMO%20Provisional%20State%20of%20the%20Global%20Climate%202023.pdf*
[6] *Climate Status Report for Ireland 2020 (Environmental Protection Agency, Marine Institute, Met Éireann, August 2021)*

Annual average air temperature is rising:

- The annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons.
- An increase in the number of warm spell days the last 60 years with very little change in cold spell duration.

Sea level continues to rise:

- Satellite observations indicate that the sea level around Ireland has risen by approximately 2-3mm/year since the early 1990s. Analysis of sea level data from Dublin Bay suggests a rise of approximately 1.7mm/year since 1938 which is consistent with global average rates.

The ocean is becoming more acidic:

- Measurements in the surface waters to the west of Ireland between 1991 and 2013 indicate an increase in ocean acidity which threatens calcifying species such as corals, shellfish and crustaceans.

The ocean is getting warmer:

- The average sea surface temperature at Malin Head over the 10 years between 2009 and 2018 was 0.47°C above the 1981-2010 mean.

There is an increase in river flows across most of the country:

- However, there is evidence in recent years of an increase in potential drought conditions, especially in the east.

The area of forests and artificial surfaces has increased:

- Land cover observations since 1990 show increases in the area covered by both artificial surfaces and forests and a decrease in wetland areas which include peatlands. There was an increase of 38% in the volume of trees between 2006 and 2017.

The IPCC's Sixth Assessment Report does not, however, conclude that a climate catastrophe is inevitable, but rather, there remains a 'narrow path' to determine the future course of climate, mainly by cutting emissions down to net zero. The Proposed Development will continue to contribute to the decarbonisation of the energy sector and reduce harmful emissions. In this regard, it is in compliance with national and international climate change policy and targets.

2.2.1 International Climate Policy

United Nations Framework Convention on Climate Change

In 1992, Ireland joined an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), as a framework for international efforts to combat the challenge posed by climate change. The UNFCCC seeks to limit average global temperature increases and the resulting climate change and cope with impacts that are already inevitable. It recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other GHGs. The framework set no binding limits on GHG emissions for individual countries and contains no enforcement mechanisms. Instead, the framework outlines how specific international treaties (called "protocols" or "Agreements") may be negotiated to set binding limits on GHGs.

Kyoto Protocol

The Kyoto Protocol operationalises the UNFCCC by committing industrialised countries and economies in transition to limit and reduce GHG emissions in accordance with agreed individual targets. Ireland is a Party to the Kyoto Protocol, which came into effect in 2005, and as a result of which, emission reduction targets agreed by developed countries are now binding.

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted and includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1st January 2013 to 31st December 2020;
- A revised list of GHGs to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the UNFCCC. Every year since 1995 (excluding 2020 due to COVID-19), the COP has gathered the 196 Parties (195 countries and the EU) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations (UN) and held, in Paris, from 30th November to 12th December 2015. COP21 closed with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The 12-page text, made up of a preamble and 29 articles, provides for a limitation of the global average temperature rise to well below 2°C above pre-industrial levels and to limit the increase to 1.5°C. It is flexible and takes into account the needs and capacities of each country. The IPCC's Sixth Assessment Report further collaborates this need to limit any increase in global average temperature to 1.5oC, stating that (underlined for emphasis),

> <u>*"Humanity has emitted 2,560 billion equivalent tons of CO2 since 1750, and we only have a budget of 500 more if we want to limit warming to 1.5°C.*</u>
>
> *By following a trajectory of very low GHG emissions (SSP1-1.9), the threshold of 1.5°C will be reached in the short term, between 2021 and 2040, before being very slightly exceeded (1.6°C anticipated over the period 2041-2060) then respected in the long term (1.4°C anticipated over the period 2081-2100).*
>
> <u>*Everything is not lost, but we must pursue the Paris Agreement's most ambitious goal of limiting warming to 1.5°C."*</u>

An article published by the IPCC on the 6th October 2018 titled 'Global Warming of 1.5°C', notes the impacts of global warming of 1.5°C above pre-industrial levels and related global GHG emission pathways; in the context of mitigation pathways, strengthening of the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. This special report is part of an invitation contained in the Decision of the 21st session of the COP of the UNFCCC to adopt the Paris Agreement and provides an update on the impact of climate change if emissions are not reduced.

COP25 Madrid

COP25, the 25th session of the COP, was held between the 2nd and 13th of December 2019 in Madrid. The conference was characterised by repeated warnings from civil society (NGOs and corporates) on emerging evidence and scientific consensus on climate change risk. Specifically, it was noted that there are only c. '*10 years left*' before the opportunity of limiting global warming to 1.5°C is no longer feasible. As such, the only remaining approach to limiting rising global temperatures is a '*7.6% reduction of global GHG emissions every year between 2020 and 2030, and to reach net zero emissions by 2050*'. However, consensus was not achieved between States on finalising the operating rules of the Paris Agreement and to ensure that it became operational by 2020. Three issues which emerged between States from the COP25 are summarised below:

- There was no uniform consensus between States to raise countries' climate ambitions, e.g. to make increased commitments in light of growing climate change data. Some States were opposed to imposing any obligation on countries to submit enhanced pledges by the following year, arguing it should be each country's own decision. All states were required to submit a review of their commitments for COP 26 in 2020. At the current level of climate targets, within a decade, the objective of the Paris Agreement will no longer be achievable;
- There was no agreement on finalising Article 6 of the Paris agreement, the foundations for international cooperation to combat climate change. The aim was to establish the rules for new international mechanisms for financing and transferring GHG emission reductions; and
- There was no agreement on financing (Green Climate Fund); specifically, relating to both loss and damage caused by climate change.

Despite the lack of consensus on the above challenges, the COP25 did achieve more limited success with regard to the introduction of the "*San Jose Principles for High Ambition and Integrity of International Carbon Markets*", which sets out the framework on which a robust carbon market should be built. These principles include, but are not limited to:

- Ensures environmental integrity and enables the highest possible mitigation ambition;
- Delivers an overall mitigation in global emissions, moving beyond zero-sum offsetting approaches to help accelerate the reduction of global GHG emissions;
- Prohibits the use of pre-2020 units, Kyoto units and allowances, and any underlying reductions toward Paris Agreement and other international goals; and
- Ensures that double counting is avoided and that all use of markets toward international climate goals are subject to corresponding adjustments.

These principles were supported by 23 EU, including Ireland, and Latin American countries, 5 no. Pacific Islands and 2 no. countries in the Caribbean.

COP26 Glasgow

COP26 took place in Glasgow, Scotland between the 31st October and 12th November 2021. The summit was centred around the fact that "*climate change is the greatest risk facing us all.*" The UK, as hosts for the summit, have developed a ten-point plan to deliver a green industrial revolution, seeking to lead the world in tackling and adapting to climate change.

The key items COP26 seeks to achieve are:

- Secure global net zero by mid-century and keep 1.5 degrees within reach;
- Adapt to protect communities and natural habitats;
- Mobilise finance; and
- Work together to deliver.

All world leaders at the summit confirmed the need to urgently address the gaps in ambition and work together to achieve climate action.

The summit highlighted that the Paris Agreement is working, with leaders outlining national targets and efforts to further reduce emissions. There was a clear commitment to working together to achieve climate aims, with significant announcements including:

- *"Over 40 leaders joined the Breakthrough Agenda, a 10-year plan to work together to create green jobs and growth globally, making clean technologies and solutions the most affordable, accessible and attractive option before 2030 – beginning with power, road transport, steel, hydrogen and agriculture.*
- *Over 120 countries covering more than 90% of the world's forests endorsed the Glasgow Leaders' Declaration on Forests & Land Use committing to work collectively to halt and reverse forest loss and land degradation by 2030, backed by the biggest ever commitment of public funds for forest conservation and a global roadmap to make 75% of forest commodity supply chains sustainable.*
- *A Just Energy Transition Partnership was announced to support South Africa's decarbonisation efforts; a powerful example of collaboration between an emerging economy and international partners.*
- *The launch of the Global Methane Pledge saw over 100 countries committing collectively to reduce global methane emissions by 30% by 2030."*

COP27 Egypt

COP27 took place in Sharm el-Sheikh from the 6th of November to the 20th of November 2022. The COP is a supreme decision-making body of the UNFCCC. COP27 centred around three major topics:

1. *Closing the emissions gap to keep 1.5°C alive*
2. *Loss and Damage*
3. *Climate Finance*

COP27 officially ended on the 18th of November, but due to the nature of negotiations an outcome text and the final press conference was not held until November 20th. The first outcomes of the negotiations of the COP27 agenda were seen in the first draft document. A consolidated final document followed and while it removed much of the vague wording of the draft, it also removed some critical key points, particularly in relation to the strengthening of actions required by developed nations. The most significant outcomes from COP27 are outlined below:

- **Phase down/out language:** In Glasgow last year, the final agreement was delayed due to the stance if China and India, among others, who were not comfortable the 'phase out' of coal wording in the draft text. This led to the watering down of this commitment to a 'phase down' of coal use. The hope was that COP27 would work to include further language on coal and fossil fuel reduction efforts. However, the wider commitment to phase out all fossil fuels, led by India, and backed by the US and the EU, was taken out and can be marked as the biggest disappointment of COP27.
- **1.5°C Pathway:** The 1.5°C warming limit has been retained and reassurances have been made that there is no room for backsliding. It gives the key political signals that the phase down of all fossil fuels is happening. There has been the setting of a workplan for 2023 to help articulate the nature and components of a global collective goal on adaptation and resilience and how it can be formatted in a way to take into account the Global Stocktake.
- **Climate Finance & Loss and Damage:** There has been the launch of an initiative by the V20 and G7 known as the Global Shield Against Climate Risk (GSACR). The intention of this initiative has been framed almost as an insurance policy backed by the World Bank to prepare and protect those most vulnerable to climate change disasters. The initiative seeks to reform the current climate finance model currently

operating in the form of loans, typically with high interest rates and repayment requirements. The beginnings of a framework to compensate for the unequal distribution of harm that has been caused by climate change and the unequal contributions of emissions has also been put in place.

COP28- United Arab Emirates

The 28th session of the COP to the UNFCCC, was held in Dubai from 30 November to 13 December 2023. The main objective of COP was to assess the progress made by all parties on the implementation of the 2015 Paris Agreement through the concluding phase of the 'global stocktake', which began after COP26 in 2021.

The outcomes from COP28 are as follows:

- **Loss and Damage:** Initiated at COP 27, the fund for the loss and damage to developing countries due to climate change was established. Unlike other forms of climate finance, there is no firm obligation for developed countries to pay into the fund. The loss-and-damage fund being launched was marked as a substantial outcome had been achieved during the COP28 opening session.
- **Fossil Fuel Phase-Out & Increasement of Renewable Energy Capacity:** Another result of the COP28 was the adoption of a fossil fuel phase-out agreement which commits parties to the transition away from the fossil fuels in energy systems. The agreement calls for a tripling of renewable energy capacity globally by 2030. This was the first time that the COP explicitly addressed the need to end the use of fossil fuels.
- **Adaptation Framework:** An important decision to come out of COP28 was a "framework" that is meant to guide nations in their efforts to protect their people and ecosystems from climate change. The 'global goal on adaptation' was first established by the Paris Agreement in 2015 but received little attention up until COP26. Developing countries pushed for financial adaptation targets to be introduced, however, ultimately no quantifiable financial targets were included in the final text.

European Green Deal – European Climate Law (2021)

The European Green Deal, initially introduced by the European Commission in December 2019, sets out the 'blueprint' for a transformational change of the 27-country bloc from a high- to a low-carbon economy, without reducing prosperity and while improving people's quality of life, through cleaner air and water, better health and a thriving natural world. The Green Deal is intended to work through a framework of regulation and legislation setting clear overarching targets, e.g. **a bloc-wide goal of net zero carbon emissions by 2050 and a 55% cut in emissions by 2030 (compared with 1990 levels)**. This is a substantial increase compared to the existing target, upwards from the previous target of at least 40% (2030 Climate & Energy Framework), and furthermore, these targets demonstrate the ambition necessary to keep the global temperature increase to well below 2°C and pursue efforts to keep it to 1.5°C as per the Paris Agreement. With regard to the energy sector, the Green Deal focuses on 3 no. key principles for the clean energy transition, which will help reduce GHG emissions and enhance the quality of life for citizens:

1. *Ensuring a secure and affordable EU energy supply;*
2. *Developing a fully integrated, interconnected and digitalised EU energy market; and*
3. *Prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources (e.g. the subject development).*

The European Climate Law writes into law the objectives set out above in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. Climate neutrality by 2050 means achieving net zero GHG emissions for EU countries as a whole, mainly by cutting emissions, investing in green technologies and protecting the natural environment. The Climate Law includes:

- A legal objective for the EU to reach climate neutrality by 2050;
- An ambitious 2030 climate target of at least 55% reduction of net emissions of GHGs as compared to 1990, with clarity on the contribution of emission reductions and removals;
- A process for setting a 2040 climate target, taking into account an indicative GHG budget for 2030-2050 to be published by the European Commission;
- A commitment to negative emissions after 2050;
- The establishment of European Scientific Advisory Board on Climate Change, that will provide independent scientific advice;
- Stronger provisions on adaptation to climate change; and
- Strong coherence across Union policies with the climate neutrality objective.

The law aims to ensure that all EU policies contribute to this goal and that all sectors of the economy and society play their part. All 27 no. EU Member States have committed to turning the EU into the first climate neutral continent by 2050. One third of the 1.8 trillion-euro investments from the NextGenerationEU Recovery Plan, and the EU's seven-year budget, will finance the European Green Deal. On 14th July 2021, the European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net GHG emissions by at least 55% by 2030, compared to 1990 levels.

Achieving these emission reductions in the next decade which is crucial to Europe becoming the world's first climate-neutral continent by 2050 would clearly be assisted by the Proposed Development.

2.2.1.2 Project Compliance with International Climate Policy

From the review of the relevant policy documents, it is considered that the Proposed Development will aid in reducing reliance on fossil fuels for electricity generation. This will help to achieve the UNFCCC goals of limiting global temperatures as a result of climate change and the goals of the Kyoto Protocol and the several COP agreements as outlined above. By making a just transition to more renewable forms of electricity generation, the level of carbon emissions will drop as our reliance on non-renewable forms of energy lessen.

The Proposed Development is also considered to be in line with the European Green Deal which also aims to reduce carbon emissions and achieve net zero carbon emissions by 2050. These goals will not be met if projects, such as the one proposed, are not implemented. The Proposed Development would also aid in ensuring energy security within the EU which is a target of the European Green Deal. As wind is an indigenous and abundant resource, countries can tap into their own wind potential, reducing the vulnerability to price fluctuations and geopolitical risks associated with fossil fuel imports.

2.2.2 National Climate Policy

Programme for Government – Our Shared Future (April 2021)

The Programme for Government – Our Shared Future (updated in April 2021) places specific emphasis on climate change, stating that the next ten years are a critical period in addressing the climate crisis, and therefore, a deliberate and swift approach to reducing more than half of Ireland's carbon emissions over the course of the decade (2020-2030) must be implemented. The programme states that the Government are committed to reducing GHG emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050.

With regard to energy generation, the Programme notes that the Government is committed to the rapid decarbonisation of the energy sector. The Programme states the Government's ongoing support and commitment to take "*the necessary action to deliver at least 70% renewable electricity by 2030.*" While it is noted this has been updated by subsequent CAPs.

The Climate Action and Low Carbon Development (Amendment) Act (2021)

The Climate Action and Low Carbon Development Act 20 (as amended) ('the Climate Act') legally binds Ireland to achieve net zero emissions no later than 2050, and to a **51% reduction in emissions by the end of this decade**.

The Climate Act provides the framework for Ireland to meet its international and EU climate commitments and to become a leader in addressing climate change. As indicated by the premise of the legislation, the reduction of emissions is a key proponent of the Climate Act and incorporates the following key provisions:

- Embeds the process of setting binding and ambitious emissions-reductions targets in law;
- Provides for a national climate objective, which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy;
- Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% over the period to 2030, relative to a baseline of 2018;
- The role of the Climate Change Advisory Council has been strengthened;
- The Government must adopt carbon budgets that are consistent with the Paris agreement and other international obligations;
- Actions for each sector will be detailed in the Climate Action Plan which must be updated annually; and
- Local Authorities must prepare individual Climate Action Plans which will include both mitigation and adaptation measures and will be updated every five years.

Local Authorities must prepare individual Climate Action Plans which will include both mitigation and adaptation measures and will be updated every five years. Under Section 15 of the Climate Act, public bodies are obliged to, in so far as practical, perform their functions in a manner consistent with the latest CAP, the National Energy & Climate Plan 2021 – 2030 and other national climate mitigation and adaptation plans. WCC, as a public body, with consenting functions must comply with this obligation in determining the subject application.

The Proposed Development represents a significant opportunity to contribute to Irelands continuance as a nationally important wind energy generator, contributing to the 51% reduction in emissions being sought, which is as outlined above a legally binding requirement. The Proposed Development is therefore considered compliant with the relevant policies and objectives set out at both the European (e.g. European Green Deal) and national tiers of governance in this regard.

Carbon Budgets

The first national carbon budget programme proposed by the Climate Change Advisory Council, approved by Government and adopted by both Houses of the Oireachtas in April 2022, comprises three successive 5-year carbon budgets[6]. The total emissions allowed under each budget are shown in **Table 2-1** below.

Table 2-1:Proposed Carbon Budgets of the Climate Change Advisory Council

	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2	2031 – 2035 Provisional Carbon Budget 3
	All Gases		

Carbon Budget (Mt CO_2eq)	295	200	151
Annual Average Percentage Change in Emissions	-4.8%	-8.3%	-3.5%
The figures are consistent with emissions in 2018 of 68.3 Mt CO_2eq reducing to 33.5 Mt CO_2eq in 2030, thus allowing compliance with the 51% emissions reduction target by 2030.			

Report of the Joint Committee on Climate Action - Climate Change: A Cross-Party Consensus for Action (2019)

In March 2019, the Joint Committee on Climate Action Change released a report detailing a cross-party consensus for action. The report in its introduction states that *"Irelands performance in meeting international obligations has to date been poor"* (refer to *'Emissions Projections for Ireland'* below). The Report highlights on-going concern regarding emission projections and growing evidence that Ireland is off track in meeting its 2030 targets under the relevant the EU Directives.

The report states that the transformation of Ireland's energy system will be required for the country to meet its future 2030 and 2050 GHG emission targets; specifically, in order to reach net zero emissions by 2050, Ireland will be required to fully decarbonise electricity generation. Therefore, there is a clear incentive for developing, and safeguarding, Ireland's capacity in renewable energies and renewable electricity. Since this report was published, the Climate Act has been enacted and there have been recent progress / future scenario assessments (e.g. EirGrid's 'All Island Generation Capacity Statement 2022 – 2031' (October 2022).

Given the clear concern that the county's future emissions targets may be missed, it is crucial that projects such as the Proposed Development which can contribute in a meaningful manner towards climate change targets, and which can be provided without significant adverse environmental effects arising are brought forward and supported with favourable consideration through the planning system and constructed.

Climate Action Plan 2023

The Climate Action Plan 2023 ('CAP23') was published in December 2022 by the Department of the Environment, Climate and Communications. This outlines the actions required to 2035 and beyond to meet Ireland's commitment to becoming carbon neutral by 2050. CAP23 sets out a roadmap to deliver on Irelands climate ambition and is aligned to ensure that Ireland achieves its legally binding target (the Climate Act) of net zero GHG emissions no later than 2050. A target aims for a reduction in emissions of 51% over the period 2018 to 2030 and in doing so, prevent/ mitigate the potentially devastating consequences of climate change on Ireland's environment, society, economic and natural resources.

The CAP23 states that to do so, Ireland must harness the untapped indigenous renewable resources and has a target of achieving 80% of energy being produced from renewable sources by 2030 (unchanged from the previous Climate Action Plan, 2021) with a target of 9GW of that being produced by onshore wind. Measures set out in CAP23 to achieve these targets include to *'accelerate and increase the deployment of renewable energy to replace fossil fuels'* (Section 12.1.4 CAP23). It is clear from the message and ambition of CAP23 that the drive to deploy renewable energy projects such as the Proposed Development in Ireland are critical to achieving the aims and objectives of CAP23 including the 9GW of onshore wind energy by 2030 and carbon neutrality by 2050.

> *"Achieving these ambitions will require a coordinated effort across Ireland and every economic sector will be involved. It requires no less than a national transformation over the coming years in how we work, travel, heat out homes, source our energy and use our land".*

Decarbonisation of the electricity sector is, as noted in CAP23, key to the decarbonisation of other sectors who will depend on electrification including transport, heating and industry. The increase in portion of renewable electricity of 80% by 2023 will come in part from a targeted 9GW of onshore wind. The plan notes:

> *"Achieving further emissions reductions between now and 2030 requires a major step up in how we accelerate and increase the deployment of renewable energy to replace fossil fuels, deliver a flexible system to support renewables, and manage electricity demand".*

Chapter 12 of CAP23 sets out the state of play, targets and actions for the decarbonisation of the Electricity sector. Carbon emissions from electricity have fallen by 45% between 2005 and 2020, falling by 19% between 2005-2012 and by 33% between 2012 and 2020. This trend is largely due to the availability of renewable energy generated electricity (a sixfold increase between 2005 and 2020) and an associated reduction in the use of carbon heavy fuels such as peat and coal.

Due to the scale of the challenge, and the recognition of central role of the electricity sector in achieving sector wide targets, the electricity sector has been allocated the smallest carbon budget and will require the steepest carbon emissions decline of all sectors – namely a reduction in carbon emission by -75% relative to 2018 baseline. Carbon budgets 1 and 2 allow for 30.02 MtCO2eq from the electricity sector up to 2025 and 20 MtCO2eq. from 2026-2030. This means an average of 8 MtCO2eq. per annum. Emissions for the period 2021 were 9.98 MtCO2eq., which is in exceedance of 8 MtCO2eq., which means that to keep on track, electricity will now have to achieve annual emissions of c. 7.5 MtCo2eq. from 2022 to 2025.

The measures set out for the electricity sector include *inter alia*:

- Reduce annual CO2eq. emissions from the sector to 3 MtCO2eq by 2031 (75% reduction compared to 2018);
- Accelerate and increase the deployment of renewable energy to replace fossil fuels;
- Accelerate the delivery of onshore wind, offshore wind and solar through a competitive framework to reach 80% of electricity demand from renewable energy by 2030;
- Target 6GW of onshore wind and up to 5 GW of solar by 2025;
- Target 9 GW onshore wind, 8 GW Solar and at least 5 GW of offshore wind by 2030; and
- Align the relevant constituent elements of the planning and permitting system to support accelerated renewable energy development, supported by national policy and associated methodologies to inform regional and local planning policies, noting that Development Plans are obliged to set out objectives to facilitate energy infrastructure.

Having regard to the targets and measures set out above, it is clear that there is strong policy support for the provision of renewable energy generators, such as the Proposed Development.

Climate Action Plan 2024

The Climate Action Plan 2024 ('CAP24') builds on CAP23 by refining and updating the status of the actions required to deliver the decarbonisation required under the carbon budgets and sectoral emissions ceilings. The renewable electricity generation targets are unchanged from the CAP23 (9GW of onshore wind and 80% renewable electricity share).

CAP24 includes the latest trends in the electricity sector:

- In 2022, renewable generation accounted for 38.6% of electricity, an increase from 35% in 2021.
- Electricity accounted for 14.4% of Ireland's GHG emissions in 2022.

- To meet the first carbon budget the electricity sector requires a decarbonisation rate of 17.3% per annum in the period 2023-2025. For context, the decarbonisation rate between 2018 and 2022 was 1.4% per annum.

CAP24 acknowledges the urgency and importance of the decarbonising the electricity sector. The plan states:

> *"Given that the programme of large-scale offshore wind deployment is expected to be realised towards end decade, deployment rates for onshore renewables will need to increase to match demand growth to ensure we keep electricity emissions within range of the carbon budgets. This requires a major upscaling and accelerating in current deployment of renewables, particularly onshore wind."*

The scale of the challenge is apparent when quantified:

> *"As an example, the historical average deployment of onshore wind installed capacity connected between 2008 and 2020 inclusive was ~280 MW per annum from 19 projects (with an annual maximum of 612 MW). To achieve the necessary emissions abatement, an approximately eight-times increase of renewable energy deployment to **2.3 GW annually** would be needed between **2024 and 2030**."*

CAP24 identifies the alignment of local and national policy as a critical to accelerate renewable energy rollout.

> *"greater alignment between local plans and renewable energy targets at national and regional level to support investment in and delivery of onshore wind and solar renewable energy is also critical".*

Having regard to the targets and measures set out above, it is clear that there is strong climate policy support for the provision of renewable energy generators, such as the Proposed Development.

2.2.2.2 Project Compliance with National Climate Policy

The Ballywater Wind Farm is operational and has been since 2005 when it was first commissioned. The wind farm has been generating renewable energy and supplying to the national grid over the last 19 years. The extension to the operational period of the Proposed Development will ensure that the energy from the wind farm will continue to be available on the national grid and contribute to Irelands efforts to decarbonise the economy. The continued operational life of the Proposed Development will help Ireland to reduce its over dependence on imported fossil fuels and helping in meeting the ambitious climate targets set out above. Therefore, it is considered that the Proposed Development is in compliance with national climate policy.

2.3 Renewable Energy Policy and Targets

This section of the EIAR provides a breakdown of European and national renewable energy policy with regard to the Proposed Development.

National policy has developed in line with European and international policies, targets and commitments, in that the importance and urgency of decarbonising the energy generation sector, the economy in general and reducing GHG emissions has become increasingly more apparent.

The Proposed Development complies with the nationally stated need to provide a greater amount of renewable energy onto the national grid and will further reduce the national reliance on fossil fuels for electricity generation.

2.3.1 European Renewable Energy Policy

Renewable Energy Directive

The Renewable Energy Directive (RED) is the EU legal framework for the development of renewable energy across all sectors of the EU economy, supporting clean energy cooperation across EU countries. Since the introduction of the RED in 2009, it has undergone several revisions, all pushing the renewable energy targets upwards, to combat increasing emissions. Since its adoption in 2009, the share of renewable energy sources in energy consumption has increased from 12.5% in 2010 to 23% in 2022[7]. Of the 27 EU Member States the lowest proportions of renewables were recorded in Ireland (13.1%). Crucially, the RED sets the overall target for renewable energy in the EU.

RED I - 2009

Renewable Energy Directive 2009 (RED I - the original RED) (2009/28/EC), adopted in 2009, set binding targets for EU Member States to achieve a 20% share of renewable energy in final energy consumption by 2020. It established a framework for national renewable energy action plans, sustainability criteria for biofuels and bioliquids, and a system of guarantees of origin for renewable energy.

RED II – 2018

RED II, the first major amendment to the RED, (2018/2001/EU) entered into force in December 2018, as part of the Clean Energy for all Europeans package. In RED II, the overall EU target for renewable energy sources consumption by 2030 was raised to 32%.

RED II recognises the increasing need for the repowering of existing renewable energy developments, and introduces provisions for the streamlining of the permit granting process. RED II states that EU member states should ensure that the permit granting process is simplified, with the process not exceeding one year.

RED III – 2023

In November 2023, a revision of the RED[8] (RED III), came into force. RED III increases the EU wide renewable energy target from 32% set under the previous revision of the RED to 42.5%, with an ambition to reach 45% by 2030. The increase was proposed under the publication of REPowerEU in May 2022. RED III also introduces specific targets for Member States in the industry, transport, and building (district heating and cooling) sectors.

Under RED III, EU Member States must identify areas for the acceleration of renewables where projects will undergo a simplified and fast-track procedure. The deployment of renewables will also be of "*overriding public interest*" in order to limit the number of legal challenges on new renewable energy installations. These measures came in response to REPowerEU which found that permitting is the biggest bottleneck for deploying wind at scale, with approximately 80GW of wind power capacity stuck in permitting procedures across Europe.

RED III recognises the significant potential of repowering, which includes extending the operational life of existing renewable energy developments to contribute to the achievement of the renewable energy target of 42.5%.

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[7] *https://ec.europa.eu/eurostat/en/web/products-eurostat-news/w/ddn-20231222-2*
[8] *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)*

Furthermore, RED III acknowledges that repowering limits the need to designate new sites for renewable energy development. This approach benefits from utilising existing grid connections and is more likely to gain public acceptance,. RED III reiterates the provisions introduced in RED II for a simplified and swift permit granting process, not exceeding one year in length. Article 16c(2) of the RED III sets out that *"where the repowering of a renewable energy power plant is subject... to an environmental impact assessment pursuant to Article 4 of Directive 2011/92/EU, such a screening process, determination or environmental impact assessment shall be limited to the potential impact arising from a change or extension compared to the original project."*

There is an 18-month period to transpose most of the directive's provisions into national law, with a shorter deadline of July 2024 for some of the provisions related to permitting for renewables, in particular Article 16(f) which establishes the legal presumption that the construction and operation of renewable energy development and storage assets are in the ***"overriding public interest and serving public health and safety when balancing legal interest in individual cases for the purposes of Article 6(4) and Article 16(1), point (c), of Directive 92/43/EEC [the 'Habitats Directive'], Article 4(7) of Directive 2000/60/EC [the 'Water Framework Directive'] and Article 9(1), point (a), of Directive 2009/147/EC.[the 'Birds Directive']".***

Regulation 2022/2577

In recognition of the worsening energy crises arising from Russia's war against Ukraine, the Council of the EU adopted Regulation (EU) 2022/2577 on 22 December 2022, '*Laying down a framework to accelerate the deployment of renewable energy*.' This regulation, which has immediate and direct effect in Member States, applies to "*all permit-granting processes that have a starting date within the period of its application*" and includes a number of tangible measures aimed at streamlining the permit-granting process and facilitating the accelerated deployment of renewable energy. The period of application of the Regulation is the 30 December 2022 to 29 June 2024 with a provision for this to be reviewed and extended. The period of application of the Regulation was subsequently extended to the 30 June 2025 and therefore applies to the present application and EIA.

> *'A fast deployment of renewable energy sources can help to mitigate the effects of the current energy crisis, by forming a defence against Russia's actions. Renewable energy can significantly contribute to counter Russia's weaponisation of energy by strengthening the Union's security of supply, reducing volatility in the market and lowering energy prices.'*[9]

Central to the regulation is the presumption that renewable energy development must be considered to be in **the overriding public interest** when addressing competing interests under the Habitats Directive (92/43/EEC), Birds Directive (2009/147/EEC) and the Water Framework Directive (2006/60/EC) and that renewable energy projects should be given priority when balancing legal interests in a given case – Article 3:

1. *'The planning, construction and operation of plants and installations for the production of energy from renewable sources, and their connection to the grid, the related grid itself and storage assets shall be presumed as being in the overriding public interest and serving public health and safety when balancing legal interests in the individual case, for the purposes of Article 6(4) and Article 16(1)(c) of Council Directive 92/43/EEC, Article 4(7) of Directive 2000/60/EC of the European Parliament and of the Council and Article 9(1)(a) of Directive 2009/147/EC of the European Parliament and of the Council....'*
2. *'Member States shall ensure, at least for projects which are recognised as being of overriding public interest, that in the planning and permit-granting process, the construction and operation of plants and installations for the production of energy from*

[9] *Council Regulation (EU) 2022/2577, at Recital 1*

> *renewable sources and the related grid infrastructure development are **given priority when balancing legal interests in the individual case**.... (emphasis added)'*

The Regulation was introduced as a temporary, emergency measure and included provision for the EU Commission to review the application of, and continued need for, the measures included in the Regulation. The Commission completed its review of the Regulation and furnished its report to the Council on the 28 November 2023. In its report the Commission recommended the prolongation of the validity of certain measures in the Regulation, including Article 3(2), and by Regulation 2024/223 of the 22 December 2023 the Council of the European Union, Regulation 2022/2577 was extended and amended, with Article 3 applying to the all permit-granting processes commenced up to the 30 June 2025.

The importance, continued need and effectiveness of Article 3(2) of Regulation 2022/2577 in aiding the accelerated deployment of renewable energy is explained in Recital 14 of Regulation 2024/223:

> *'...Article 3(2) of Regulation (EU) 2022/2577 requires priority to be given to projects that are recognised as being of overriding public interest whenever the balancing of legal interests is required in individual cases and where those projects introduce additional compensation requirements for species protection... The first sentence of Article 3(2) of Regulation (EU) 2022/2577 has the potential, in the current urgent and still unstable energy situation on the energy market which the Union is facing, to further accelerate renewable energy projects since it requires Member States to promote those renewable energy projects by giving them priority when dealing with different conflicting interests beyond environmental matters in the context of Member States' planning and the permit-granting process. The Commission's report demonstrated the value of the first sentence of Article 3(2) of Regulation (EU) 2022/2577 which recognises the relative importance of renewable energy deployment in the current difficult energy context beyond the specific objectives of the derogations foreseen in the Directives referred to in Article 3(1) of Regulation (EU) 2022/2577. Given the particularly severe situation in the supply of energy which the Union is currently facing, it is appropriate to prolong the application of Article 3(2) of Regulation (EU) 2022/2577 in order to appropriately recognise the crucial role played by renewable energy plants to fight climate change and pollution, reduce energy prices, decrease the Union's dependence on fossil fuels and to ensure the Union's security of supply in the context of the balancing of legal interests carried out by permit-granting authorities or national courts. At the same time, it is also appropriate to keep the environmental safeguard that, for projects recognised as being of overriding public interest, appropriate species conservation measures, underpinned by sufficient financial resources, are adopted. (emphasis added)'.*

While Article 3(1) of the Regulation is mirrored in Article 16(f) of REDIII, the wider obligation placed on competent authorities engaged in the consenting of renewable energy projects under Article 3(2) of Regulation 2022/2577 is not and, as explained in Recital 14 of Regulation 2024/223, is an appropriate additional temporary measure given the particular difficulties which the Union is currently facing in the supply of energy. In considering applications for the development of such projects planning authorities are obliged to give effect to this legislative imperative.

Energy Roadmap 2050

The Energy Roadmap 2050 was published by the European Commission in 2011 and analyses the transition of the contemporary energy system in ways that would be compatible with the GHG reductions targets as set out in the Renewable Energy Directive (Directive 2009/28/EC) while also increasing competitiveness and security of supply. To achieve these targets and objectives, the Roadmap states that significant investments will need to be made in new low-carbon technologies and renewable energy, e.g. wind energy infrastructure, energy efficiency and grid infrastructure. Five main routes are identified to achieving a more sustainable, competitive and secure energy system in 2050:

- High Energy Efficiency;
- Diversified Supply Technologies;
- High Renewable Energy Sources;
- Nuclear energy; and
- Carbon capture and storage.

The analysis found that decarbonising the energy system is technically and economically feasible. The Roadmap notes that all scenarios show the biggest share of energy supply technologies in 2050 comes from renewables. In this regard, it should be noted that the Climate Change Advisory Council states within their 2020 Annual Review (September 2020) that, "*while the share of renewable electricity generation, particularly wind, is increasing [in Ireland], the [overall] pace of decarbonisation of the [electricity generation] sector needs to accelerate*", as it is not compatible with a low-carbon transition to 2050. As such, a major prerequisite for a more sustainable and secure energy system is a higher share of renewable energy up to and beyond 2030 to 2050. Each of the scenarios assumes in the analysis that increasing the share of renewable energy and using energy more efficiently are crucial, irrespective of the particular energy mix chosen.

European Green Deal

The European Green Deal was launched in December 2019 and proposes to increase the binding target of renewable sources in the EU's energy mix from 32% to **40% by 2030** via amendments to the Renewable Energy Directive as per the 'Fit for 55' package (July 2021)[10]. The Deal recognises that 75% of the EU's GHG emissions stems from the production and use of energy, hence emphasising the need to decarbonise the EU's energy system. The deal identifies three key principles to support a clean energy transition:

1. *ensuring a secure and affordable EU energy supply*
2. *developing a fully integrated, interconnected and digitalised EU energy market*
3. *prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources*[11].

REPowerEU

The European Commission has proposed in May 2022 an outline of a plan to make Europe independent from Russian fossil fuels including oil and gas, due to the high and volatile energy prices, and security of supply concerns following Russia's unprecedented military attack on Ukraine. At the time of publication, the EU imported 90% of its gas consumption, with Russia providing around 45% of those inputs. Russia also accounted for around 25% of oil and 45% of coal imports. Phasing out dependence on fossil fuels can be done well before 2030, increasing the resilience of the EU-wide energy system based on two pillars:

1. *Diversifying gas supplies, via higher Liquefied Natural Gas (LNG) and pipeline imports of biomethane and renewable hydrogen production and imports from non-Russian suppliers*
2. *Reducing faster the use of fossil fuels by boosting energy efficiency, increasing renewables and addressing infrastructure bottlenecks.*

Article 3 of the REPowerEU plan is centred around the roll out of renewable energy projects in order to accelerate the phasing out of Russian fossil fuels. With full implementation of the measures in REPowerEU plan, at least 155 billion cubic meters (bcm) of fossil gas use could be removed, which is equivalent to the volume imported from Russia in 2021. Nearly two thirds of that reduction can be

[10] *https://www.consilium.europa.eu/en/policies/eu-plan-for-a-green-transition/*
[11] *https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/energy-and-green-deal_en*

achieved within a year. A part of this plan includes *'Speeding up renewables permitting to minimise the time for roll-out of renewable projects and grid infrastructure improvements'.* Article 3 of the plan states that:

> *"Slow and complex permitting processes are a key obstacle to unleashing the renewables revolution and for the competitiveness of the renewable energy industry."*

The REPowerEU plan also presents measures to streamline the permitting process at a national level and outlines best practices within member states. Article 3 of the REPowerEU plan also states that member states should take steps to introduce permitting related country specific recommendations in the European semester. The plan also states that all member states must as a matter of urgency, fully implement the Renewable Energy Directive in order to simplify the permitting procedures.

The RePowerEU plan also operationalises the principle of renewable energy development as ***"an overriding public interest".*** This coupled with the introduction of "go-to" areas and other ways to shorten and simplify permitting while also minimising potential risks and negative impacts on the environment further highlights the importance at EU level of the increased provision of renewable energy projects such as the Proposed Development. At the time of writing, Ireland has not yet designated areas for the development of renewable energy projects however, the proposed directive eliminates the member states' option to opt out and, instead, mandates that they designate sufficient areas for accelerating renewables within a period of 18 months.

As such, it is submitted that the Proposed Development is strongly supported by EU energy policy. Many of the measures outlined in RePowerEU have been incorporated into national policy through the National Energy Security Framework, which was published by the Government in April 2022, and discussed in further detail in Section 2.3.2 below.

2.3.1.2 Project Compliance with EU Policy

The Proposed Development is considered to be fully in accordance with and supported by the above-mentioned EU Policy. The Proposed Development is in line with the targets outlined in the 2030 Climate and Energy Framework. An EU wide binding target of 27% renewable energy by 2030 and a target of at least 27% energy efficiency by 2030 are both targets that can be achieved through the continued operation of the Proposed Development and other similar projects. The target of increasing the binding target of the EU's energy mix from 32% to a minimum of 42.5% by 2030 is also considered to be a target that would be achievable through the continued operation the Proposed Development. Similarly, the Energy Roadmap 2050 envisions scenarios aimed at realizing the EU's climate action and energy objectives. It highlights that across all scenarios, the primary source of energy supply technologies in 2050 is projected to be renewables. Therefore, it is submitted that the Proposed Development is in line with the EU Energy Roadmap.

The RePowerEU plan, aims at increasing the energy security within the EU and increasing the share of renewable energy onto the EU electricity grid. A part of this plan includes *'Speeding up renewables permitting to minimise the time for roll-out of renewable projects and grid infrastructure improvements'.* This will make the sector more efficient and reach the set goals faster. Therefore, it is considered that the Proposed Development is strongly supported by EU energy policy.

2.3.2 National Renewable Energy Policy

White Paper on 'Ireland's Transition to a Low Carbon Energy Future' 2015 - 2030

On 19th June 2020, the updated Green Paper on Energy Policy in Ireland was published. The Paper which was originally published on 14th May 2014 marked the start of a public consultation process on the future of Ireland's energy policy over the medium to long-term. The Department of Communications, Climate Action & Environment acknowledged that energy is an integral part of

Ireland's economic and social landscape and that *"a secure, sustainable and competitive energy sector is central to Ireland's ability to attract and retain Foreign Direct Investment and sustain Irish enterprise. The three key pillars of energy policy are to focus on security, sustainability and competitiveness".*

Following on from an extensive consultation process, a Government White Paper entitled *'Ireland's Transition to a Low Carbon Energy Future 2015-2030'* was published in December 2015 by the (then) Department of Communications, Energy and Natural Resources ("DCENR"). This Paper provides a complete energy update and a framework to guide policy up to 2030. The Paper builds upon the White Paper published in 2007 and takes into account the changes that have taken place in the energy sector since 2007.

The policy framework was developed to guide policy and actions that the Irish Government intends to take in the energy sector up to 2030 and also reaching out to 2050 to ensure a low carbon future that maintains Ireland's competitiveness and ensures a supply of affordable energy. The Energy Vision 2050, as established in the White Paper, describes a *'radical transformation'* of Ireland's energy system which will result in GHG emissions from the energy sector reducing by between 80% and 95%, compared to 1990 levels. The paper advises that a range of policy measures will be employed to achieve this vision with emphasis on the generation of electricity from renewable sources, which there are plentiful indigenous supplies and increasing the use of electricity and bio energy to heat homes and fuel transport.

In this White Paper, the DCENR acknowledges that onshore wind is one of the cheapest forms of renewable energy in Ireland, stating that:

> *"Onshore wind continues to be the main contributor (18.2% of total generation and 81% of RES-E in 2014). It is a proven technology and Ireland's abundant wind resource means that a wind generator in Ireland generates more electricity than similar installations in other countries. This results in a lower cost of support."*

The *Green Paper on Energy Policy in Ireland 2015-2030* was updated and republished in 2020 and updated again in January 2021. The updated Paper outlines that:

> *'The 2020 target of 40% RES-E is likely to require a total of 3,500-4,000 MW of onshore renewables generation capacity, compared to the 2,500 MW available at end December 2014, of which wind generation accounted for 2,200MW.* ***To achieve our target, the average rate of build of onshore wind generation will need to increase to up to 260 MW per year. The current rate of build is about 170 MW per year.****'*

Furthermore, the White Paper outlines that Solar technology is rapidly becoming cost competitive for electricity, not only compared with other renewables but also compared with conventional forms of generation, it recognises that:

> *"The deployment of solar in Ireland has the potential to increase energy security, contribute to our renewable energy targets, and support economic growth and jobs."*

National Energy Security Framework 2022

The National Energy Security Framework (DECC, April 2022) highlights clearly the impacts the Russian invasion of Ukraine and the resulting war has had on Europe's energy system. The resulting decision by the EU to phase out the import of Russian gas, oil and coal (REPowerEU) has brought to the fore the importance of security of supply and how energy policy is designed for long-term resilience. It takes account of the need to decarbonise society and economy, to reduce Ireland's emissions by 51% over the decade to 2030 and reach net zero emissions by 2050. According to the SEAI's Energy in Ireland (2021) report, oil accounts for 45% of Ireland's primary energy requirement making it one of the highest rates of oil dependency in the EU. The International Energy Agency, of which Ireland is a member country, includes a 10-point plan to cut oil use which calls for an acceleration in the deployment of wind and solar projects. Ireland's response per the Framework is set out over three themes:

- Theme 1 – managing the impact on consumers and businesses
- Theme 2 – ensuring security of energy supply in the near-term
- Theme 3 – reducing our dependency on imported fossil fuels in the context of the phasing out of Russian energy imports across the EU

In relation to theme 3, the Framework highlights that replacing fossil fuels with renewables, including wind energy, will be a focus area of work. The Framework calls for "*Supportive policies across Government and State agencies*" which *"can reduce barriers and fast track permitting for renewable energy generation projects. Similarly, renewable energy developers need to match this through taking a leadership role in delivering high quality applications to relevant consenting authorities, meeting project milestones on time and minimising delays."* There are a number of 'Responses' set out in the Framework aimed at reducing reliance on imported fossil fuels and increasing indigenous renewable energy generation, including Response 25 which seeks the alignment of all elements of the planning system to support accelerated renewable energy development.

Having regard to the above, it is clear that the provision of renewable energy, such as the electricity produced by the Proposed Development, is vital in helping to secure the State's energy supplies and reduce reliance on imported fossil fuels.

Energy Security in Ireland to 2030 – Energy Security Package

Published in November 2023, the energy security package titled 'Energy Security in Ireland to 2030' builds on the policies set out in the NESF. The energy security package is based on the recognition of the following fact:

> *"Ireland's future energy will be secure by moving from an oil-, peat-, coal- and gas-based energy system to an electricity-led system maximising our renewable energy potential, flexibility and being integrated into Europe's energy systems."*

The energy security package includes a range of measures to implement this approach by the prioritisation of the following:

1. *Reduced and Responsive Demand.*
2. *Renewables-Led System.*
3. *More Resilient Systems.*
4. *Robust Risk Governance.*

Independent research undertaken as part of the package, the McCarthy Report[12], provides an analysis of developments in the electricity sector in Ireland. The McCarthy Report makes the following observation in relation to the consenting process:

> *"The problem of delays encountered by major infrastructure projects, including in the electricity system, due to planning and environmental consent issues was evident. They had been commented upon by the International Energy Agency in its 2019 review of Ireland which named planning delays as the principal challenge to delivery of policy for the sector."*

A key finding from the technical analysis conducted as part of the energy security package is the interdependence of energy security on two essential pillars: '*harnessing our indigenous renewable*

[12] https://www.gov.ie/pdf/?file=https://assets.gov.ie/276441/eb496e01-5c01-4594-af09-74342b4ac971.pdf#page=null

energy resources at speed and at scale and the rapid electrification of energy demand'. As such, the energy security package provides additional measures to supplement the existing measures introduced under previously published government policy documents. Those additional measures most relevant to the Proposed Development are as follows:

> *"Action 10: To implement Planning and Consenting System Reforms and provide greater certainty to the sector."*

The energy security package aims to ensure that the planning system is fully aligned and resourced to fully support accelerated renewable energy development. It also aims to ensure renewable energy projects are prioritised in line with the recast Renewable Energy Directive and RePowerEU.

The Proposed Development supports the Government's objectives in ensuring the State's energy security, as it serves as a domestic renewable energy generator capable of providing clean electricity to the national electricity grid, contributing to a renewables-led system.

2.3.2.2 Project Compliance with Renewable Energy Policy

National Energy Policy aims to achieve two main gaols, 1) to decarbonise Ireland's national energy network, and 2) to increase Ireland's indigenous energy supply in order to improve the country's energy security. The Proposed Development is an existing, low carbon and indigenous energy supply which provides clean, renewable energy to the national electricity grid. Therefore, the continued operation of the Ballywater Wind Farm is in accordance with and supported by national energy policy.

The National Energy Security Framework outlines several steps to accelerate Ireland's shift to renewable energy initiatives. It is evident that the Proposed Development aligns with this Framework by continuing to provide renewable energy on the national grid, thus expediting Ireland's transition to a low-carbon energy future.

2.4 Climate and Renewable Energy Target Progress

At a European level, the latest data shows that, as of 2022, 23% of energy came from renewable energy sources[13]. This represents an increase of 1.1% compared to 2021 levels. While progress is being made to increase the share of renewable energy, it is clear that all EU Member States need to intensify their efforts to collectively comply with the target of 42.5% set in the latest revision of the renewable energy directive.

Of the 27 EU Member States, Ireland has the lowest proportion of renewable energy at 13.1%. It is evident that Ireland is not performing well when compared against our European counterparts and that urgent action is required to increase the overall share of renewable energy in our gross final energy consumption. When it comes to the share of renewable energy in electricity, Ireland does perform better generating 36.8% in 2022, but still below the EU average of 41.1%[14].

[13] https://ec.europa.eu/eurostat/en/web/products-eurostat-news/w/ddn-20231222-2
[14] https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_ren__custom_9264705/default/bar?lang=en

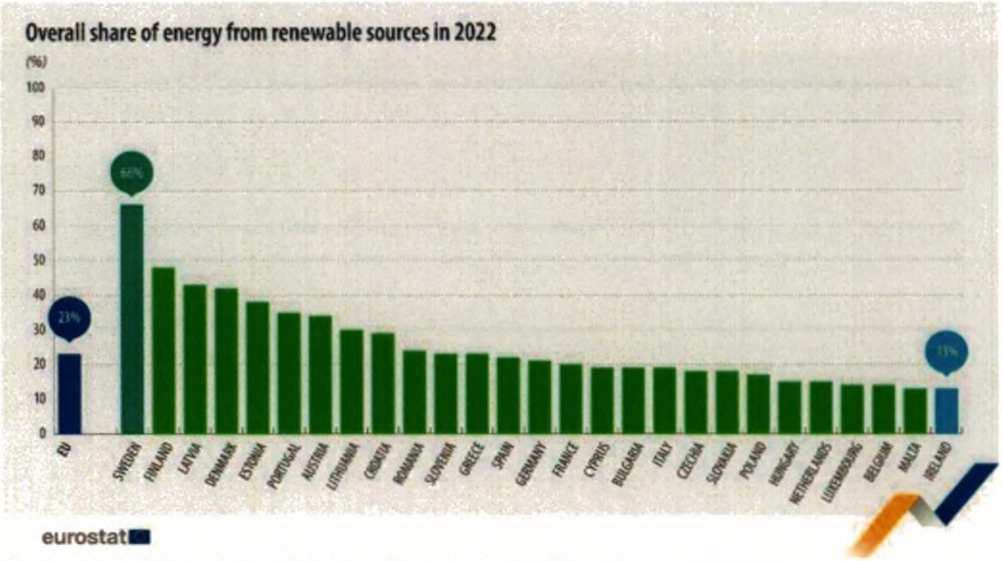


Figure 2-1 Overall share of energy from renewable sources (source: Eurostat)

Ireland's Greenhouse Gas Emissions Projections 2022 – 2040 (June 2023)

The Environmental Protection Agency (EPA) publish Ireland's Greenhouse Gas Emission Projections and at the time of writing, the most recent report, 'Ireland's Greenhouse Gas Emissions Projections 2022–2040' was published in June 2023. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the EU ESD and Effort Sharing Regulation (ESR).

The EPA has produced two scenarios in preparing these GHG emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands GHG emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2021. This is the cut off point for which the latest national GHG emission inventory data is available, known as the 'base year' for projections. The WAM scenario has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's CAP23.

The EPA Emission Projections Update notes the following key trends:

- Ireland is not on track to meet the 51 per cent emissions reduction target (by 2030 compared to 2018) based on these projections which include most 2023 Climate Action Plan measures.
- Emissions from the Energy Industries sector is projected to decrease by between 50 and 60 per cent over the period 2021 to 2030. Renewable energy generation is projected to range from 68 to over 80 per cent of electricity generation as a result of projected further and rapid expansion in wind energy and other renewables.
- Sectoral emissions ceilings for 2025 and 2030 are projected to be exceeded in almost all cases, including Agriculture, Electricity, Industry, and Transport.
- The first two carbon budgets (2021-2030), which aim to support achievement of the 51 per cent emissions reduction goal, are projected to be exceeded by a significant margin of between 24 and 34 per cent.

As decarbonising electricity generation will have a significant positive contribution in achieving Ireland's emissions it is clear that continued renewable energy production such as that of the Proposed Development must be encouraged and supported if carbon saving targets are to be met.

National Energy Projections (November 2023)

The National Energy Projections report (SEAI, November 2023) sets outs the most recent updates to Ireland's progress towards its binding European and National renewable energy targets. Based on the EPA projections outlined above published in June 2023, the report presents the findings of the 2023 national energy and climate modelling cycle.

The existing EU wide target set in REDII is 32% RES by 2030. Irelands current national EU binding target for 2030 RES is 34.1%. There are also interim targets for 2022, 2025 and 2027, as shown in

Table 2-2 below. Since the publication of the *National Energy Projections* report, the European Parliament and Council have introduced REDIII, increasing this target to a minimum of 42.5% RES by 2030. It is likely that Ireland's national target will increase in line with the increase at EU level.

Table 2-2: Overall renewable energy share projections under EPA scenarios

Current REDII target for overall renewable energy share (RES) for Ireland		WEM	WAM - CAP21	WAM – CAP23
2025	Projected overall RES	19%	20%	22%
	REDII overall RES target for Ireland	**24%**	**24%**	**24%**
	Gap to target	-4%	-3%	-2%
2027	**Projected overall RES**	**22%**	**26%**	**27%**
	REDII overall RES target for Ireland	28%	28%	28%
	Gap to target	**-5%**	**-2%**	**-1%**
2030	Projected overall RES	31%	40%	45%
	REDII overall RES target for Ireland	**34%**	**34%**	**34%**
	Gap to target	-3%	6%	11%

In the interim years of 2025 and 2027, the WAM-CAP23 scenario indicates a failure to meet the interim overall RES targets. This is attributed to the revised profile of renewable generation capacity additions, which now assumes that more of the planned capacity will arrive later in the decade. If Ireland's target aligns with the increased EU-level goal under RED III, it would widen the gap to the target during the interim years.

The decarbonisation of the electricity generation is critical considering the need to electrify other sectors such as heating and transport in order to achieve the sectoral decarbonisation targets. By 2030, renewable energy sources are anticipated to dominate electricity generation, particularly experiencing a significant surge later in the decade attributed to the integration of substantial offshore wind projects. In the CAP23 scenario, there is an expedited deployment of onshore renewable generation capacity in the earlier years of the decade compared to the CAP21 scenario. However, both scenarios aim to achieve a similar overall percentage of electricity derived from renewable sources (RES-E) by the year 2030.

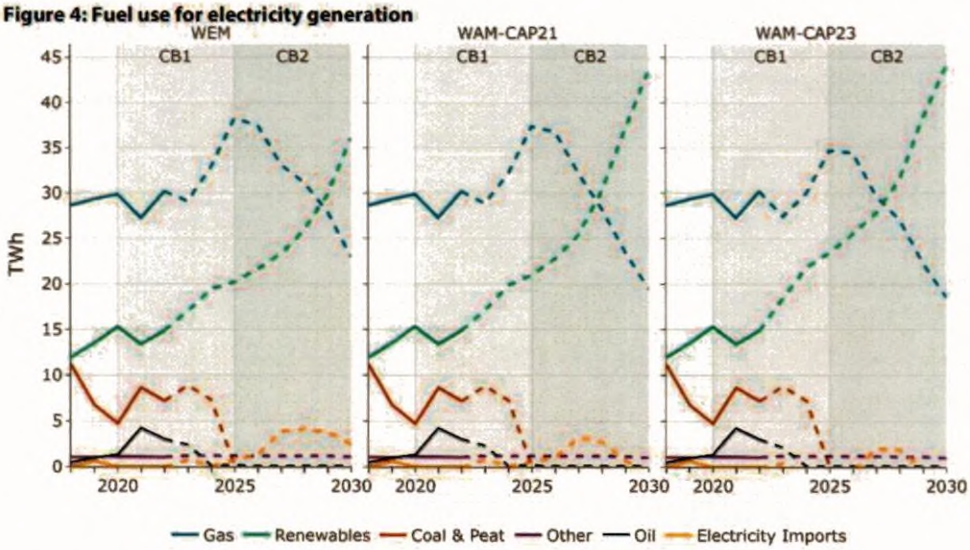


Figure 2-2: Electricity generation by fuel source (source: SEAI)

The report projects GHG emissions under the WEM and WAM scenarios. It is projected that in both the WEM and WAM scenarios, the carbon budget for the electricity sector will be exceeded. This is largely due to the cumulative nature of the carbon budgets, where exceedances in the early years results in steeper emissions reductions in the latter years to compensate. In the WEM scenario, emissions are projected to reach the first sectoral ceiling in 2024. This results in a significant overspend of 7.4 $MtCO_2eq$ (19%) within the final 2 years of the first carbon budget period 2020–2025. This would have a knock-on effect on the second carbon budget period 2025-2030, which would likely be unattainable from the outset.

Under the WAM CAP23 scenario, cumulative emissions reach the first sectoral ceiling in the 2024, leading to an overspend of the first budget period by 5.6 $MtCO_2eq$ 2024-2026. Despite the improvement on the WEM scenario, the WAM CAP23 scenario exceeds the second budget period (2025 – 2030) ceiling by 2027. By the end of the decade, the WAM CAP23 scenario projects an exceedance of 13.8 $MtCO_2eq$ (23%).

It is clear from the projections outlined above that unprecedented action is required as soon as possible. Unless carbon emissions are reduced sharply before 2025, it will be impossible to stay within the second budgeting period as required to by law under the Climate Action and Low Carbon Development Act 2021.

Energy in Ireland (December 2023)

The SEAI *Energy in Ireland 2023* was published in December 2023 and set outs the most recent updates to Ireland's progress towards its binding European and National renewable energy targets. Some of the key points from this report are outlined below (from 2022):

- Ireland imported 81.6% of its total primary energy requirement.
- 85.8% of Ireland's primary energy requirement came from fossil fuel.
- Ireland's total energy demand was 4.7% higher than in 2021.
- Demand for electricity was 2.5% higher than in 2021, consistent with the annual growth of recent years.

The SEAI report illustrates (Figure 6) the summary of sectoral ceilings within the first two carbon budgets, over the periods 2021-2025 and 2026-2030 – copied below in **Figure 2-3**.

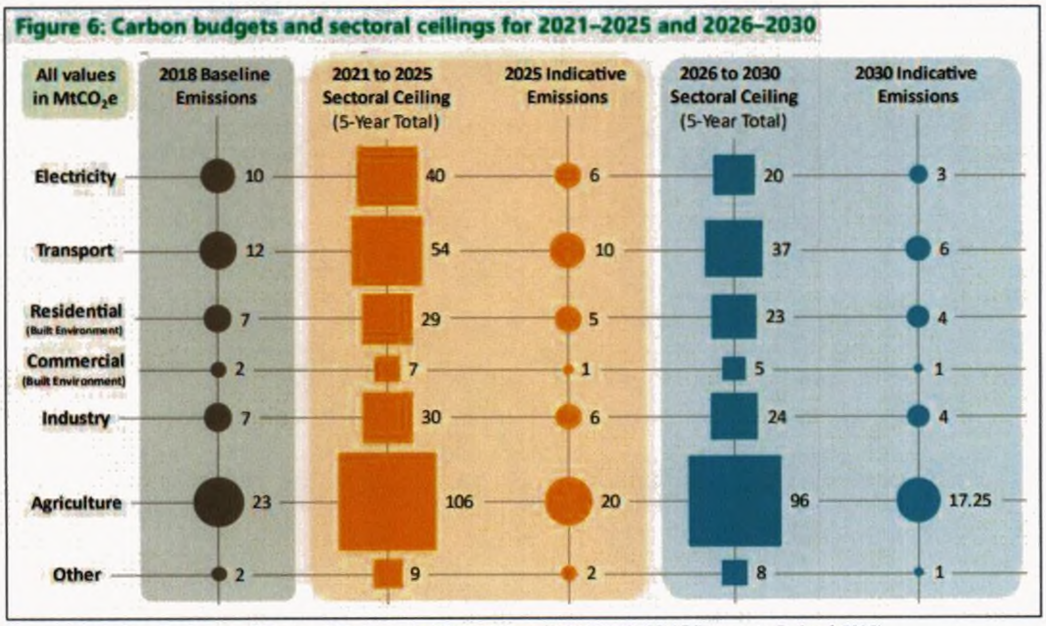


Figure 2-3 Carbon Budgets and Sectoral Ceilings for 2015-2025 and 2026-2030 (SEAI Energy in Ireland 2022)

The emissions ceiling for the electricity sector from 2021 to 2025 stands at 40 MtCO2e in total, with an annual average of 8 MtCO2e (indicated by the dotted bars). In the initial two years of this period, sectoral emissions totalled 19.74 MtCO2e, leaving a remaining budget of 20.26 MtCO2e for 2023-2025, equivalent to an annual average of 6.75 MtCO2e (shown by the dark grey bars).

The report confirms that wind accounted for 85.7% of renewable electricity generated in 2022 having 4.54GW of installed wind capacity in 2022. SEAI's provisional estimate for installed wind capacity in 2023 is based on EirGrid data to the end of August, and ESBN data to the end of September, and totals 4.59 GW.

Security of supply is a focus in the report, noting *"In 2022, Ireland imported 81.6% of its total primary energy requirement. For comparison, the average energy import dependency of all EU member states was 57.5% in 2020. Ireland has a high energy import dependency because it imported all its coal and oil products, and 74.0% of its natural gas supplies."*

The Climate Change Advisory Council Annual Review 2023

The Climate Change Advisory Council (CCAC) concluded within their 2023 Annual Review that at the current rate of policy implementation, *"Ireland will not meet the targets set in the first and second carbon budget periods unless urgent action is taken immediately and emissions begin to fall much more rapidly".*

In relation to the rollout of renewable energy, the CCAC note that the current rate of renewable energy connections to the national grid needs to increase substantially in order to meet CAP23 targets. The CCAC state:

> *"The current rate of connecting renewables will need to more than double to meet NCAP 2023 targets for 9GW of onshore wind and 8GW of solar power connected to the electricity system by 2030, which for context equates to a further approximately 1,500MW of onshore renewables connected to the electricity system on average each year."*

The CCAC reiterates the importance of the REPowerEU regulations and the agreed aim to ensure "*the planning, construction and operation of plants and installations for the production of renewable energy is presumed to be in the overriding public interest"*. The CCAC acknowledge that to achieve the

CAP23 target of 9GW of onshore wind energy, significant advances in the processing of planning applications will have to take place to allow the necessary quantity of onshore wind energy developments to be assessed and granted by the planning authorities.

Ireland's Climate Change Assessment (January 2024)

In January 2024, the EPA published Irelands Climate Change Assessment (ICCA). This assessment provides a comprehensive overview and breakdown of the state of knowledge around key aspects of climate change with a focus on Ireland.

The ICCA Synthesis Report states that having peaked in 2001, Ireland's GHG emissions have reduced in all sectors except agriculture. However, Ireland currently emits more GHGs per person than the EU average. The report goes on to state that there has been an identified gap in policy that indicates that Ireland will not meet its statutory GHG emission targets. Achieving net zero carbon dioxide emissions by 2050 requires significant and unprecedented changes to Ireland's energy system. Policies tailored to suit different stages of technology development are critical for achieving a net zero energy system. Established technologies, such as wind energy. will be key in meeting short-term emission reduction targets (i.e. 2030).

The Climate Change Advisory Council Electricity Sectoral Review 2024

The Climate Advisory Council annual review in May 2024 outlines detailed observations and recommendations for the electricity sector in Ireland. This review emphasises the urgent need for Ireland to accelerate its transition to renewable energy to meet its 2030 electricity capacity targes and adhere to sectoral emissions ceilings.

The Climate Change Advisory Council states:

> *"Ireland needs to reduce and ultimately prevent emissions of greenhouse gases. to stay within the agreed carbon budget, the Electricity sector needs to achieve the largest reduction in sectoral emissions of all sectors: a 75% decrease by 2030 compared with 2018."*

Key observations in relation to Renewable Electricity are outlined below:

- Renewables accounted for 41% of electricity demand in 2023, up from 39% in 2022.
- By the end of 2023, the total renewable grid capacity in Ireland was 5.7 GW, with the majority (4.7 GW) from onshore wind turbine installations.
- In 2023, only onshore wind (0.2 GW) generation was connected. This is significantly below the annual average increase of 1.6 GW of onshore renewables required to meet 2030 capacity targets.
- In 2023, 0.5 GW of wind projects received planning permission; however, no onshore wind projects were awarded permission before September. Appeals and judicial reviews, including for all of An Bord Pleanála's (the Board) approved projects, continue to delay the development of projects.

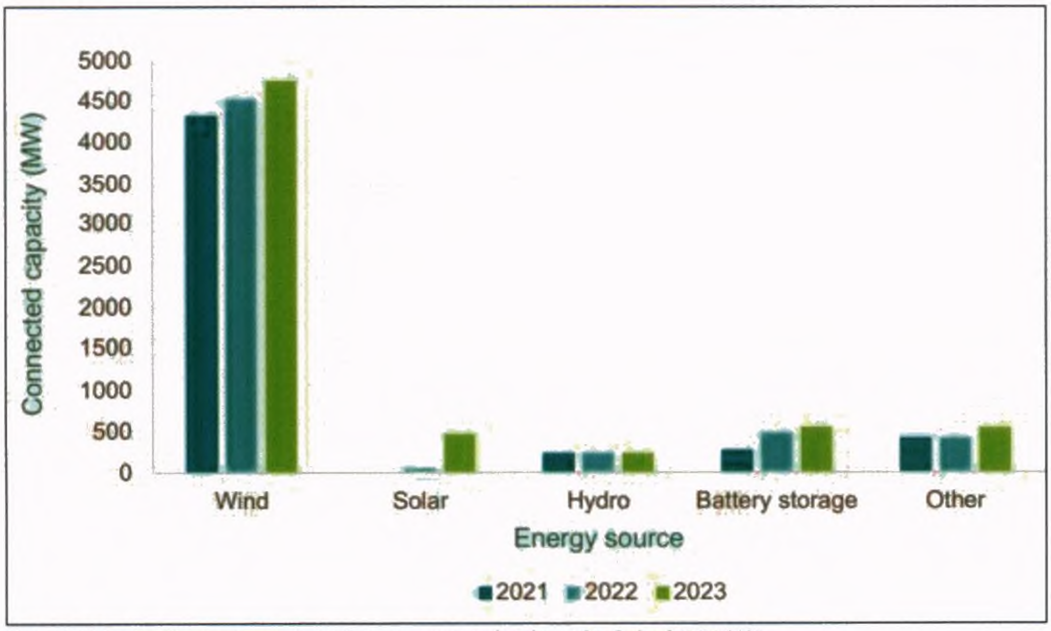


Figure 2-4 Renewable energy capacity and storage connected to the grid in Ireland, 2021-2023

Taken together, it remains clear that while progress has been made, Ireland must continue to strive to meet our targets and onshore wind energy will continues to form an important part of that renewable energy mix. By continuing to generate 42MW of renewable wind energy the Proposed Development will support the achievement of our national renewable energy targets of 9GW of onshore wind and 80% renewable electricity share BY 2030, as set out in CAP24.

2.5 Planning Policy Context

2.5.1 Introduction

This section of the EIAR provides the strategic planning context of the Proposed Development. As is examined below, the Proposed Development is in line with national, regional and local policies, frameworks, guidelines and plans. This section has been broken down to the following sections:

- National Policy Context
- Regional Policy Context
- Local policy Context
- Other Relevant Material Considerations

As a renewable energy project, the Proposed Development is consistent with the overall national policy objectives to increase penetration and deployment of renewable energy resources and has been designed in the context of the relevant wind energy and other guidelines. The specific compliance with the County Development Plan provisions is dealt with in detail in the County Development Plan sections below.

2.5.2 National Policy Context

National Planning Framework: Project Ireland 2040

The National Planning Framework (NPF), published in February of 2018, forms the top tier of the national planning policy structure which establishes the policy context for the Regional Spatial and Economic Strategies (RSES) and local level development plans. In an effort to move away from developer led development to one informed by the needs and requirements of society up to 2040, a number of objectives and policies have been put in place in order for the country to grow and develop in a sustainable manner.

- Developing a new region-focused strategy for managing growth;
- Linking this to a new 10-year investment plan, the Project Ireland 2040 National Development Plan 2018-2027;
- Using state lands for certain strategic purposes;
- Supporting this with strengthened, more environmentally focused planning at local level; and
- Backing the framework up in law with an Independent Office of the Planning Regulator.

The NPF notes that the population of Ireland is projected to increase by approximately 1 million people by 2040 which will result in a population of roughly 5.7 million. This population growth will place further demand on both the built and natural environment. To strengthen and facilitate more environmentally focused planning at the local level, the NPF states that future planning and development will need to:

> "*Tackle Ireland's higher than average carbon-intensity per capita and enable a national transition to a competitive low carbon, climate resilient and environmentally sustainable economy by 2050, through harnessing our country's prodigious renewable energy potential.*"

A key focus throughout the NPF is the fostering of a transition toward a low carbon, climate-resilient society. In this regard, one of the stated key elements of the NPF is an Ireland which has a secure and sustainable renewable energy supply and facilitates the ability to diversify and adapt to new energy technologies. Key features identified in the NPF to facilitate the transition towards a low carbon energy future include:

- A shift from predominantly fossil fuels to predominantly renewable energy sources.
- Increasing efficiency and upgrades to appliances, buildings and systems.
- Decisions around development and deployment of new technologies relating to areas such as wind, smart grids, electric vehicles, buildings, ocean energy and bio energy.
- Legal and regulatory frameworks to meet demands and challenges in transitioning to a low carbon society.

Relevant to the subject development, the **National Strategic Outcome 8** (*Transition to Sustainable Energy*), notes that in creating Ireland's future energy landscape, new energy systems and transmission grids will be necessary to enable a more distributed energy generation which connects established and emerging energy sources, i.e. renewables, to major sources of demand. The successful transition to a low-carbon power system will depend on the pillars of 1) *Sustainability*, 2) *Security of supply* and 3) *Competitiveness*. A common theme underpinning these pillars is the need for a fit-for-purpose transmission and distribution energy network. Specifically, the NPF states that reinforcement of the distribution and transmission network to facilitate planned growth and distribution of a more renewables focused source of energy across the major demand centres, e.g. the functional purpose of the extant grid connection.

The following National Policy Objectives (NPO) are applicable to the Proposed Development.

- **NPO 21:** Enhance the competitiveness of rural areas by supporting innovation in rural economic development and enterprise through the diversification of the rural economy into new sectors and services, including ICT-based industries and those addressing climate change and sustainability.

- **NPO 54:** Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emissions reductions.

Ireland's national energy policy under **Objective 55** aims to '*promote renewable energy use and generation at appropriate locations within the built and natural environment to meet national objectives towards achieving a low carbon economy by 2050*'. The NPF aims to ensure that decisions that are made today meet our future needs in a sustainable manner.

> *"The manner in which we plan is important for the sustainability of our environment. Our planning system has influence across a wide range of sectors, both directly and indirectly and interacts with many common issues related to effective environmental management, including water services, landscape, flood risk planning, protection of designated sites and species, coastal and marine management, climate mitigation and adaptation, and land use change."*

An overarching objective of the NPF is to foster a transition toward a low carbon, climate-resilient society, which reflects the policy ethos established at the European level of governance (e.g. climate change and renewable energy targets – Section 2.2 & 2.3). In this regard, one of the key themes of the NPF is the realisation of an Ireland which has a secure and sustainable renewable energy supply and the ability to diversify and adapt to new energy technologies. The NPF references the National Climate Policy Position (superseded by the then Climate Action Plan 2019) which established the fundamental objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. The NPF emphasises that rural areas have a strong role to play in securing a sustainable renewable energy supply for the country and acknowledges that *"rural areas have significantly contributed to the energy needs of the country and continue to do so"*. In this regard, the NPF states:

> *"In meeting the challenge of transitioning to a low carbon economy, the location of future national renewable energy generation will, for the most part, need to be accommodated on large tracts of land that are located in a rural setting, while also continuing to protect the integrity of the environment".*

The NPF acknowledges that GHG emissions from the energy sector must be reduced by at least 80% by 2050 when compared to 1990 levels while ensuring a secure supply of energy exists. New energy systems and the maintenance / safeguarding of existing grid assets will be necessary for a more distributed, renewables focused energy system required to harness Ireland's considerable indigenous energy sources and *"connect the richest sources of that energy to the major sources of demand"*.

The Proposed Development represents a significant investment in a rural area, in the renewable energy industry which is essential for diversifying the energy sector, contributing to innovation in the rural economy and delivering on climate and energy targets. National Planning **Objective 21** of the NPF aims to *'Enhance the competitiveness of rural areas by supporting innovation in rural economic development and enterprise through the diversification of the rural economy into new sectors and services, including ICT-based industries and those addressing climate change and sustainability'*. The Proposed Development is directly supporting economic growth in rural Co. Wexford while also contributing to national, regional and local climate and renewable energy targets.

It is clear that the continued operation of existing renewable energy developments, such as the Proposed Development is in line with the aims and objectives of the NPF which seeks to transition to a low carbon and climate resilient economy.

Draft Revised National Planning Framework

In July 2024, the Irish Government published the draft revision of the National Planning Framework (NPF) for public consultation. The Draft Revision of the NPF focuses on the need to update the

Framework published in 2018 in order to appropriately reflect changes to Government policy that have taken place since the initial publication six years ago, such as climate transition.

There is an increased emphasis on the importance of the renewable energy development and infrastructure needed to support this. Chapter 9 acknowledges that ***the "accelerated delivery of the additional renewable energy generation is... essential for Ireland to meet its climate targets."*** A number of new or amended National Policy Objectives (NPOs) have been proposed in order to achieve this objective.

Table 9.1 of the Draft Revised National Planning Framework sets regional renewable energy capacity allocations for wind and solar energy. This was one of the key actions for 2024 under the CAP24. The Southern Region, in which the Proposed Development is located, is allocated an additional 978 Megawatts (MW) of wind energy. Under NPO 75, the Southern Regional Assembly will be required to plan how and where to deliver the required capacity by identifying capacity allocations for each Local Authority in its area. WCC will then be required to plan for the delivery of the energy capacity target that they have been allocated, under NPO 76.

The introduction of renewable energy targets represents a more active and prescriptive approach to land use planning for renewable energy development. If adopted in the final version of the Revised NPF, it will align the national target of 9GW of onshore wind energy with the policies and objectives of Local Authorities.

2.5.2.2 National Development Plan 2021- 2030

The National Development Plan 2021 – 2030 (NDP) was published on 4th October 2021 and sets out the major public investment projects identified by Government which are to play a significant role in addressing the opportunities and challenges faced by Ireland over the coming years such as Covid-19, Brexit, housing, health, population growth, and most relevant to the subject development, climate change. It is stated that the NDP 2021 – 2030 will be the *'largest and greenest ever delivered in Ireland'*, and in this regard, the NDP highlights that extensive consultation was undertaken to ensure that the plan adequately supports the implementation of climate action measures. Reflecting on the recent publication of the IPCC's Sixth Assessment Report, the NDP notes that the Irish Government is fully committed to 'playing its part' to ensure that the worst climate change damage can be avoided, e.g. significant reductions in CO_2 and other GHG emissions as assisted by the achievement of both European and National renewable energy targets. Specifically, the NDP states that,

> *"The next 10 years are critical if we are to address the climate crisis and ensure a safe and bright future for the planet, and all of us on it.*
>
> *The investment priorities included in this chapter [Ch. 13] must be delivered to meet the targets set out in the current and future Climate Action Plans, and to achieve our climate objectives. The investment priorities represent a decisive shift towards the achievement of a decarbonised society, demonstrating the Government's unequivocal commitment to securing a carbon neutral future."*

Notwithstanding this, the NDP acknowledges that it is not its role to set out a specific blueprint for the achievement of Ireland's climate targets; but as noted above, facilitate capital investment allocations for the climate and environmental strategic priorities.

One of the NDP's strategic climate priorities in the need for low-carbon, resilient electricity systems; specifically, the plan commits to <u>increasing the share of renewable electricity up to 80% by 2030</u>. This is characterised by the NDP as an '*unprecedented commitment to the decarbonisation of electricity supplies*', which is certainly an ambitious and an explicit driver for the continued operation of renewable generators such as the Proposed Development. The focus of investment in renewable energy infrastructure is to contribute to a long-term, sustainable and competitive energy future for Ireland.

2.5.2.3 Project Compliance with the National Planning Policy

With regard to the above, it is considered that the proposed wind energy development is in line with and supported by the National Planning Framework and the National Development Plan.

The National Planning Framework projects a population increase of 1 million people by 2040 and therefore recognises the strain and demand this will put on Irelands energy system. In order to ensure Ireland delivers on our renewable energy and carbon emission reduction targets, the NPF recognises the need for increased renewable energy onto the national grid. This shift from fossil fuels is dependent upon schemes such as the one proposed to generate renewable energy. Given the projected population increase, it is considered that if the share of renewable energy onto the grid is not increased, Ireland will fail to reach the National and International targets on emission reductions. The 21 no. wind turbines, with an electricity generation capacity of 42MW, will continue contribute to Ireland's national targets and support the country in meeting its renewable energy and carbon emission reduction goals at the EU level. The Proposed Development is directly supported by National Planning Objective 21, 54, and 55.

The National Development Plan 2021 - 2030 is clear in its priority to reach a low-carbon, climate resilient society over the lifetime of the plan. The Proposed Development, if permitted, will continue to provide clean, renewable electricity to the national grid, furthering development objectives of the NDP, namely the target to increase the share of renewable electricity up to 80% by 2030.

2.5.3 Regional Policy

Regional Spatial & Economic Strategy for the Southern Region

The Southern Regional Assembly ('SRA') was established in 2015, the Regional Spatial and Economic Strategy ('RSES') for the Southern Region came into effect on 31st January 2020. The RSES provides a long-term, strategic development framework for the future physical, economic and social development of the Southern Region. The RSES seeks to achieve balanced regional development and full implementation of Project Ireland 2040 – the National Planning Framework. The RSES aims to build on the region's strengths and potential to become a more prosperous, sustainable, climate resilient and attractive region for the benefit of all its people. up to 2040 and beyond.

The RSES notes that planning policy and objectives must incorporate resilience and adaptability to ensure that the Region are agile and responsive to change. At present, Irish per capita GHG emissions are among the highest in Europe and Government has identified '*Climate Change as the most important long-term challenge facing Ireland' with a stated commitment to 'the transformation required to achieve a low carbon resilient future'*. Transition to a low carbon energy future will require a wide range of policy responses across industry and public sectors, including electricity.

To achieve national and EU targets in the context of the electricity sector, the RSES notes that further investment is required to develop alternative renewable energy sources with greater interconnection to energy resources. This key enabling action is captured under **Strategic Aim 8** which sets out the need to "*safeguard and enhance the environment through sustainable development, prioritising action on climate change across the region, driving the transition to a low carbon and climate resilient society.*" Both the NPF and RSES emphasise, however, that the planning process is well placed to implement and integrate climate change objectives.

- **RPO 9 (Holistic Approach to Delivering Infrastructure)**: *It is an objective to ensure investment and delivery of comprehensive infrastructure packages to meet growth targets that prioritise the delivery of compact growth and sustainable mobility as per the NPF objectives including for renewable energy and climate change adaption.*

The RSES sets out a number of Regional Policy Objectives ('RPOs') designed to facilitate greater integration of renewables into the National Grid. The RSES notes that there is significant potential to use renewable energy across the Region to achieve climate change emission reduction targets. As such, the RSES supports renewable energy projects such as the Proposed Development.

- ***RPO 50 (Diversification)*** *It is an objective to further develop a diverse base of smart economic specialisms across the rural Region, including innovation and diversification in (among other things) renewable energy as a dynamic driver for the rural economy.*
- ***RPO 87 (Low Carbon Energy Future):*** *The RSES is committed to the implementation of the Government's policy under Ireland's Transition to a Low Carbon Energy Future 2015-30 and Climate Action Plan 2019. It is an objective to promote change across business, public and residential sectors to achieve reduced GHG emissions in accordance with current and future national targets, improve energy efficiency and increase the use of renewable energy sources across the key sectors of electricity supply, heating, transport and agriculture.*
- ***RPO 95 (Sustainable Renewable Energy Generation):*** *It is an objective to support implementation of the National Renewable Energy Action Plan (NREAP), and the Offshore Renewable Energy Plan and the implementation of mitigation measures outlined in their respective SEA and AA and leverage the Region as a leader and innovator in sustainable renewable energy generation.*
- ***RPO 96 (Integrating Renewable Energy Sources):*** *It is an objective to support the sustainable development, maintenance and upgrading of electricity and gas network grid infrastructure to integrate renewable energy sources and ensure our national and regional energy system remains safe, secure and ready to meet increased demand as the regional economy grows.*
- ***RPO 99 (Renewable Wind Energy):*** *It is an objective to support the sustainable development of renewable wind energy (on shore and offshore) at appropriate locations and related grid infrastructure in the Region in compliance with national Wind Energy Guidelines.*
- ***RPO 100 (Indigenous Renewable Energy Production and Grid Injection):*** *It is an objective to support the integration of indigenous renewable energy production and grid injection.*

The Regional Policy Objectives listed above reflect the strong support for renewable energy throughout the RSES. The Proposed Development will generate renewable electricity contributing to the objectives of the RSES. The Proposed Development is therefore in alignment with policy at a regional level.

The RSES also acknowledges the need to develop a strong grid to support the integration of renewable energy on to the national electricity grid. The RSES sets out a number of infrastructural RPOs, relevant to the Proposed Development which indicate that the Region is open to, and ready to invest in, renewable energy generation:

- ***RPO 219 New Energy Infrastructure:*** *It is an objective to support the sustainable reinforcement and provision of new energy infrastructure by infrastructure providers (subject to appropriate environmental assessment and the planning process) to ensure the energy needs of future population and economic expansion within designated growth areas and across the Region can be delivered in a sustainable and timely manner and that capacity is available at local and regional scale to meet future needs.*
- ***RPO 221 Renewable Energy Generation and Transmission Network:***
  a) Local Authority City and County Development Plans shall support the sustainable development of renewable energy generation and demand centres such as data centres which can be serviced with a renewable energy source (subject to appropriate environmental assessment and the planning process) to spatially suitable locations to ensure efficient use of the existing transmission network;
  b) The RSES supports strengthened and sustainable local/community renewable

energy networks, micro renewable generation, climate smart countryside projects and connections from such initiatives to the grid. The potential for sustainable local/community energy projects and micro generation to both mitigate climate change and to reduce fuel poverty is also supported;
c) The RSES supports the Southern Region as a Carbon Neutral Energy Region.

- ***RPO 222 Electricity Infrastructure:*** *It is an objective to support the development of a safe, secure and reliable supply of electricity and to support and facilitate the development of enhanced electricity networks and facilitate new transmission infrastructure projects that might be brought forward in the lifetime of this plan under EirGrid's (2017) Grid Development Strategy (subject to appropriate environmental assessment and the planning process) to serve the existing and future needs of the Region and strengthen all-island energy infrastructure and interconnection capacity.*

The RSES is ultimately supportive of indigenous renewable energy production and grid e.g. the Proposed Development in the region and sets a clear precedent to identify and capitalise on those opportunities associated with the transition to renewable energy generation.

2.5.3.2 Project Compliance with Regional Planning Policy

The Southern Regional Assembly states that its region has a crucial role to play in Irelands transition to a low carbon future. In continuing to utilise the wind energy resource at Ballywater, the Proposed Development will continue to directly contribute to the achievement of a sustainable, secure and resilient energy supply in a manner consistent with the proper planning and sustainable development of the area/region. In the region, a noticeable trend has emerged to recognise and take advantage of emerging opportunities related to the shift towards a decarbonized economy, particularly in the realm of renewable energy generation and therefore the proposal is considered to be in line with Regional Policy.

2.5.4 Local Policy

Wexford County Development Plan 2022-2028

The Wexford County Development Plan 2022-2028 (WCDP) was adopted by the Elected Members of WCC on Monday, 13th June 2022 and came into effect on Monday 25th July 2022. The plan sets out the policies and objectives for the development of the County over the 6 year plan period.

In Chapter 2 of the Plan outlines the council's vision to facilitate a transition to a low carbon economy. **Objective CA01** aims to enable *'the decarbonisation of the country's economy and reduces the county's carbon footprint in support of national targets for climate mitigation and adaption objectives as well as targets for greenhouse gas emissions reductions'.*

It is recognised that renewable energy developments play a key role in the County's transition to a low carbon economy. **Objective CA16** seeks *'to support change across business, public and residential sectors to achieve reduced greenhouse gas emissions in accordance with current and future national targets, improve energy efficiency and* ***increase the use of renewable energy*** *sources across the key sectors of* ***electricity supply****, heating, transport and agriculture'.*

Objective CA04 aims to '*implement the Energy Strategy contained in Volume 10 of the Wexford County Development Plan to facilitate the transition to a low carbon county'.* The vision of the Energy Strategy is *'to maximise Wexford's renewable energy potential and its transition to becoming a more energy secure, low carbon county in line with national energy targets whilst balancing the need to protect the environmental, social and heritage assets of the county'.* The provisions of the Energy Strategy are outlined in the following section.

Wexford County Development Plan 2022-2028 Energy Strategy

Volume 10 of the WCDP comprises an 'Energy Strategy' which details the policies and objectives for the County relating to renewable energy, including wind, for the period of the Development Plan. It includes an energy expectation for the County to 2027 which includes "*A reduction in demand for non-renewable energy sources, such as coal, oil and gas, and an increased demand for electricity from all sectors, leading to cleaner, more sustainable energy usage across the county.*" Onshore wind is noted as the main source of renewable energy within the County. The Strategy acknowledges the role extension of life and repowering of existing wind farms will play in meeting targets. The most pertinent objectives are set out as follows:

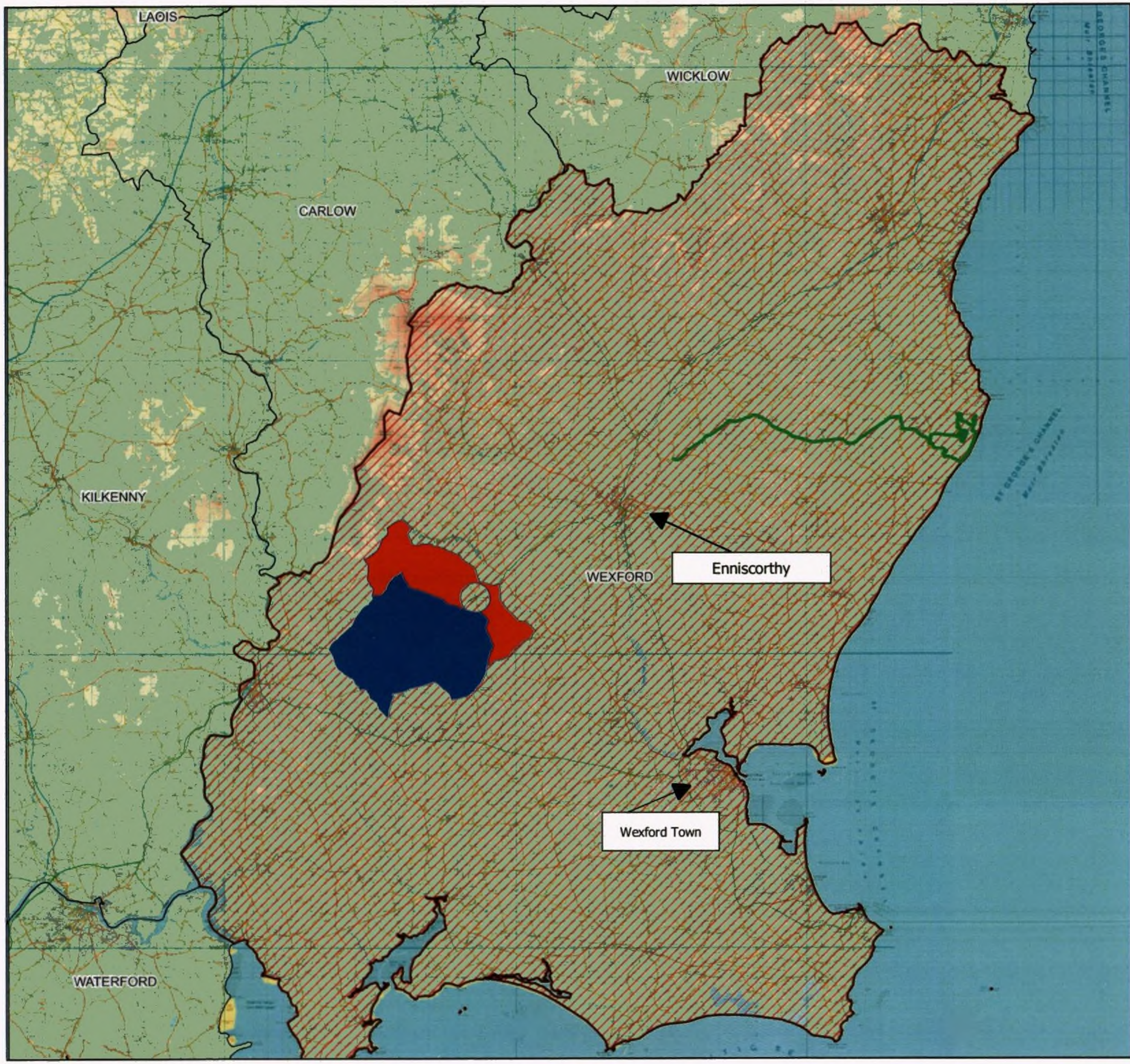
- **Objective ES07**: Ensure the security of energy supply by supporting the development of wind energy resources in County Wexford at appropriate scales and in appropriate locations, subject to compliance with normal planning and environmental criteria and the development management standards contained in Section 5.7.
- **Objective ES08:** Aim to achieve the target set out in the Renewable Energy Strategy, to enable County Wexford to make the initial steps toward a low carbon economy by 2027.
- **Objective ES09:** Facilitate wind energy development on appropriate sites in the county and work with the relevant agencies to encourage investment in research and technology associated with wind farms and other renewable energy technology.
- **Objective ES10:** Favourably consider proposals for the development of infrastructure for the production, storage and distribution of electricity through the harnessing of wind energy in appropriate sites and locations, subject to relevant policy, legislation and environmental considerations and the development management standards contained in Section 5.7.
- **Objectives ES15:** Consider the re-powering (by replacing existing wind turbines) and extension of existing wind farms. Applications on such sites will each be assessed on their merits, demonstrate that the equipment is upgraded to the best available technology and will be subject to the development management standards contained in Section 5.7 (see Table 8).

The Energy Strategy sets renewable energy targets based on the most likely energy scenario modelled in Ireland's National Energy and Climate Plan (NECP) 2021-2030. Installed capacity and future projects are also considered in the targets. It is noted that the targets are based on the national target for RES-E of 70% set in the Climate Action Plan 2019, which was in place at the time the analysis. The current RES-E target is 80%.

The relevant targets are as follows:

- **RES-E:** The Strategy sets a target of 100% renewable energy by 2031 which is to be met through a combination of renewable energy developments. To achieve this target, it is projected that county Wexford would need to have an installed onshore wind energy capacity of 193.09 MW by 244.22 MW by 2031. As of 2021, the county had an installed capacity of 182.46MW.

The WCDP divides the County into the following three areas for the purposes of wind energy development: Acceptable in Principle, Open for Consideration and Not Normally Permissible. The Ballywater Wind Farm site is zoned as ***'Not Normally Permissible'*** in the WCDP. These areas are considered to be generally unsuitable for new wind farm development due to significant environmental, heritage and landscape constraints, housing density, distance from the grid and/or wind speed.



Map Legend

- EIAR Site Boundary

Wexford County Wind Energy Strategy

- Acceptable in Principle
- Open for Consideration
- Not Normally Permissible

N

Drawing Title: Ballywater Wind Farm Location and WCC Wind Energy Zoning Designations	
Project Title: Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By: CF	Checked By: KB
Project No.: 230417	Drawing No.: Figure 2-5
Scale: 1:250,000	Date: 2024-09-16

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The Wind Energy Methodology implemented by the Planning Authority in preparing their Energy Strategy included:

> "*an analysis of key environmental, landscape, technical and economic criteria. GIS was utilised to examine a range of factors relating to wind energy development including wind energy potential (through the Wind Speed Atlas), grid infrastructure, natural heritage designations, urban settlements, landscape sensitivity and the location of existing and permitted wind farms. Each of these criteria were mapped and overlaid on GIS in order to determine the most suitable locations for wind farm development. The strategies of adjoining authorities were also examined to ensure consistency across boundaries.*"

In relation to existing wind farms, the Energy Strategy states that special cognisance has been taken of the existing operational and permitted wind farms and investments made by private developers, the ESB and EirGrid in terms of site access roads, electricity transmission and distribution infrastructure and appropriately sited substations.

In relation to the north of the County, the Energy Strategy states that:

> "*due to the number of existing wind farms, and having regard to the areas open for consideration for wind farm development in adjoining counties, it is considered that the north-west of the county has reached capacity in terms of wind farm development. Further wind farm development in this area may have potential adverse cumulative impacts. This area is also designated as 'Uplands' in the Landscape Character Assessment and is identified as having limited capacity to absorb development. The north-east of the county is also mainly designated as 'Uplands' and there are a number of settlements in this area which make it less suitable for wind farm development. The north of the county has therefore been included in the Not Normally Permissible area*".

In relation to the repowering and the extension of life of existing Wind Farms in areas identified as *'Not Normally Permissible'*, the Energy Strategy states that applications will be assessed on a *'case-by-case basis* and will be subject to the development management standards contained in Section 5.7. Further, the Energy Strategy states that '*any such applications should include details of how best available techniques are to be used to keep noise impacts to a minimum*'.

In relation to the Planning Authority's assessment of the proposal against the relevant development management standards, the Planning Authority will have *'particular regard to the reasons why the area was identified as 'Not Normally Permissible'*. As outlined in the above, the main reason for the *'Not Normally Permissible'* zoning designation is the fact that the north-west of the county is deemed to have reached capacity in terms of wind farm development. As an existing wind farm, it is therefore submitted that the extension of operational life of the Ballywater Wind Farm does not directly conflict with the *'Not Normally Permissible'* wind energy zoning designation and associated policy.

A full assessment of the Proposed Development against the WCDP policies and objectives, Energy Strategy policies and objectives and Energy Strategy Wind Farm Development Management Standards are set out in Tables 6-2, 6-3 and 6-4, respectively, of the accompanying Planning Report.

2.5.4.2 Compliance with Local Planning Policy

Having regard to the above, it is clear there is strong policy support for wind energy development and associated infrastructure at a local level and a commitment to shift to a low carbon economy and away from using fossil fuels. The Proposed Development will continue to contribute to decarbonisation of energy and will further contribute to the national, regional renewable energy and emissions reduction targets. Furthermore, it is the policy of the WCC to assess applications for repowering/ extensions of existing wind farms on its merits. With regard to the designation of the area as 'Not Normally Permissible', it is clear that the underlying reason for this designation is that the north-west of the county is deemed to have reached its wind energy capacity. Given the fact that the Ballywater Wind Farm is an existing wind farm, there is no potential for new cumulative effects to arise. Therefore, the Proposed Development is considered to be compliant with the relevant provisions of the WCDP.

2.5.5 Other Relevant Material Considerations

DoEHLG Wind Energy Development Guidelines 2006

In June 2006, the then Department of Environment, Heritage and Local Government (DoEHLG) published '*Wind Energy Development Guidelines for Planning Authorities*' (the Guidelines) under Section 28 of the Planning and Development Act, 2000 (as amended) (the Act). The aim of these guidelines was to assist the proper planning of wind power projects in appropriate locations around Ireland. The Guidelines highlight general considerations in the assessment of all planning applications for wind energy. They set out advice to planning authorities on planning for wind energy through the development plan process and in determining applications for planning permission. They contain guidelines to ensure consistency of approach throughout the country in the identification of suitable locations for wind energy development.

Each wind project has its own characteristics and defining features, and it is therefore impossible to write specifications for universal use. Guidelines should be applied practically and do not replace existing national energy, environmental and planning policy. While the 2006 Guidelines remain the relevant guidelines in place, at the time of lodgement, decision makers (Planning Authorities and An Bord Pleanála) are not bound to their provisions and they can (and do) consider updated standards/requirements/specifications in assessing impacts and the proper planning and sustainable development of the area.

Draft Revised Wind Energy Development Guidelines 2019

The Department of Housing, Planning and Local Government published the *Draft Revised Wind Energy Development Guidelines* (draft Guidelines) in December 2019. The draft Guidelines were open to public submissions up until the 19th of February 2020. These submissions are now being considered by the Department. At time of writing, the guidelines in place remain the 2006 Guidelines pending the Department publishing a final version of any revised guidance.

The draft Guidelines clearly sets out the recognition that the proper planning and sustainable development of areas and regions must be taken into account when local authorities prepare their development plans and assess planning applications, irrespective of the significant role renewable energy has to play in tackling climate change.

The draft Guidelines note that potential impacts of wind energy development proposals on the landscape, including the natural and built environment, must be considered along with the legitimate concerns of local communities. With this in mind, and in line with the previously stated "*preferred draft approach*", the 2019 Draft Revised Guidelines primarily focus on addressing a number of key aspects including, but not limited to:

- Acceptable noise thresholds and monitoring frameworks;
- Visual amenity setback;
- Control of shadow flicker;
- Compliance with Community consultation and dividend requirements, as included within the obligatory Community Report; and
- Consideration of the siting, route and design of the proposed grid connection as part of the whole project.

The submission period for the draft Guidelines closed in February 2020. Under the consultation it was evident that a number of submissions made appeared to have observations surrounding similar points, these include but are not limited to themes such as noise, visual amenity set back and shadow flicker. With regards to noise, a number of the received submissions noted that the provisions put forward in the draft Guidelines were unworkable, as such it was considered that should the noise measures be implemented there is the potential for an on-going impact on the development of onshore wind energy in the future. In relation to set back distances there was strong criticism with regards to this distance being measured to the curtilage of a property due to this measurement being ambiguous and difficult to implement. Furthermore, questions were raised surrounding the strict measures which have been put in place surrounding shadow flicker, the draft Guidelines put forward the provision that '*there will be no shadow flicker at any existing nearby dwelling or other relevant existing affected sensitive property*'. While the overall provision is possible a number of clarifications were sought to ensure that this provision could be implemented in a reasonable manner.

At time of writing the draft Guidelines are not yet finalised and are not in force, with the relevant guidelines for the purposes of Section 28 of the Act remaining those published in 2006. Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects it is possible that an updated version of the draft Guidelines may be finalised during the consideration period for the current Proposed Development. Should the draft Guidelines, in their current form, be adopted in advance of a planning decision being made on this application, the Proposed Development will be capable of achieving the requirements of the draft Guidelines as currently proposed in relation to any revised noise and shadow flicker requirements, which can be achieved by implementing mitigation through use of the turbine control systems, where necessary.

IWEA Best Practice Guidelines for the Irish Wind Energy Industry 2012

The Irish Wind Energy Association (IWEA) (now Wind Energy Ireland) published updated Wind Energy Best Practice Guidelines for the Irish Wind Industry in 2012. The guidelines aim to encourage and define best practice development in the wind energy industry, acting as a reference document and guide to the main issues relating to wind energy developments. The purpose of the guidelines is to encourage responsible and sensitive wind energy development, which takes into consideration the concerns of local communities, planners, and other interested groups. The guidelines outline the main aspects of wind energy development with emphasis on responsible and sustainable design and environmental practices, on aspects of development which affect external stakeholders, and on good community engagement practices. In approaching the development of IWEA's guidelines the aim was to be complementary to the Department of the Environment Heritage and Local Government's 'Wind Energy Development Guidelines' (2006).

IWEA Best Practice Principles in Community Engagement and Community Commitments 2013

IWEA extended its guidance with the publication of this Best Practice in Community Engagement and Commitment. IWEA and its members support the provision of financial contributions by wind farm operators to local communities and have sought to formulate best practice principles for the provision of a community commitment. The document sets out IWEA's best practice principles for delivering extended benefits to local communities for wind farm developments of 5MW or above. Best Practice Principles of community engagement when planning the engagement strategy and preparing associated literature are also outlined in the document. The aim of these guidelines is to ensure that the views of local communities are taken into account at all stages of a development and that local communities can share in the benefits.

Further details on the community engagement that has been undertaken as part of the Proposed Development are presented below.

DCCAE Code of Practice for Wind Energy Development Ireland – Guidelines for Community Engagement 2016

In December 2016, the Department of Communications, Climate Action and Environment (DCCAE) issued a Code of Practice for wind energy development in relation to community engagement. The Code of Good Practice is intended to ensure that wind energy development in Ireland is undertaken in adherence with the best industry practices, and with the full engagement of local communities.

Community engagement is required through the different stages of a project, from the initial scoping, feasibility and concept stages, right through construction to the operational phase. The methods of engagement should reflect the nature of the project and the potential level of impact that it could have on a community. The guidelines advise that ignoring or poorly managing community concerns can have long-term negative impacts on a community's economic, environmental or social situation. Not involving communities in the project development process has the potential to impose costly time and financial delays for projects or prevent the realisation of projects in their entirety.

Department Circular PL5/2017

On the 3rd of August 2017, the (then) Department of Housing, Planning and Local Government issued Circular PL5/2017 to provide an update on the review of the wind energy and renewable policies in development plans, and the advice contained within a previous Departmental Circular PL20-13. Circular PL20-13 advised that local authorities should defer amending their existing Development Plan policies in relation to wind energy and renewable energy generally as part of either the normal cyclical six-yearly review or plan variation processes and should instead operate their existing development plan policies and objectives until the completion of a focused review of the Guidelines. The new circular (PL05/2017) reconfirms that this continues to be the advice of the Department.

The Circular also sets out the four key aspects of the *preferred draft approach* being developed to address the key aspects of the review of the Guidelines as follows:

- The application of a more stringent noise limit, consistent with World Health Organisation noise standards, in tandem with a new robust noise monitoring regime, to ensure compliance with noise standards;
- A visual amenity setback of 4 times the turbine height between a wind turbine and the nearest residential property, subject to a mandatory minimum distance of 500 metres between a wind turbine and the nearest residential property;
- The elimination of shadow flicker; and
- The introduction of new obligations in relation to engagement with local communities by wind farm developers along with the provision of community benefit measures.

Renewable Energy Support Scheme

The CAP24 is the Government's plan to give Irish people a cleaner, safer, and more sustainable future to halve emissions by 2030 and reach net zero no later than 2050. The Plan sets out actions across every sector which will ensure Ireland meets its future climate commitments. A key part of the Plan is to increase the proportion of renewable electricity to up to 80% by 2030 and a target of 9GW from onshore wind. These measures will be driven by the Renewable Electricity Support Scheme ('RESS') which aims to promote the generation of electricity from renewable sources.

The RESS is an auction-based scheme which invites renewable electricity projects to bid for capacity and receive a guaranteed price for the electricity they generate.

RESS 1 was the first Renewable Electricity Support Scheme run by the Government of Ireland and concluded in 2020. RESS 2 was run in 2022 and concluded in June 2022. The successful projects in

RESS 2 represent a potential increase of nearly 20% in Ireland's current renewable energy generation capacity. They will be delivered between 2023 and 2025. A public consultation was opened in 2022 to refine the Terms and Conditions developed for RESS 2 with a limited and specific set of changes for RESS 3. This consultation closed in December 2022. RESS 3 auction was run in 2023 and concluded in September 2023.

The RESS ensures that Ireland is on a pathway to meet our ambitious climate targets and lays the foundations of a thriving and cost-effective renewable electricity market. This will support the growth of the green economy, create sustainable work opportunities, and ultimately benefit the consumer as renewables become more cost effective and increase Ireland's energy security.

2.6 Planning History

2.6.1 Planning applications within the application site boundaries

In October 2024 a planning search was conducted using WCC's online planning portal, along with An Bord Pleanála's (the Board) online case search function to identify relevant planning applications within the designated red line boundary of the planning application site. Planning applications within the red line boundary in are outlined in **Table 2-3** below.

Table 2-3: Planning applications within the Red Line Boundary within Co. Wexford

Pl. Ref.	Applicant	Description	Decision
97/1661	Ballywater Farms Limited	Develop a 500 sow integrated pig unit, comprising of a dry sow/service house, farrowing house, weaner houses (2 no) trowbridge houses (5 no) and a mixing/milling feed house E.I.S submitted	Granted (Conditional) 20.03.1998
2000/2833	Ballywater Farms Limited	Erect a wind measuring pole not exceeding 40m high	Granted (Conditional) 29.09.2000
2001/0458	Ryland Construction Limited	Erect 24 wind turbines not exceeding 70 metres in height with a rotor diameter not exceeding 70 metres and ancillary buildings and incidental site works and works to improve access from the beach at Ballinoulart. The wind farm will have an anticipated minimum output of 36 M.W. the planning application will be accompanied by an EIS which will be available at the offices of Wexford County Council	Granted (Conditional) 02.07.2002

2004/2901	Ryland Construction Limited	Construct a 110kV substation and perimeter fence and incidental site works (To service Ballywater Wind Farm)	Granted (Conditional) 15.10.2004
2008/2605	Ballywater Farms Limited	Retention of an agricultural storage building with precast concrete walls and roof cladding of a size of 72m by 30m by 13m in height	Granted (Conditional) 30.01.2009
2016/0470	Ballywater Farms Limited	Erection of 3 new easifeed slatted livestock sheds (demolish and replace 7 no existing barns with the footprint of one of the sheds), a livestock handling shed, a dry store, extend existing slatted tanks, silage pits and all associated works. The development is within the curtilage of a protected structure (WCC0663)	Granted (Conditional) 02.08.2016
2021/0983	Ballywater Stables Limited	Permission is sought for a new horse barn and indefinite retention of existing hay barn	Granted (Conditional) 20.09.2021
2021/1890	Ballywater Farms Limited	Permission for retention permission for 1. Change of plans and elevations of shed previously granted under planning permission 20160470. 2. Construction of calf shed. 3. Construction of Dungstead. 4. Construction of silage pits. 5. Construction of a new dairy unit and all associated ancillary site works. The above works are within the curtilage of a protected structure Ref no WCC0663.	Granted (Conditional) 12.09.2022
2022/1267	Ballywater Farms Limited	Permission to construct a roof over existing Dungstead. The works are within the curtilage of a protected structure ref. no. WCC0663	Granted (Conditional) 14.12.2022

2.6.2 Wind Energy Developments within 25Km

A planning search was carried out to establish permitted, operational and proposed wind energy developments within 25km of the turbines within the existing Ballywater Wind Farm for the purpose of informing the potential cumulative effects (see Section 2.9 of this Chapter for further details). The search was carried out using the relevant local authority planning, An Bord Pleanála and EIA planning portals in October 2024 for relevant planning applications. In total, 7 wind energy developments within 25km of the turbines within the existing Ballywater Wind Farm were identified as presented below in **Table 2-4**:

Table 2-4 Wind Farm developments within 25km

Pl. Ref.	Applicant	County	Wind Farm	Description	Decision	Status	Turbine No.
				Single/ Domestic Turbines			
Wexford CC Pl. Ref. 20071625	James Osborne	Wexford	Gorey Wind Turbine	Erection of a chinook 75 wind turbine within the boundarires of Gorey Business Park as part of the phased introduction of a renewable energy program and green initative encompassing wind, solar, geo-thermal and wood chip energy production. Turbine tower to have a height of 32.0m and blade diameter of 15m. Permission to allow for all associated site works and services.	Granted Wexford County Council 07/12/2007	Granted Planning Permission	1
Wexford CC Pl. Ref. 20110988 ABP Ref. PL26.240826	Dan and Mary Morrissey	Wexford	Cherryorchard Domestic Wind Turbine	Erection of a wind turbine on site	Granted by ABP 27/11/2012	Granted Planning Permission	1
				Larger Wind Energy Applications			
Wexford CC Pl. Ref. 20034003	Connor Brennan	Wexford	Ballyduff Wind Farm	Erect two wind turbines not exceeding 85 metres hub height with a rotar diameter not exceeding 80 metres and ancillary buildings and roadways. The maximum output of the wind farm will not exceed 5 Megawatts.	Granted Wexford County	Granted Planning Permission	2

Pl. Ref.	Applicant	County	Wind Farm	Description	Decision	Status	Turbine No.
					Council 16/04/2004		
Wexford CC Pl. Ref. 20033444	Kate McCarthy	Wexford	Ballynancoran Wind Farm	Erect a wind farm consisting of 2 wind turbines and service trackways on the site. The developer has also applied to erect an electrical transformer compound, control housing and anemometer on the same site	Granted Wexford County Council 30/04/2004	Granted Planning Permission	2
Wexford CC Pl. Ref. 20091730	Ballycadden Wind Farm Limited	Wexford	Ballycadden Wind Farm	A windfarm of up to 9 wind turbine generators to export electricity with a hub height of up to 85 metres a blade length of up to 41 metres the construction of an electrical substation, site roads, meteorological mast and ancillary services. An existing planning permission for a wind farm (ref 20022904 and An Bord Pleanála ref. Pl. 26.201448) is current on this land and should this application be approved only one of the developments will be constructed. The Wexford wind strategy map show the development location is within policy area 1 uplands which is an area open to consideration for wind farms. An environmental impact statement (EIS) has been prepared in respect of this development and this EIS has been submitted with the planning application	Granted Wexford County Council 23/04/2010	Granted Planning Permission	9
Wexford CC Pl. Ref. 20100733	Kenneth & Malcom Rothwell	Wexford	Ballaman Wind Farm	Wind farm to consist of up to two wind turbines with a hub height of up to 85m and a blade length of up to 45m and the construction of an electrical substation, site roads and associated ancillary services. The Wexford wind strategy map shows the development location is within policy area 1 uplands which is an area open to consideration for wind farms	Granted Wexford County Council 05/11/2010	Granted Planning Permission	2
ABP Ref: OA27.319864	Sure Partners Ltd	Located off the coasts of Co. Wicklow	Arklow Bank Wind Park 2.	Proposed offshore wind energy development - Arklow Bank Wind Park 2. The site of the Proposed Development comprises an Array Area (the area within which the Wind Turbine Generators (wtgs), the Offshore Substation Platforms (osps), and associated cables (export, inter-array and interconnector cabling) and foundations will be installed and a Cable	Case is due to be decided 10/12/2024	In Planning	Project Design Option 1 56 / Project

Pl. Ref.	Applicant	County	Wind Farm	Description	Decision	Status	Turbine No.
		and Co. Wexford		Corridor and Working Area (the area within which export, inter-array and interconnector cabling will be installed). The overall Proposed Development site area is 139.4 km2 and all of the Proposed Development will be seaward of the High Water Mark (HWM). The Array Area is located approximately 6 km to 15 km off the coast and covers an area of approximately 63.4 km2 . The Cable Corridor and Working Area extends from the Array Area to the HWM at Johnstown North, north of Arklow Town, Co. Wicklow where the offshore export cables make landfall (the Landfall). The area of the Cable Corridor and Working Area is 76.0 km2 .			Option 2 47

2.7 Scoping and Consultations

2.7.1 Scoping

Scoping is the process of determining the content, depth and extent of topics to be covered in the environmental information to be submitted to a competent authority for projects that are subject to Environmental Impact Assessment (EIA). This process is conducted by contacting the relevant authorities and Non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment with the potential to be affected by the proposal. These organisations are invited to submit comments on the scope of the EIAR and the specific standards of information they require. Comprehensive and timely scoping helps ensure that the EIAR refers to all relevant aspects of the Proposed Development and its potential effects on the environment and provides initial feedback in the early stages of the design iteration process. In this way scoping not only informs the content and scope of the EIAR, it also provides a feedback mechanism for the proposal design itself.

A scoping document, providing details of the Proposed Development, was prepared by MKO and circulated in September 2023. MKO requested the comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the EIAR process. Telecommunications operators were contacted in January 2024 in order to determine the presence of telecommunications links either traversing or in close proximity to the Wind Farm site.

2.7.2 Scoping Reponses

Table 2-7 lists the responses received to the scoping document circulated. Telecommunications operators were scoped at an earlier stage. Copies of all scoping responses received as of **October 2024** are included in Appendix 2-1 of this EIAR. The recommendations of the consultees have informed the scope of the assessments undertaken and the contents of the EIAR. Those bodies engaged with at scoping stage are set out below in **Table 2-5**.

Table 2-5: Scoping List and Responses

Ref	Consultee	Date of Response
1	An Taisce	No Response
2	Bat Conservation Ireland	No Response
3	BirdWatch Ireland	No Response
4	Butterfly Conservation Ireland	No Response
5	Commission for Regulation of Utilities , Water and Energy	No Response
6	Department of Agriculture, Food and the Marine	12/10/2023
7	Department of Defence	No Response
8	Department of Housing, Local Government and Heritage	11/03/2024
9	Department of Communications, Climate Action and the Environment	No Response
10	Department of Tourism, Culture, Arts, Gaeltacht, Sport, and Media	No Response
11	Department of Transport	18/10/2023
12	EirGrid	No Response
13	Environmental Protection Agency	No Response
14	Failte Ireland	29/09/2023
15	Geological Survey of Ireland	16/10/2023
16	Health Service Executive	01/11/2023
17	Inland Fisheries Ireland	No Response
18	Irish Aviation Authority	07/12/2023
19	Irish Peatland Conservation Council	No Response
20	Irish Raptor Study Group	No Response
21	Irish Red Grouse Association - Conservation Trust	20/10/2023

Ref	Consultee	Date of Response
22	Uisce Éireann	12/10/2023
23	Irish Wildlife Trust	26/09/2023
24	Office of Public Works	No Response
25	Sustainable Energy Authority of Ireland	No Response
26	The Heritage Council	No Response
27	Transport Infrastructure Ireland	02/10/2023
28	Waterways Ireland	26/09/2023
29	Wexford County Council (Environment Department)	No Response
30	Wexford County Council (Heritage Department)	No Response
31	Wexford County Council	15/11/2023
32	Coimisiún na Meán	26/09/2023
33	ESB Telecoms	No Response

Table 2-6 sets out the detail of Telecommunication consultation responses received. The responses received were fully considered and issues raised where followed up through contact with the respondent where clarification was necessary and addressed throughout the EIAR.

Table 2-6: Telecommunications Scoping and Responses

Ref	Consultee	Date of Response
1	ComReg	16/01/2024
2	Eircom Ltd	No Response
3	Imagine Networks Services Ltd	16/01/2024
4	Ivertec Ltd.	16/01/2024
5	Eir	16/01/2024
6	Meteor Mobile Communications Limited	16/01/2024
7	Ripple Communications Ltd	No Response
8	Three Ireland (Hutchison) Ltd	16/01/2024
9	Viatel Ireland Ltd	No Response
10	Virgin Media Ireland Ltd.	22/01/2024
11	RTE Transmission Network Ltd	17/01/2024
12	RTE/Saorview	17/01/2024
13	Vodafone Ireland Ltd	16/01/2024
14	Enet	16/01/2024
15	BT Communications Ireland	16/02/2024
16	ESB Telecoms	16/01/2024
17	2rn (RTE Transmission Network) RTÉ/Saorview	17/01/2024
18	Tetra Ireland Communications Ltd.	17/01/2024
19	Towercom	19/01/2024
20	Virgin Media	22/01/2024
21	BAI	16/01/2024
22	Ajisko Ltd	16/01/2024
23	Beat 102	No Response
24	Radio Services	16/01/2024
25	Irish Defence Forces	17/01/2024
26	Irish Defence Forces (Air Corps)	16/01/2024
27	JFK Communications Ltd	19/01/2024
28	JS Whizzy Internet Limited	No Response
29	Hibernian Towers	29/02/2024
30	Irish Rail	16/01/2024
31	FASTCOM Broadband Limited	No Response
32	AP Wireless	No Response
33	Pure Telecom	No Response
34	Digiweb	No Response

35	Cellnex	No Response
36	EOBO Ltd	No Response
37	Irish Water	16/01/2024
38	Lackabeha Services Ltd T/A Airwaves Internet	No Response
39	Meteor Mobile Communications Limited	No Response
40	TETRA Ireland	No Response
41	The Irish Aviation Authority	16/01/2024
42	Viatel Ireland Ltd	No Response

Table 2-7 below provides a summary of the details received from the consultees. The table also identifies the relevant chapter where the points raised by each of the consultees are addressed.

Table 2-7 Consultee responses and relevant chapters

Consultee	Points Raised by Consultee	Addressed in Chapter
Department of Agriculture, Food and the Marine	Response from Felling Department - provided a number of comments from the felling division in relation to the proposed development. Main points were with regards to the fact that if the proposed development will involve the removal or felling of trees, a felling licence will be needed, and provided further information on how to apply for a felling licence, the legal and regulatory framework surrounding tree felling and other information on requirements with a felling licence application."	N/A
Department of Housing, Local Government and Heritage	Apologised for the delay in reply and advised that the Development Applications Unit had to prioritise its workload and focus on statutory consultation planning cases. Added that "*The Department is not in a position to make specific comment on this particular referral at this time. No inference should be drawn from this that the Department is satisfied or otherwise with the proposed activity. The Department may submit observations/recommendations at a later stage in the process.* "	N/A
Department of Transport	Advised that the Department has no comment to make at this point in time. Requested that they be informed of any future updates.	N/A
Fáilte Ireland	Provided a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, for use in the preparation of the Environmental Impact Assessment for the Proposed Development. The purpose of the Fáilte Ireland EIA Guidelines report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the development involves tourism or may have an impact upon tourism. Advised that these guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines.	Chapter 5 Population and Human Health

Geological Survey of Ireland	Replied advising that they encourage the use of all relevant publicly available GSI datasets, and provided a list of those they think would be of the highest relevancy, and a full list of all GSI available data and websites. Also requested that, should any site investigation works occur, they would appreciate a copy of the results in order to add to the GSI national borehole database.	Chapter 7 Land, Soils and Geology, Chapter 8 Hydrology and Hydrogeology
Health Service Executive	Provided an HSE Environmental Report, Emergency Management Consultations Report and Aide Memoire. The Environmental Response provided general comments with regards to the conducting of the EIA, asking to take regard of the fact that, as the Wind Farm is already built, any mitigation measures mentioned should be known to work on site & also take into account complaints received over lifetime of the Wind Farm. Also requested that a number of documents should be taken into consideration during conduction of the EIA and advising on aspects which should be undertaken as part of the application, including Public Consultation, Noise and Vibration and Shadow Flicker assessments and assessment of Water quality and geological impacts The Emergency Management Consultation Report provided as a scoping response advised on specific observations with regards to the proposed development, providing a number of recommendations within the context of site operations. Provided an Aide Memoire for use in the event of an emergency situation.	Chapter 4 Description of the Project, Chapter 5 Population and Human Health
Irish Aviation Authority	Advised that, based on the information provided, IAA's Aerodromes Division has no requirements for incorporation into the Environmental Scoping Assessment Report.	N/A
Irish Red Grouse Association - Conservation Trust	State that the IRGCT fully supports the Government's drive for renewable energy but feels mitigation efforts should be significantly increased to help combat the damage that anthropogenic activities are causing to our planet. Calls for net biodiversity gain and greater habitat protection and preservation around the site (and other similar developments), making note of red listed species such as meadow pipit, yellowhammer, lapwing which are present surrounding the existing site.	N/A
Uisce Éireann	Advised that at present, Uisce Éireann does not have the capacity to advise on the scoping of individual projects. Provided general recommendations with regards to any possible impacts on water services which should be considered in the scope of the EIA where relevant including; Impacts on Drinking Water Sources, public water supplies or reservoirs, and discharges, any interruption or crossing of water infrastructure and more.	Chapter 8 Hydrology and Hydrogeology
Irish Wildlife Trust	Advised that they do not have the staff capacity to respond to this consultation at the moment, but they will endeavour to respond if possible. No further response was received.	N/A

Transport Infrastructure Ireland	Replied stating that they are not in position to engage directly with planning applicants with respect to proposed developments. Sent general recommendations which the proposed development should have regard to, including relevant roads network, TII's EIA Guidelines & other TII publications.	Chapter 13 Material Assets
Waterways Ireland	Advised that this is not within any Zone of Influence of their waterways so they will not be commenting.	N/A
Wexford County Council	Planning Department replied requesting that we apply for pre-planning, on replying that we had, and were awaiting a date while quoting their planning reference number (P20230295) given previously with regards to pre-planning meeting. They then followed up with an indicative pre-planning meeting date, which was held on the 12/12/2023.	Chapter 2 Background to the Proposed Development
Coimisiún na Meán	Advised that Coimisiún na Meán does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, they are not aware of any issues from existing windfarms into existing FM networks. Also advised that the wind farm is not located close to any existing or planned FM transmission sites.	Chapter 13 Material Assets

2.8 Other Consultations

2.8.1 Community Engagement

The Applicant has engaged with the wider community in relation to the Proposed Development. Public consultation began in January 2024 through engagement with nearby residents, local representatives, and local community groups. This included door-to-door engagement in the form of a letter drop with near neighbours within a 1.5km radius of the wind farm. The letter contained all the main points and details of the project with a contact email and phone number for locals to avail of. A dedicated project website went live on the 11th January 2024 showing the project in more detail and will include maps, drawings and other relevant information.

On the 5th March 2024, a Public Information Event was held at Ballygarrett Realt GAA Club. The objective of the consultation was to ensure that the views and concerns of all were considered as part of the Proposed Development design and EIA process. Appendix 2-2 of this EIAR contains a full and detailed Community Engagement Report. The report was prepared to record the consultation carried out with the local community in respect of the Proposed Development.

The Proposed Development has the potential to have significant benefits for the local economy, by means of job creation, landowner payments and commercial rate payments. An important part of any renewable energy development, which Ballywater Wind Farm has been at the forefront of developing, is its Community Benefit Package. The concept of directing benefits from wind farms to the local community is promoted by the National Economic and Social Council (NESC) and the Wind Energy Ireland (WEI) among others. While it may be simpler and easier to put a total fund aside for a wider community area, the applicant is endeavouring to develop new ways to direct increased gain towards the local community with particular focus on those living closest to the Proposed Development.

The Guidelines state that:

"While it is not a mandatory requirement, it is strongly recommended that developers of a wind energy project should engage in active consultation and dialogue with the local community at an early stage in the planning process, ideally prior to submitting a planning application".

This was further addressed in the Preferred Draft Approach to Wind Energy Development in Ireland (June 2017) which stated the following with respect to planning applications for wind farms:

"Planning applications must contain a Community Report prepared by the applicant which will specify how the final proposal reflects community consultation. The Community Report must also outline steps taken to ensure that the proposed development will be of enduring economic benefit to the communities concerned".

The draft Guidelines has retained this position stating the following:

"In order to promote the observance of best practice, planning authorities should require applicants to prepare and submit a Community Report with their planning application and a condition on any subsequent planning permission should require developers to carry out the development in accordance with the approved Community Report".

The report outlines the consultation and community engagement initiatives undertaken by the applicant prior to the submission of the planning application. It also outlines the main issues identified during this process, how the final proposal reflects community consultation and the steps taken to ensure that the Proposed Development will be of enduring economic benefit to the communities concerned.

The Proposed Development will provide an enduring economic benefit to the communities surrounding the Proposed Development as outlined in **Appendix 2-2** of the EIAR, through the community benefit package for residents and community groups, employment during the operation Proposed Development and through the annual rates payable to the local authority.

2.8.2 Pre-Planning Meetings

2.8.2.1 Wexford County Council (P20230295)

The prospective applicant and members of the design team met with WCC in relation to the Proposed Development prior to the submission of the planning application. A pre-planning meeting took place under the provisions of Section 247 of the Act on the12th December 2023, via MS Teams and included representatives from WCC, CGNEE and MKO. The team gave a PowerPoint presentation which included an introduction to the project team and the client, the site location was outlined, and the existing layout of the Proposed Development was discussed. A brief history of the site was presented and the rationale behind the forthcoming application was also discussed. An overview of the EIAR process and the planning application was also presented and ongoing consultation and survey efforts to date were presented to the Council. Those in attendance were as follows:

- James Lavin- WCC
- Joanne Keogh- WCC
- Anthony Butler- WCC
- Alan Clancy- MKO
- Fergal Connolly- MKO
- Robert Kennedy- MKO
- Keelin Bourke – MKO
- Niall Monk- CGNEE
- Anthony Walsh- CGNEE

Throughout the meeting matters discussed included the following:

- The existing site location and wind energy designations;
- The principle of development in relation toto the national, regional and local policy context;
- The timeframe for extension of operation of the Proposed Development;
- The scope of the EIAR as well as survey effort carried out to date; and
- Considerations regarding impacts of the Proposed Development on biodiversity and how this would be addressed in the EIAR.

In conclusion, the Applicant informed WCC of their intention to submit a planning application to extend the operational life of the existing Ballywater Wind Farm by an additional 10 years.

2.9 Cumulative Impact Assessment

The EIA Directive and associated guidance documents state that as well as considering any direct, indirect, secondary, transboundary, short-, medium-, and long-term, permanent and temporary, positive and negative effects of a proposed development or project (all of which are considered in the various chapters of this EIAR), the description of likely significant effects should include an assessment of cumulative impacts that may arise. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to a proposed development or project. 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.

To gather a comprehensive view of cumulative impacts on these environmental considerations and to inform the EIA process being undertaken by the consenting authority, each relevant chapter within this EIAR includes a cumulative impact assessment where appropriate.

The potential for cumulative impacts arising from other projects has therefore been fully considered within this EIAR.

2.9.1 Methodology for Cumulative Assessment of Projects

The EIA Directive includes a requirement to consider '*a cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.*' The methodology for the cumulative assessment has been informed by the relevant Guidance documents and by the nature and scale of the Proposed Development.

The potential cumulative impact of the Proposed Development and combined with the potential impact of other projects or plans has been carried out with the purpose of identifying what influence the Proposed Development will have on the surrounding environment when considered collectively with approved and existing projects, projects pending a decision from the planning authority, projects in the public domain such as those Strategic Infrastructure Development (SID) at pre-consultation with An Bord Pleanála, and land-uses in the vicinity of the Proposed Development site location.

The cumulative impact assessment of projects has three principle aims:

- To establish the range and nature of existing and approved projects within the cumulative impact study area of the Proposed Development.
- To summarise the relevant projects which have a potential to create cumulative impacts.
- To identify the projects that hold the potential for cumulative interaction within the context of the Proposed Development and discard projects that will neither directly or indirectly contribute to cumulative impacts.

Assessment material for this cumulative impact assessment was compiled on the relevant developments within the vicinity of the Proposed Development. The material was gathered through a search of relevant online Planning Registers, reviews of relevant EIAR (or historical EIS) documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts.

2.9.2 Cumulative Study Area

The geographical boundaries of the various zones of sensitivity of and to the Proposed Development from which there may be potential for cumulative impacts to arise relative to each individual EIAR topic, i.e. each chapter, is presented below in **Table 2-8.** Following consultation with the EIAR team on each individual topic, the maximum geographical extent and justification for this extent was established and is presented below. Due to the nature of the Underground Grid Connection (i.e. no construction, decommissioning or groundworks proposed), there is no potential for any cumulative impacts with the continued operation of the existing Underground Grid Connection or any other permitted or proposed developments in the environment, the grid connection has been scoped out of the cumulative assessment.

Table 2-8 Cumulative Study Areas and Justification

Individual Topic	Maximum Extent	Justification
Population & Human Health (Incl. Shadow Flicker)	**Wind Farm Site:** Project Study Area for Population (Electoral Divisions) Shadow Flicker Study Area (10xRD buffer from existing turbines) Consideration for the Population & Human Health cumulative extent is also given to the Air Quality, Climate, Noise and Landscape & Visual (i.e. Residential Visual Amenity) Cumulative Study areas	The Study Area for Population is identified in Section 5.3.1 in Chapter 5 as the Electoral Divisions within which the Project is located. For the assessment of cumulative shadow flicker, any other existing, permitted or proposed wind farms are considered where their ten times rotor diameter shadow flicker study area are located within the Shadow Flicker Study Area of 1.63km (ten times the rotor diameter from existing turbines) for the Proposed Development.
Biodiversity (Bats)	10km from the existing turbines	A 10km buffer of the existing turbines is used as is recommended for the desktop study and cumulative assessment by NatureScot Guidelines 2021 (Section 4).
Biodiversity (Birds)	15km from the existing turbines for large infrastructural development, such as wind farms, energy and public transport developments	The Proposed Development was considered in the context of other plans, existing and approved projects and planning applications, in the surrounding area that could result in cumulative impacts on birds. The Ballywater wind farm is within 15km of four Special Areas of Conservation and two

Individual Topic	Maximum Extent	Justification
		Special Protection Areas. Although there is no formal requirement for this 15km radius zone, it is recommended for plans and projects in guidance for planning authorities provided by the NPWS (DEHLG, 2009[15]) and has become the norm across other land use sectors in Ireland.
Land, Soils and Geology	EIAR Site Boundary	As there is no pathway for offsite cumulative impacts for Land, Soils and Geology, the cumulative study area is the EIAR Site Boundary.
Water	A combination of surface water and groundwater bodies which show potential connectivity to the Project site.	Regional surface water catchments are used for cumulative impact assessment with regard large infrastructural developments such as wind farms, energy and public transport developments. The potential for cumulative effects for these developments likely exists on a regional catchment scale (i.e. significant works likely existing in several sub-basins). The combined sub basin area encompasses the area of the Cahore_SC_010 subcatchment. There will be no potential for cumulative impacts beyond Cahore_SC_010 due to increases in flow volume (as the catchment area increases) and increasing distance from the Project. River Sub Basins are used for smaller developments (i.e. private & commercial type developments). These developments are not likely to present a significant cumulative impact risk on a regional catchment scale as any effects would likely be imperceptible as a result of the setback distances and localised nature of the

[15] https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

Individual Topic	Maximum Extent	Justification
		associated works. Given the nature and scale of the proposed works and the lack of hydrological cumulative impact potential beyond the river sub basin scale, the Water cumulative study area is defined by river sub basins in which the Wind Farm site is located.
Climate	The Climate assessment has been considered on a national basis and not confined to a specific study area.	The Climate assessment has considered the cumulative effects of the Proposed Development with other developments on a national basis under the relevant national Sectoral Emissions Ceilings.
Noise & Vibration	The list of wind farms which were initially considered in cumulative assessment extended to 25 km 5km buffer from existing turbines	The geographical boundary for the cumulative noise assessment is the area within which noise levels from the proposed, consented and existing wind turbine(s) may exceed 35 dB LA90 at up to 10 m/s wind speed (Institute of Acoustics document *Good Practice Guide To The Application Of Etsu-R-97 For The Assessment And Rating Of Wind Turbine Noise*). The nearest operational, permitted or proposed wind turbines are at located at Gorey Business Park and Ballyduff at a distance of 14.1km and 19.9km respectively from the Proposed Development. Based on these distances, a cumulative wind turbine noise review is not required and has therefore been scoped out of this assessment.
Cultural Heritage	25km buffer from existing turbines	Cumulative impacts on setting are more likely to occur at the operational stage of the development (i.e. post-construction). In this regard in order to assess overall cumulative effects on archaeology and cultural heritage, the Proposed Development is considered in the context of other developments, in particular other permitted and proposed wind farms within

Individual Topic	Maximum Extent	Justification
		25km of the Proposed Development.
Landscape & Visual	20km from existing turbines for visual and landscape effects. 15km from existing turbines for effects on landscape character.	The Wind Energy Development Guidelines (DoEHLG, 2006) ('the Guidelines') require that *"in areas where landscapes of national or international renown are located within 25 km of a proposed wind energy development, the Zone of Theoretical Visibility should be extended as far (and in the direction of) that landscape".* There are no landscapes of national or international renown within 25km of the Proposed Development, and therefore the cumulative boundary for visual and landscape effects is reduced to 20km from the Proposed Development. This LVIA Study Area of 20km for landscape and visual effects as is suggested by guidance: *"For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate"* (WEDGs Page 94, DoEHLG, 2006; Page 152, DoHPLG, 2019). The Landscape Character Areas (LCA) study area has been chosen as 15 kilometres for effects on landscape character. Through experience conducting LVIA for other wind energy development projects, the assessment team determined that no significant effects on landscape character are likely to arise beyond distances of 15km from the existing turbines. Therefore, a LCA Study Area of 15km is deemed appropriate for effects on landscape character in relation to the assessment of effects upon designated Landscape Character Areas.
Material Assets: Traffic & Transport	5km from Ballywater Wind Farm	Given the nature of the Project (i.e. no construction or groundworks proposed), it was determined that this buffer was

Individual Topic	Maximum Extent	Justification
		suitable for the cumulative assessment.
Material Assets: Telecoms & Aviation	The list of wind farms and other projects which were initially considered in cumulative assessment extended to 25km.	The geographical boundary for the telecoms cumulative assessment is defined by the potential for other wind farm projects to interfere with broadcast signals that interact with the Proposed Development As the nearest proposed, permitted or existing wind turbine is 14.1km from the existing Ballywater turbines, there is no potential for cumulative telecoms or aviation effects.

To gather a comprehensive view of cumulative impacts within the cumulative study area and to inform the EIA process being undertaken by the consenting authority, each relevant chapter within the EIAR addresses the potential for cumulative effects where appropriate and within the context of their identified cumulative study area. A long list of projects considered (i.e. the largest cumulative study boundary of 25km list) across all disciplines in their cumulative impact assessment is included in **Appendix 2-3**. Smaller cumulative assessment studies have considered all projects within their specific boundary which fall within the long list in **Appendix 2-3**.

2.9.3 Summary

The cumulative impact assessments carried out in each of the subsequent chapters of this EIAR consider all potential significant cumulative effects arising from relevant projects, plans and land uses within the cumulative study area and within the vicinity of the Proposed Development. These include ongoing agricultural practices. Additional detail in relation to the potential significant cumulative effects arising and, where appropriate, the specific suite of relevant mitigation measures proposed are set out within each of the relevant chapters of this EIAR.

3. CONSIDERATION OF REASONABLE ALTERNATIVES

3.1 Introduction

Article 5(1)(d) of Directive 2011/92/EU[1] of the European Parliament and of the Council of 13 December 2011 on the assessment of effects of certain public and private projects on the environment (codification), as amended by Directive 2014/52/EU[2] (the EIA Directive), requires that the Environmental Impact Assessment Report (EIAR) contains "*a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.*"

Article 5(1)(f) of the EIA Directive requires that the EIAR contains "*any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.*"

Annex IV of the EIA Directive states that the information provided in an EIAR should include a "*description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.*"

This section of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the proposed project and its specific characteristics, in terms of site location and other renewable energy technologies as well as site layout incorporating size and scale of the project. It provides an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

It is important to note that the existing Ballywater Wind Farm and Ballywater 110kV Substation (the 'Proposed Development') are existing infrastructure that have been operating and supplying electricity to the national grid since 2005. This EIAR has been prepared for the proposal to extend the operational lifespan of the Proposed Development beyond 2025, for a further 10 years. The EIAR assesses the continued operation of the Project, i.e. the Proposed Development and the Underground Grid Connection. No construction or groundworks are proposed as part of the Project.

The consideration of alternatives is an effective means of avoiding environmental impacts. As set out in the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022)*[3], *the presentation and* consideration of reasonable alternatives investigated is an important part of the overall EIA process. The factors of hierarchy, non-environmental factors and site-specific issues may be taken into account in the consideration of reasonable alternatives, as set out below.

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[1] *European Union (2011). Directive 2011/92/EU. European Parliament and European Council.*
[2] *European Union (2014). Directive 2014/52/EU. European Parliament and European Council.*
[3] *Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports. EPA, Wexford. Available at:* https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf

Hierarchy

EIA is concerned with projects. The Environmental Protection Agency (EPA) 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, May 2022), state that in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by means of a Strategic Environmental Assessment (SEA), the higher tier form of environmental assessment.

Non-environmental Factors

EIA is confined to the potential significant environmental effects that influence consideration of alternatives. However, other non-environmental factors may have equal or overriding importance to the developer of a project, for example project economics, land availability, engineering feasibility or planning considerations.

Site-Specific Issues

The EPA guidelines state that the consideration of alternatives needs to be set within the parameters of the availability of the land, i.e. the site may be the only suitable land available to the developer, or the need for the project to accommodate demands or opportunities that are site-specific. Such considerations should be on the basis of alternatives within a site, for example design and layout.

3.1.2 Methodology

The European Commission's *'Guidance on the Preparation of the Environmental Impact Assessment Report'* (EU, 2017)[4] outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives, the developer needs to provide the following:

- A description of the reasonable alternatives studied; and
- An indication of the main reasons for selecting the chosen option with regards to their environmental impacts.

There is limited European and National guidance on what constitutes a 'reasonable alternative' however the EU Guidance Document (EU, 2017) states that reasonable alternatives "*must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives*".

The guidance also acknowledges that "*the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative.*"

The current EPA Guidelines (EPA, 2022) state that "*It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required.*"

Consequently, taking consideration of the legislation and guidance requirements into account, this section addresses alternatives under the following headings:

- 'Do-Nothing' Alternative;
- Alternative Locations;

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[4] *European Union (2017) Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU).*

- Alternative Processes;
- Alternative Technologies;
- Alternative Turbine Layouts and Development Design
- Alternative Mitigation Measures.

Each of these is addressed in the following sections.

3.2 'Do-Nothing' Alternative

Article IV, Part 3 of the EIA Directive states that the EIAR should include "*an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.*" This is referred to as the "*Do-Nothing*" alternative. EU guidance (EU, 2017) states that this should involve the assessment of "*an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario.*"

Condition no. 17 of the existing planning permission for Ballywater Wind Farm and by consequence, for the existing Ballywater 110kV Substation states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."*

Similarly, condition no. 13 of the current planning permission states:

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"* (WCC Pl. Ref. 2001/0458)"

The 'Do-Nothing' alternative with regard to the Proposed Development, is to decommission the existing wind farm and substation in 2025 when the current permissions expire. As part of the decommissioning stage, the existing turbines and substation would be dismantled, and the site reinstated to its original condition; please see Section 4.7 in Chapter 4 of this EIAR for further details regarding decommissioning. The Proposed Development seeks to extend the operational life of the existing wind farm and substation to 2035, at which stage the wind farm and substation would be decommissioned.

In implementing the 'Do-Nothing' alternative however, i.e. decommissioning the existing wind farm and substation in 2025, the opportunity to continue utilising the existing renewable energy infrastructure would be lost. So too would the opportunity to continue contributing to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas (GHG) emissions. The existing Ballywater Wind Farm is capable of suppling approximately 18,411 households with electricity every year based on the calculated electricity as produced by the Proposed Development (see Section 4.3.3.5 in Chapter 4 of this EIAR for calculations).

The opportunity to continue to provide maintenance-related employment, local authority development contributions, rates and investment in the local area would also be lost. Further details on the proposed new Community Benefit Fund associated with the continued operation of the Project can be found in Section 4.8 of Chapter 4: Description of the Project.

It is noted that the total current wind farm site, i.e. the EIAR Site Boundary as shown on figures, is approximately 472 hectares (ha). The existing development footprint therefore accounts for approximately 7.52 ha or approximately 1.5% of the total site area. The remainder of the site is used for agricultural activities, split between pastural and arable land. These existing uses can and will continue in conjunction with the proposed continued use of the development site for wind energy.

As per the original grants of permission for the existing wind farm and substation, if the 'Do-Nothing' alternative was chosen, decommissioning of the Proposed Development would involve the restoration of the site to its original state prior to development. Decommissioning activities have evolved since the original planning applications were submitted and a Decommissioning Plan has been prepared to account for such updates and is included in Appendix 4-4 of this EAIR. The removal of the wind farm and substation infrastructure such as turbine foundations under the 'Do Nothing' alternative is not considered to be the most environmentally prudent option. In order to remove this infrastructure, a significant volume of reinforced concrete, over 180m^3, would have to be removed from the ground. This could result in significant environmental nuisance such as noise, dust and/or vibration, pollution of surface waters and/or groundwaters, soils, traffic, and negative impacts on sensitive habitats within the vicinity of the Project. An image of the turbine foundation during construction can be seen in Plate 4-5 of Chapter 4 of this EIAR. In addition, removal of the access roads has the potential to create significant noise and dust issues, as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm infrastructure, a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of extending the lifetime of the existing renewable energy project at this site are presented in Table 3-1 below. On the basis of the positive environmental effects arising from the Project, when compared to the 'do-nothing' scenario, the 'do-nothing' scenario was not the chosen option.

Table 3-1 Comparison of environmental effects of 'Do-Nothing' alternative when compared against the chosen option (maintaining the existing wind farm and substation at this site)

Environmental Consideration	'Do-Nothing' Alternative i.e. decommissioning of the existing wind farm and substation in 2025
Population and Human Health (including Shadow Flicker)	Short term increase in local employment due to decommissioning works, followed by long-term loss of maintenance related employment, and loss of long-term financial contributions towards the local community through a new Community Benefit Fund. Potential short-term negative effects on health and safety of construction workers due to the greater level of demolition work which is to occur. Short term effects on residential amenity due to increases in traffic, noise and dust associated with the demolition works as part of the current decommissioning plan. No further potential for shadow flicker to affect sensitive receptors if the turbines were decommissioned.
Biodiversity and Ornithology	**Decommissioning under the current planning conditions in 2025 will involve a significant amount of demolition works at the Proposed Development.**

	Potential short term negative effects on biodiversity may occur due to disturbance, as significant decommissioning and rehabilitation works are to be undertaken, and possible further construction work may occur in order to provide new access track for the agricultural activities on site. Current decommissioning plans have the potential to have short term negative effects the surrounding designated sites due to the extent of the works. Decommissioning of the turbines under the current planning permission will remove the collision risk for bat and birds. This) is considered to have a potentially long-term positive effect on these receptors.
Land, Soils and Geology	Decommissioning under the current planning permission will involve significant demolition and groundworks, which could result in short-term, moderate negative environmental effects on land, soils and geology in immediate vicinity of the decommissioning works
Geotechnical	Current decommissioning plans involving the restoration of the Proposed Development site to its original state, including the removal of all turbine foundations and site access tracks, which could result in short-term, moderate negative environmental effects of the geotechnical stability of the site within the immediate vicinity of the existing wind farm and substation infrastructure.
Water	Decommissioning of the wind farm and substation infrastructure including the removal of foundations and access tracks could result in potential short-term, slight negative impact upon local surface water, groundwater and sea water quality due to the proximity of the site to these sensitive receptors.
Air and Climate	The extent of decommissioning works involved in order to reinstate the site to its original condition will result in an increase of LGV and HGV trips to the site, which could result in short-term, moderate, negative environmental effects from exhaust emissions and dust production. The decommissioning of the wind farm will prevent the extension of the opportunity for an increase in air quality or reduction of greenhouse gases. The decommissioning will also not assist in achieving the renewable energy targets set out in the Climate Action Plan 2024[5].
Noise and Vibration	Potential short-term, moderate negative noise impacts on nearby sensitive receptors, associated with the decommissioning phase. No potential for further noise effects once the existing turbines are decommissioned.

[5] *Department of Environment, Climate and Communications (2022). Climate Action Plan 2023.*

Landscape and Visual	**No further landscape and visual and visual effects related to turbines, once removed**
Cultural Heritage and Archaeology	**The extent of the decommissioning works, including the removal of site access roads, could result in potential negative effects on the recorded monument WX022-031, found during initial wind farm access road construction. In the absence of appropriate mitigation measures a potential direct, negative and permanent effect to the recorded monument is identified.**
Material Assets	**Greater traffic volumes will occur during the decommissioning phase under current planning conditions. Generation of significant additional construction and demolition (C&D) waste volumes due to the removal of foundations and access roads. Significant volumes of soil movement within and to the site during the decommissioning process.**

3.3 Alternative Locations

3.3.1 Site Selection Process

It is considered appropriate to extend the operational phase of the existing wind farm and substation at the current site for the following reasons:

- Ballywater Wind Farm and Ballywater 110kV Substation have been operating successfully in their current locations since 2005 when they were first commissioned. The site has proven to have reliably good wind speeds, maintained good generating capacity and delivered significant levels of renewable energy into the Irish national grid.
- While the turbine technology on the site is dated, it has been demonstrated by the Applicant that the existing 21 no. Enercon E70 model turbines can continue to operate effectively for a further 10 years without a significant loss in total generating capacity of 42 megawatts (MW). As outlined in Chapter 1 of this EIAR, all 21 no. of the turbines which make up the existing Ballywater Wind Farm are set to be decommissioned in June of 2025, under the current permission. At this point, the turbines will have only been in operation for approx. 20 years, which is several years below their operational expectancy of approximately 30 years. The Applicant carried out technical feasibility assessments in consultation with Enercon to determine the qualitative remaining useful life of the Ballywater Wind Farm turbines, which allow for the Applicant to safely extend the lifetime of the turbine components from a mechanical and operational safety perspective. Further details on this can be found in Appendix 4-1.
- The existing wind farm, substation and existing grid connection infrastructure on the Project site, including the control building and site roads, can continue to be used for the extended operational period, which reduces environmental effects when compared to an undeveloped greenfield site, particularly in relation to landscape and visual effects and effects on locally important habitats.
- The Proposed Development site entrance can continue to be used without any alterations or upgrades needed.
- The Project can comply with policies and principles outlined in Chapter 1: Introduction (of this EIAR) in terms of need for additional renewable energy in Ireland.

- The Project can continue to contribute to the achievement of national energy targets and can continue to provide significant social and economic benefits for the local area (direct and indirect employment, community development fund, recreational amenity) and the wider region.
- Repowering of the existing wind farm site (replacement of old turbines with new turbines to increase generating capacity) would likely require the use of a smaller number of significantly larger turbines. Repowering of the site with considerably larger turbines was not deemed feasible due to existing site constraints, in particular the proximity of existing residential dwellings to the site, and therefore increased potential effects from noise, shadow flicker and landscape and visual impacts.
- Having been previously permitted under the provisions of WCC Pl. Ref. 2001/0458 and WCC Pl. Ref 2004/2901, the principle for wind energy development and associated infrastructure on this site is already well established and has been proven to be in accordance with the proper planning and sustainable development of the area. Chapter 2, Section 2.5 of this EIAR outlines the strategic planning context and provides further details of the Proposed Development's alignment with national, regional, and local policies, frameworks, guidelines and plans.

3.3.2 Review of Alternative Sites

The Applicant has undertaken a review of their operational wind farm portfolio on sites approaching expiry of permission, with a view to determine if they should be decommissioned, the operational life extended or if they were suitable for repowering. It was then decided which of the sites should be first selected for extension of operation.

The existing Ballywater Wind Farm and Ballywater 110kV Substation was considered suitable for extension of operation due to the success of the existing site, the good condition and performance of the existing turbines and site infrastructure (see Appendix 4-1 for turbine performance assessment details), the wind regime on the site and the existing grid connection infrastructure. The turbines at Ballywater Wind Farm have been operational since 2005 and are still in good operational condition.

The landowners of the existing wind farm and substation development have a long-term lease agreement with the Applicant for utilisation of the lands. The Proposed Development is for an extension of life of the operational Ballywater Wind Farm and onsite substation and therefore, further detailed assessment of alternative locations was not considered to be applicable in this instance.

3.4 Alternative Processes

The activities that affect the volumes and characteristics of emissions, residues, traffic and the use of natural resources has formed part of the consideration of alternatives through the proposed lifetime extension of the existing wind farm and substation.

No construction activities, groundworks or alterations to the existing wind farm and substation infrastructure is proposed as part of the Project. There are no processes which have the potential to be carried out alternatively. Due to the absence of a construction stage, alternative processes designed to reduce emissions and use of resources during the construction stage are not required. During the operational phase the processes required at the site are relatively benign. There are no manufacturing processes per se with the potential for the generation of significant emissions to any environmental media, the use of finite natural resources or the generation of wastes or traffic volumes. On this basis, alternative processes designed to reduce emissions and use of resources during the operational stage are not required.

The low level of operation and maintenance (O&M) activities required at the site will require the use of relatively minimal quantities of raw materials in the form of energy to supply plant and machinery, standard building materials including stone, metals pipework, concrete, electrical and oils, greases and other components and consumables. Raw materials are also utilised in the manufacture of wind turbine components and electrical infrastructure that may require replacement. The use of these resources will be controlled by the employment of best practice O&M techniques including waste management practices.

During the proposed decommissioning phase, the processes required on site have evolved from what was conditioned under the original wind farm and substation planning permissions (WCC Pl. Ref 2001/0458 and WCC Pl. Ref: 2004/2901). The decommissioning processes are seen as the most environmentally sensitive, and activities which are required on site which have the potential to generate emissions or significant traffic volumes or involve the use of finite resources have been chosen in line with best practice decommissioning methods.

The purpose of the Project is to generate electricity from an infinite renewable source which will offset the use of finite fossil fuels. The baseline scenario without implementation of the Project is not to provide a renewable energy source at this suitable location, therefore failing to contribute to climate change and energy policy objectives. Such an approach would neither be optimal nor appropriate.

3.5 Alternative Technologies

The current site is developed as a wind farm capable of generating up to 42 MW of renewable energy. The Project, through extending the operational lifespan of the wind farm, will maintain this level of renewable energy generation with little additional capital investment required and no significant increases in operating costs.

The existing site could potentially be redeveloped with an alternative renewable energy technology with solar photovoltaic (PV) array, or a solar/ wind energy mix deemed suitable to this location.

Redevelopment of this site as a large-scale solar farm capable of generating enough energy to be economically viable would drastically change the existing character of the land, as it would have a significantly larger footprint. According to the Sustainable Energy Authority of Ireland (SEAI), approximately 1.6 – 2.0 hectares (ha) of solar array area is required for each Megawatt generated. Therefore, in order for a solar farm to deliver at least 42 MW (the current wind farm generating capacity) a footprint area of approximately 67.2 – 84 ha of solar array would be required. In comparison, the current wind farm (turbines, roads, and hardstanding areas) and substation footprint is 7.52 ha.

Additionally, the construction of a solar development could have a potential environmental effect on Hydrology & Hydrology, Traffic & Transport (construction phase) and Biodiversity (habitat loss) at the site compared to extending the lifetime of the existing wind farm, due to the additional requirement for land.

In consideration of the existing site constraints, significant capital investment required in order to redevelop the current wind farm site as a solar farm, increased development footprint, and the ability of the existing wind turbines to perform for a further 10 years, it was not deemed suitable to further pursue this alternative land use option. Further assessment is provided in Table 3-2 below.

Table 3-2 Comparisons of environmental effects of Alternative Land Use of Solar Energy when compared against the chosen option (maintaining use of wind turbines)

Environmental Consideration	Solar PV Array (with a 42MW output)
Population & Human Health (incl. Shadow Flicker)	No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts to local residents and road users.

Biodiversity & Ornithology	No potential for collision risk for bats and birds Larger development footprint would result in greater habitat loss.
Land, Soils and Geology	Conversion of site to a solar farm would result in greater levels of disturbance to soils and geology in order to develop new site infrastructure suitable for a solar farm.
Geotechnical	Excavations and piling involved in Solar PV array developments. More site disturbance due to construction works.
Water	Construction of a larger development footprint required, therefore increasing the potential for silt-laden runoff to enter receiving watercourses. Large-scale solar PV array has the potential to alter drainage patterns in the immediate vicinity.
Air and Climate	The Construction phase will result in dust emissions and temporary reduction in Air quality. Also, the solar farm will have to operate for a period of time before the embodied carbon generated during its manufacture and construction has been paid back. Over a 10-year period a 42MW solar farm will not produce the same amount of electricity as a 42MW windfarm and therefore will not offset the same level of Carbon emissions during that period.
Noise and Vibration	Lower potential for noise impacts on nearby sensitive receptors during the operational phase. Increased potential for noise impacts on nearby sensitive receptors during the construction phase of a new solar farm.
Landscape and Visual	Potentially less visible from surrounding area due to screening from vegetation and topography. Alters landscape character.
Cultural Heritage & Archaeology	Potential for negative effects on cultural heritage sites due to construction of larger development footprint of solar.
Material Assets	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials.

3.6 Alternative Turbine Layouts and Development Design – Repowering Option

Each of the 21 no. existing wind turbines at Ballywater Wind Farm have a potential power output of 2MW to deliver a total generating capacity of up to 42MW. It is proposed to extend the operational lifespan of the 21 existing turbines of 99m blade tip-height at the site. A similar generating capacity could also be achieved on the existing site by using a significantly larger turbine technology (for example 7MW machines). This would necessitate the installation of at least 6 new turbines of approximately 185m total height to achieve a similar output. Adopting a smaller number of larger turbines at the existing site may be challenging to achieve in line with the current Wind Energy Guidelines (2006)[6], particularly as several residential dwellings have been constructed in close proximity to the wind farm since it was first developed. After taking account of these residential receptors, as well as environmental buffers to be applied to features such as watercourses and archaeological sites, and wind turbine spacing requirements, it is unlikely that a suitable viable area exists within the Proposed Development site exists to accommodate 6 no. turbines with 185m total height.

The use of significantly larger turbines at the site, while likely to reduce the development footprint, would be problematic in terms of potential negative noise impacts, shadow flicker, ornithology/biodiversity impacts, and landscape and visual impacts to the surrounding residential receptors. The construction of larger turbines at the site would necessitate significant road upgrades and potential realignments, in order to accommodate delivery of larger turbine components, increasing the potential for negative environmental effects on biodiversity, hydrology and traffic and transportation. Furthermore, the increased use of materials, new foundation excavations and movement of excavated materials associated with significantly larger turbines (up to 185m in height) would result in a higher level of negative environmental effects than the proposed option (extension of existing wind farm operation).

It should be noted that no alterations to the pre-existing turbine model installed on the site is proposed as part of this application. The maximum height of the turbines is 99m when measured from ground level to blade tip. For the purposes of this EIAR this is the turbine size which has been assessed (e.g., existing turbine dimensions used for visual impact, shadow flicker etc.). The EIAR therefore provides a robust and accurate assessment of the turbines considered within the overall development description.

A comparison of the potential environmental effects of the installation of a smaller number of larger wind turbines when compared against the chosen option of maintaining a larger number of smaller wind turbines are presented in Table 3-3 below.

Table 3-3 Comparison of environmental effects when compared against the chosen option (smaller wind turbines)

Environmental Consideration	Smaller Number of Larger Turbine Models
Population and Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impacts on nearby sensitive receptors due to the increased height and overall size of turbines and increased Shadow Flicker Study Area.
Biodiversity and Ornithology	**Likely impacts from construction (excavations, rock-breaking, increased traffic volumes) required to install larger turbines on the site present an increased potential to negatively impact biodiversity due to disturbance and displacement effects.** **The development footprint would likely be similar in size due to the requirement to space larger turbines further apart from one another and increased foundation size and hardstanding areas. Habitat loss of fewer number of larger turbines is likely to be neutral.** **There is a greater potential collision risk for birds due to the presence of turbines up to 87% higher than those currently existing, typically encompassing a larger blade length and swept area.**

[6]*Department of the Environment, Heritage and Local Government (2006). Wind Energy Development Guidelines 2006.*

Land, Soils and Geology	Larger development footprint would result in greater volumes of soil/rock/spoil to be excavated and managed.
Geotechnical	Neutral impact due to relatively level site topography and shallow underlying granite bedrock suitable as foundation anchor.
Water	Larger development footprint, therefore, increasing the potential for silt laden runoff to enter receiving watercourses.
Air and Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of construction material and turbine component deliveries to the site.
Noise and Vibration	Potential for increased noise impacts on nearby sensitive receptors due to reduced separation distance between residential dwellings and turbine locations.
Landscape and Visual	Although a smaller number of turbines would be present, the significantly greater turbine height would have a potentially greater landscape and visual impact.
Cultural Heritage and Archaeology	Larger development footprint likely to increase the potential for impacts on recorded monuments, and also upon any unrecorded, subsurface archaeology.
Material Assets	Greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.

3.6.1 Location of Ancillary Structures

The ancillary infrastructure required for the operation of the Project includes a control building and associated grid connection. No alterations are proposed to the locations of the existing site structures, as detailed in Chapter 4: Description of the Project and Figure 4-1. These structures were initially situated based upon the constraints of the site when first developed in 2010, and these constraints have not changed significantly in the intervening period. The existing grid connection, which connects the Proposed Development to the national grid at Crane 110kV substation, runs underground predominantly in the local road network, is assessed within this EIAR.

3.7 Alternative Mitigation Measures

Due to the nature of the Project (existing wind farm, substation, and grid connection with no construction works, groundworks or land use change proposed), the greatest potential for environmental effects exists during the operational phase. During the operational phase, there are no significant ongoing emissions to any environmental media (water, air, soil, etc) and the overall general environmental risk associated with the existing infrastructure is low. Further alternative mitigation measures for this phase are therefore not necessary for further consideration, in most instances. As detailed in and Chapter 6: Biodiversity and Appendix 6-6, mitigation has been put forward which aims to reduce the collision risk on site as identified by canine led carcass searches. Further surveys, including dog-based fatality monitoring, as well as feathering and curtailment of the turbines, have been proposed in order to ensure mitigate against this risk.

The proposed Decommissioning Plan (Appendix 4-4) is seen as the most environmentally prudent option, as to remove the structures and return the site to its original condition would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. The proposed decommissioning phase mitigation measures follow current technologies, methods and best practice, and thus further alternative mitigation measures are not considered necessary.

The best practice mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the site and any identified environmental receptors. The alternative is to either not propose these measures or propose measures which are not best practice and effective, and neither of these options are sustainable.

4. DESCRIPTION OF THE PROJECT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the Project and its component parts, including those which are the subject of a proposed application for planning permission to Wexford County Council ('the Proposed Development').

The application seeks a ten (10) year planning permission for the continuation of the operational life of the existing Ballywater Wind Farm as permitted under the provisions of Wexford County Council (WCC) Pl. Ref 2001/0458 from the date of expiration (June 2025) of the current permissions. All 21 no. turbines were granted by WCC under this planning permission. The turbines are currently grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines. The larger cluster in the southwest of the site is comprised of 17 no. turbines, as well as the onsite substation, which is located to the west of this cluster, as indicated in Figure 4-2. In addition, the application seeks a ten (10) year planning permission for the continuation of the operational life of the existing onsite Ballywater 110kV Substation as permitted under the provisions of WCC Pl. Ref. 2004/2901 from the date of expiration of the current permissions, also in June 2025.

The Proposed Development does not comprise any alterations or modifications to the existing operational wind farm or substation. The Proposed Development encompasses the continued operation of the wind farm and substation, which comprises:

- *(i)* *21 no. existing Enercon E70 wind turbines with a maximum overall blade tip height of 99 metres (m), including hardstands;*
- *(ii)* *Existing 1 no. onsite 110 kilovolt (kV) electrical substation which includes 1 no. control building, security fencing, external lighting, underground cabling, and all associated infrastructure and associated electrical plant and apparatus;*
- *(iii)* *All existing associated electrical and communications cabling connecting the turbines to the onsite Ballywater 110kV Substation;*
- *(iv)* *Existing gated site entrances from the R742 and an unnamed local road;*
- *(v)* *Existing internal access tracks; and,*
- *(vi)* *All existing ancillary infrastructure.*

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

Planning condition no. 3 of the existing planning permission (WCC Pl. Ref: 2001/0458) for Ballywater Wind Farm states

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"*

It is therefore assumed that the planning permission for these turbines expires in June 2025.

The existing Ballywater 110kV Substation was also constructed in 2005. A planning application was submitted to Wexford County Council.

Planning condition no. 2 of the existing planning permission (WCC Pl. Ref: 2004/2901) for the existing substation states:

> *"This planning permission is for construction of a 110kV Substation, perimeter fence, storeroom and incidental site works (to service Ballywater windfarm) only. The proposed development shall be carried out strictly in accordance with the plans and particulars lodged with this planning application, and the terms and conditions of the original planning permission for the windfarm, granted under planning registration number 2001 0458"*

The outcome of this condition is that planning permission for the onsite substation therefore expires at the same time as the wind farm, i.e. in June 2025.

By June 2025, the turbines will have only been operational for 20 years, despite the normal operational life of a turbine being typically 30 years, while the normal operational life of a substation is approximately 40 years. Ballywater Windfarm Ltd. (the Applicant) therefore intend to apply for planning permission to continue the operation of the existing wind farm and onsite substation for 10 years beyond the expiration of the current permissions. The wind farm operator has determined that the existing wind turbines at the Ballywater Wind Farm have a remaining lifespan of at least 10 years; see Appendix 4-1 of this EIAR for further details.

All elements of the Project have been assessed as part of this EIAR. The planning application that accompanies this EIAR for the extension of operational period of the existing wind farm and onsite substation does not include the existing connection to the national electricity grid via the existing Underground Grid Connection. However, the grid connection is recognised as an integral part of the Project and is assessed together with the Proposed Development throughout this EIAR. The existing wind farm connects into the 110kV Crane Substation via this underground cabling, which feeds into the ESB National Grid Transmission and Distribution System. For the purposes of this EIAR:

- Where the 'Proposed Development' is referred to, this includes the existing Ballywater Wind Farm (and associated infrastructure) and the existing Ballywater 110kV Substation.
- Where the 'Project' is referred to, this includes the Proposed Development (i.e. the existing Ballywater Wind Farm and Ballywater 110kV Substation) and the grid connection from the onsite substation to the existing Crane 110kV Substation.
- Where 'Underground Grid Connection' is referred to, this includes the approximately 21km of underground cabling that exits the Ballywater 110kV Substation and travels west to the Crane 110kV substation, connecting the electricity generated at the Proposed Development to the National Grid.

Further details on the planning history of the site are presented in Chapter 2: Background and Policy, of this EIAR.

It is considered that any continued routine maintenance works required as part of the extended operation of the existing wind farm and substation will be minor in nature.

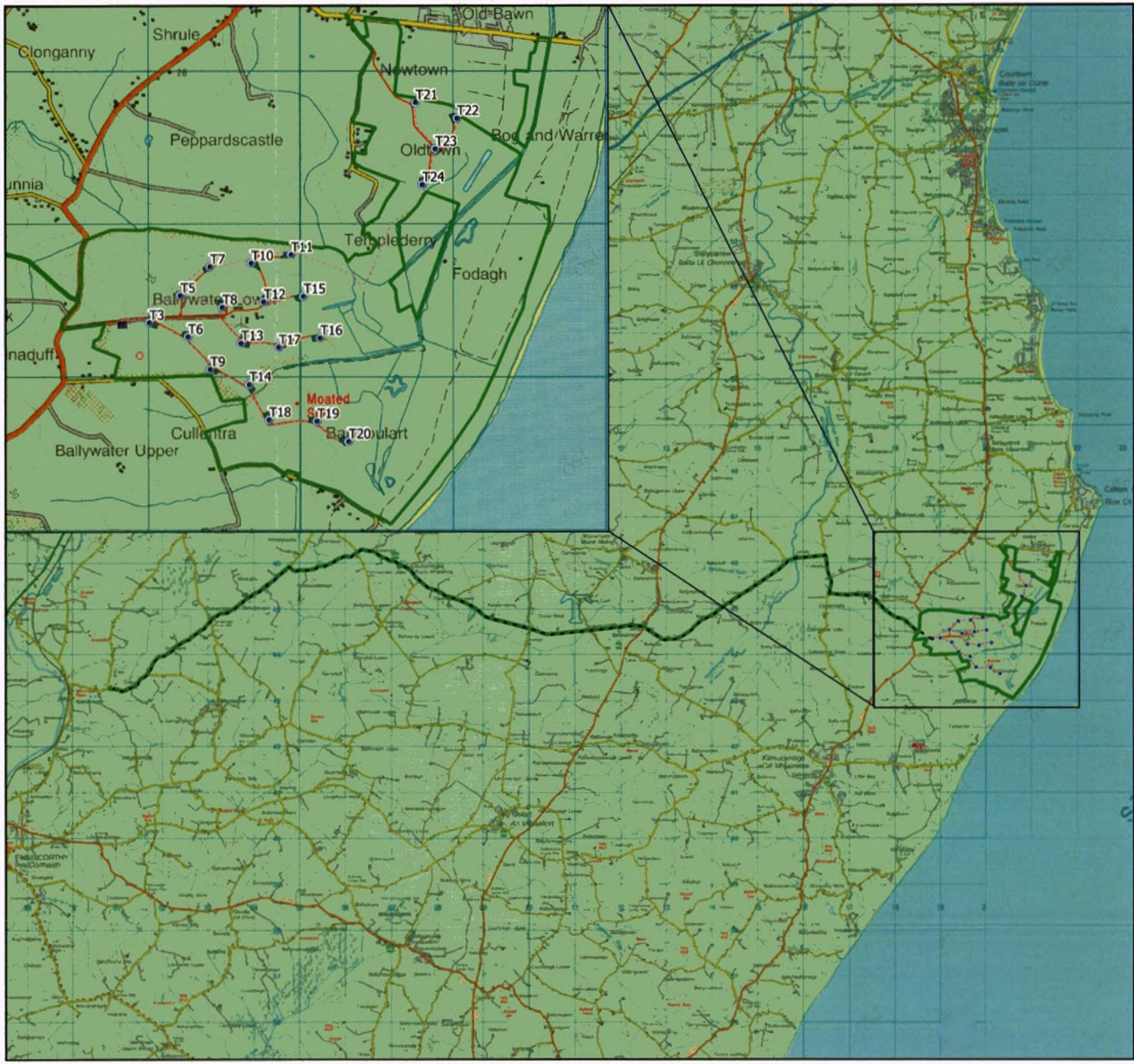
Details regarding the decommissioning stage of the existing wind farm and substation, in the context of decommissioning in either 2025 or under the current planning permission or as proposed under the scenario of a 2035 decommissioning date as part of the Proposed Development, are presented in Section 4.7 below. Decommissioning of the Project refers to the decommissioning of Ballywater Wind Farm and Ballywater 110kV Substation, as it is not proposed to decommission the Underground Grid Connection.

4.2 Site Layout

The layout of the Proposed Development (the existing wind farm and substation) was originally designed to minimise the potential environmental effects of the wind farm, while at the same time maximising the energy yield of the wind resource passing over the site.

The existing Ballywater Wind Farm site was chosen initially as being particularly suited to a wind energy development due to the favourable wind conditions. The prevailing south-westerly winds sweep across the island of Ireland providing one of the best wind resources in Europe. The estimated long-term mean wind speed at 50m on the site is c.6.4m/s, according to the SEAI Wind Atlas.

The EIAR Project layout is shown in Figure 4-1 below. The overall layout of the Proposed Development is shown on Figure 4-2. This drawing shows the locations of the existing wind farm and onsite substation infrastructure, and the Red Line Boundary defining the land which makes up the Proposed Development. Detailed site layout drawings of the existing development are included within Appendix 4-2 to this EIAR.



Map Legend

- EIAR Site Boundary
- Existing Turbine Points
- Existing Hardstands
- Existing Site Roads
- Existing Underground Cabling
- Existing Substation
- Existing Underground Grid Connection to Crane 110kV Substation

Drawing Title Project Layout - EIAR Site Boundary	
Project Title Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By CF	Checked By RK
Project No. 230417	Drawing No. Figure 4-1
Scale 1:80,000	Date 2024-10-09

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Map Legend

- Redline Boundary
- Existing Turbines
- Exisiting Hardstands
- Existing Site Roads
- Existing Underground Cabling
- Existing Substation

N

Drawing Title: Proposed Development Layout- Red Line Boundary	
Project Title: Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By: CF	Checked By: RK
Project No.: 230417	Drawing No.: Figure 4-1
Scale: 1:10,000	Date: 2024-10-09

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4.3 Development Components

4.3.1 The Proposed Development

The Proposed Development components are listed under Section 4.1 above. Table 4-1 below provides a summary of the footprint of the main existing wind farm and substation infrastructure, which are the subject of this planning application.

The Proposed Development is limited to an extension of the operational period of the existing wind farm and substation. As such, there are no changes proposed to the existing development components. The various elements of the existing wind farm and substation will remain in their current condition and will be subject to ongoing routine maintenance.

Table 4-1 Existing Development Components Footprint

Component Description	Approx. Area (hectares)
21 no. Turbines and associated hardstandings	4.4 ha
Internal site access roads (approximate 4m running width for site roads) and parking area located adjacent to the onsite substation	2.91 ha
110kV Substation and control room building	0.21 ha
Total	**7.52 ha**

Further details on each of the Proposed Development components are presented in Sections 4.3.1.

4.3.2 The Project

The Project encompasses the Proposed Development components listed in Table 4-1 above, along with the 21.4km Underground Grid Connection, which runs from Ballywater 110kV substation to Crane 110kV substation. As mentioned previously, the grid connection has been assessed as part of this EIAR, but does not form part of the planning application.

4.3.3 Wind Turbines

4.3.3.1 Turbine Locations

The existing wind turbine layout was optimised using industry-standard wind farm design software at the initial design stage in order to maximise the energy yield from the site, while maintaining sufficient distances between the proposed turbines to endure turbulence and wake effects did not compromise turbine performance. The Grid Reference coordinates for the turbine locations are listed in Table 4-2 below.

The turbines are not numbered sequentially as the initial wind farm planning application was for 24 no. turbines, 3 no. of which were subsequently not granted planning permission under the provisions of WCC Pl. Ref. 2001/0458. The turbine numbers from the original planning application for a 24 no. turbine layout were used following construction of the wind farm (meaning that there is no turbine numbered 1, 2 or 4), and have remained that way to the present day.

Table 4-2 Existing Wind Turbine Locations with Elevations

Turbine No.	Irish Transverse Mercator (ITM) Co-ordinates		Turbine Base Elevation (at top of foundation)
	Easting (E)	Northing (N)	
3	718933	644400	25 m OD
5	719137	644576	19 m OD
6	719187	644306	19 m OD
7	719332	644764	12 m OD
8	719412	644499	12 m OD
9	719333	644093	12 m OD
10	719602	644786	6 m OD
11	719865	644844	3 m OD
12	719683	644535	9 m OD
13	719536	644264	8 m OD
14	719588	643994	7 m OD
15	719946	644570	8 m OD
16	720057	644298	4 m OD
17	719782	644237	8 m OD
18	719719	643764	12 m OD
19	720035	643755	10 m OD
20	720242	643623	10 m OD
21	720676	645839	14 m OD
22	720949	645735	3 m OD
23	720804	645536	9 m OD
24	720720	645301	3 m OD

4.3.3.2 Turbine Type

Wind turbines use the energy from the wind to generate electricity. A wind turbine, as shown in Plate 4-1 below, typically consists of four main components:

- Foundation
- Tower

- Nacelle (turbine housing)
- Rotor

The existing wind turbines have a tip height of 99m, rotor diameter of 70m, a hub height of 64m and a lowest swept path of 29m. The wind turbines that are installed on the site are conventional three-blade turbines, that are geared to ensure the rotors of all turbines always rotate in the same direction.

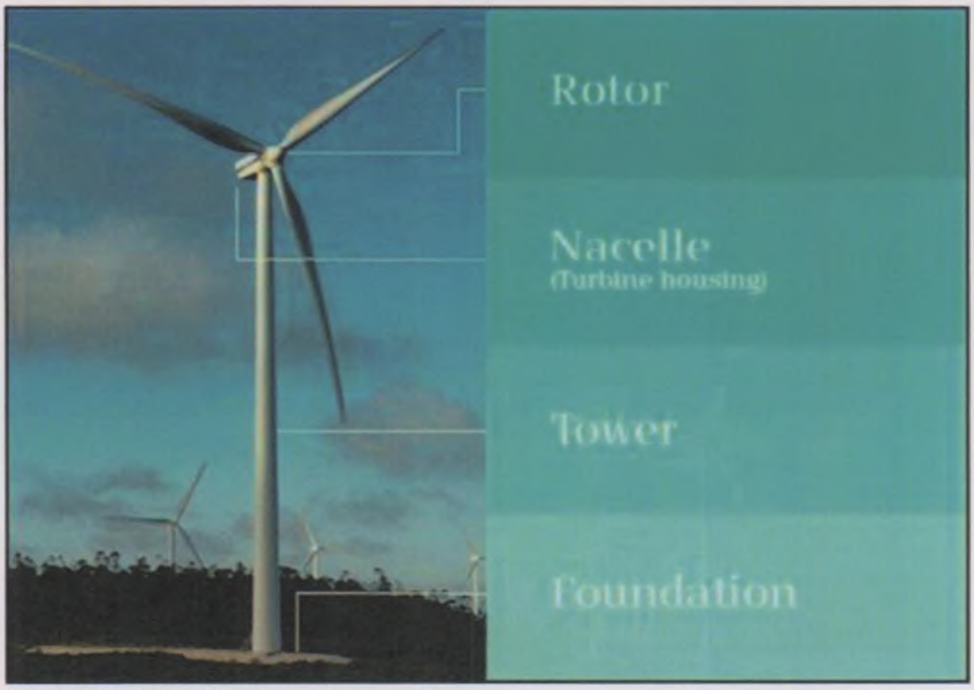


Plate 4-1 Wind Turbine Components

The existing wind turbines at the Ballywater Wind Farm were manufactured by leading turbine manufacturer, Enercon, with 21 no. E70 models installed at Ballywater Wind Farm (see Plate 4-2 and Plate 4-3 as reference to existing turbines at the site). Each turbine is capable of producing 2MW of electricity.

Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport, and ecology (specifically birds), as addressed elsewhere in this EIAR. Since there are no changes proposed to the existing turbines at the site, the parameters of the existing turbines have been used in each EIAR section that requires consideration as part of the impact assessment.

A drawing of the existing wind turbine model is shown in Figure 4-3 below. The individual components of a representative geared wind turbine nacelle and hub are shown on Figure 4-4 below.

Figure 4-5 shows a representative turbine base layout, including turbine foundation, hard standing area, assembly area, access road and surrounding works area. Plate 4-4 is aerial image of an existing turbine at Ballywater Wind Farm where these areas can be seen.


Plate 4-2 Existing Ballywater Wind Farm turbine and road infrastructure

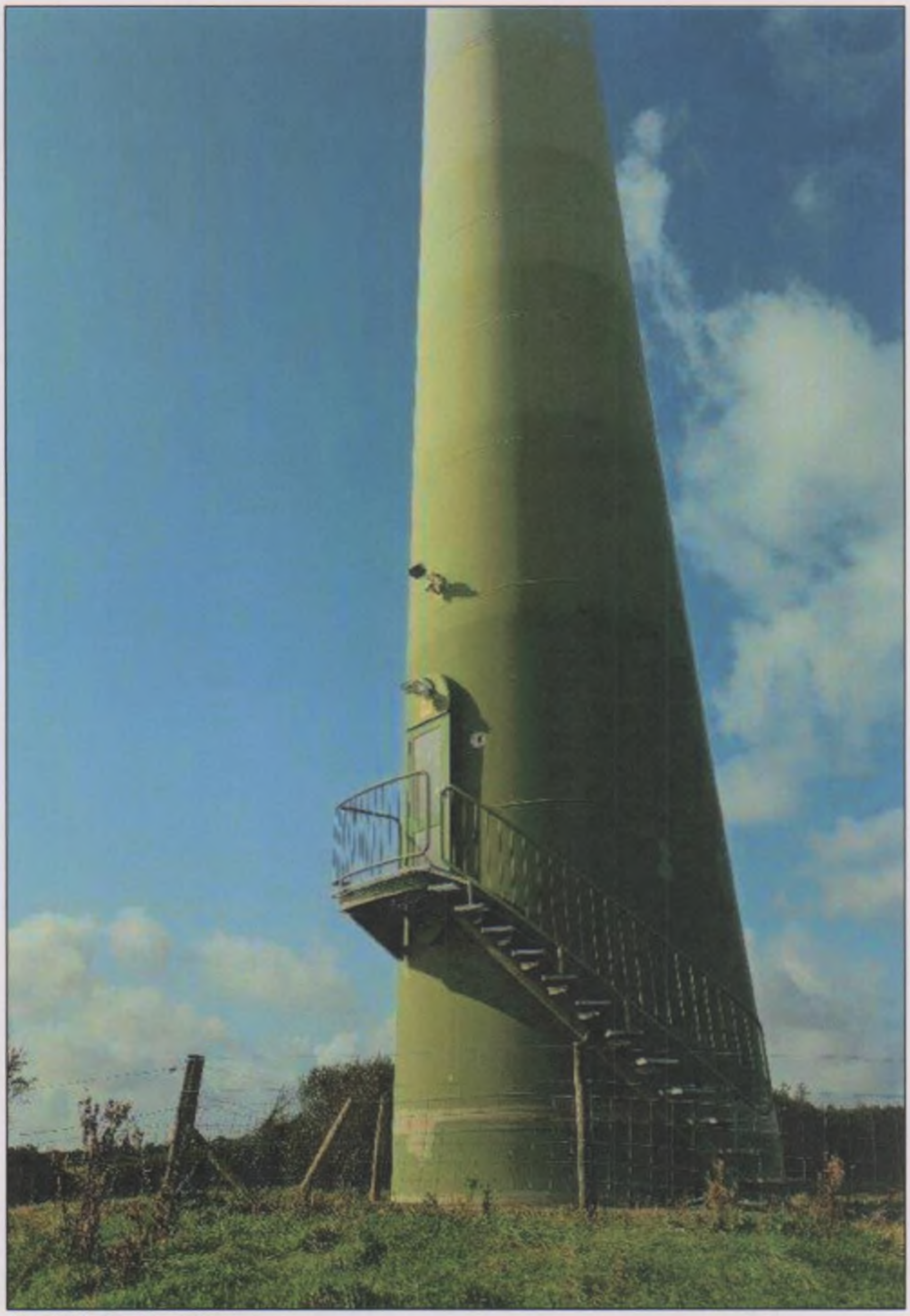
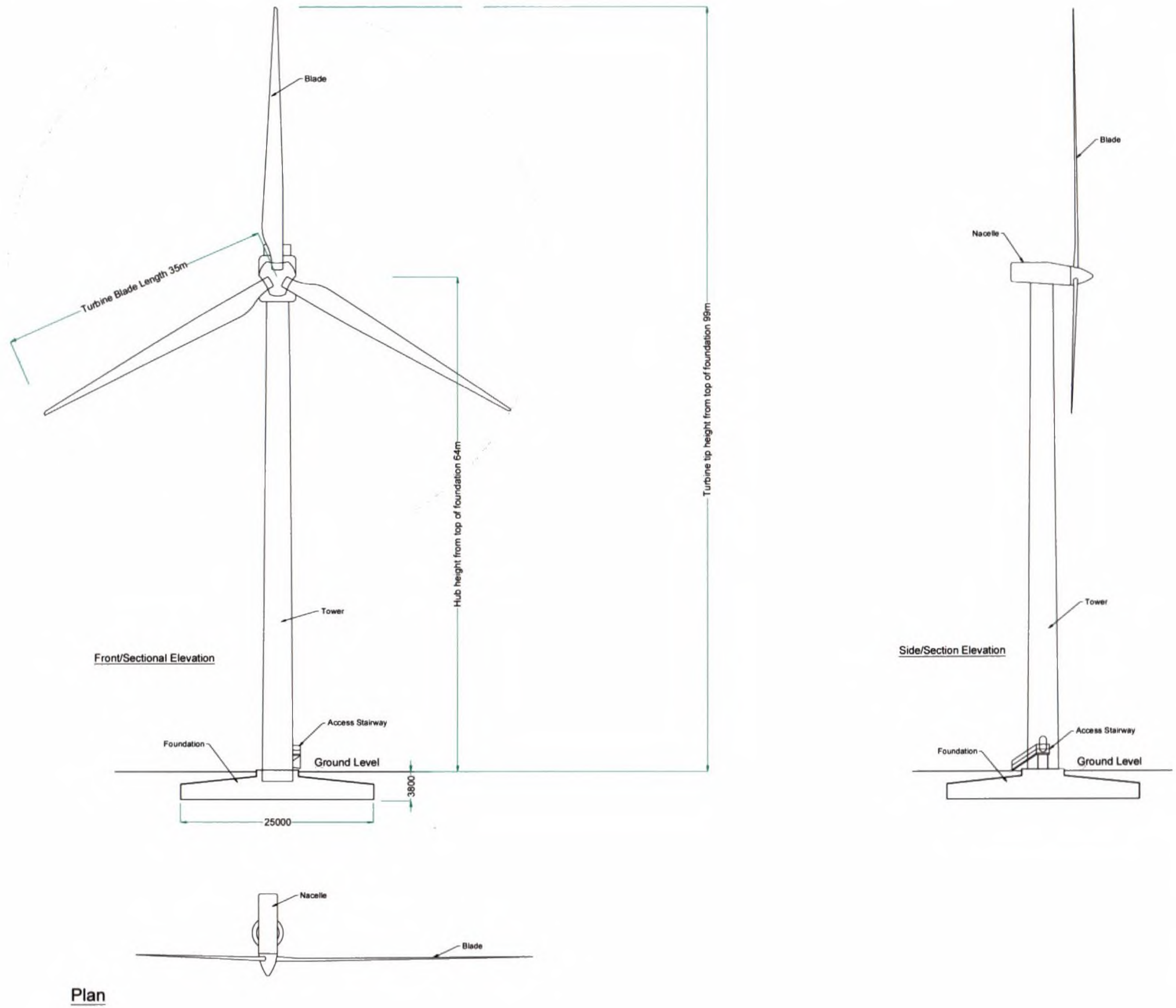


Plate 4-3 Turbine Base infrastructure



Project Design Drawing Notes

1 Drawings issued are for plan ation purposes only

2 Drawings not to be used for c n/contract conditions

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4 Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.

6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.

7. Layout plans show Turbine rotor diameter as per turbine drawing.

8. Final levels may vary depending on local ground conditions.

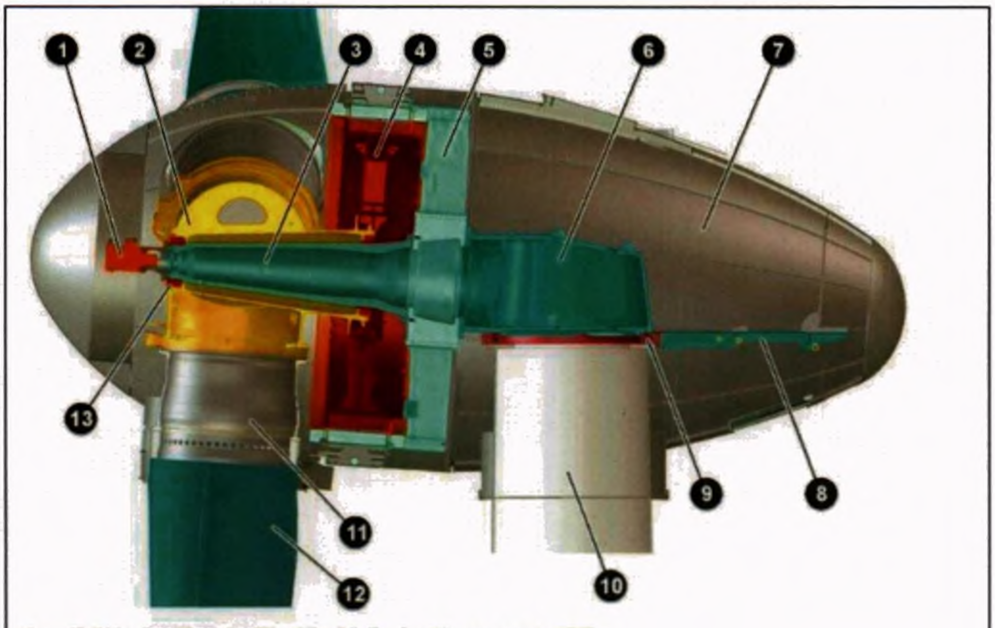
PROJECT TITLE:
CGN Ballywater Wind Farm EIAR & PA

DRAWING TITLE:
Turbine Elevations & Plan

PROJECT No.		DRAWING No.	SCALE
230417		230417-08	1:500 @ A3
DRAWN BY: GO	CHECKED BY: RK	DATE: 18.09.2024	REVISION: P01
OS SHEET No.: 4968, 4969, 5028, 5029			

MKO

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



Pict. 4: Sectional drawing of nacelle (main components)

1	Slip ring unit	8	Nacelle platform
2	Rotor hub	9	Yaw bearing
3	Axle pin	10	Tower
4	Generator rotor	11	Blade adapter
5	Generator stator	12	Rotor blade
6	Main carrier	13	Hub bearing
7	Nacelle casing		

Figure 4-4 Turbine Nacelle and Hub components

4.3.3.3 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that has been installed below the finished ground level. The turbine foundation transmits any load on the wind turbine into the ground.

The existing turbine foundations are circular in plan with an average above ground level area of $30m^2$, and an average diameter of 12 metres. An image of the existing turbine foundations during the construction phase of Ballywater Wind Farm are shown in Plate 4-5. There are no changes proposed to the existing turbine foundations as part of the Project.

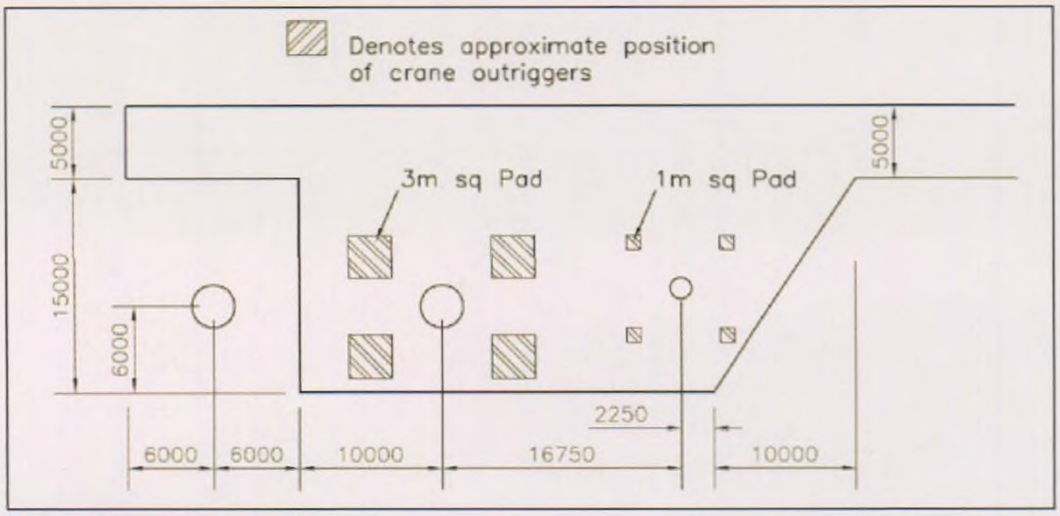


Figure 4-5 Representative Turbine Base Layout

Plate 4-4 Aerial Image of Turbine at Ballywater Wind Farm (T5)

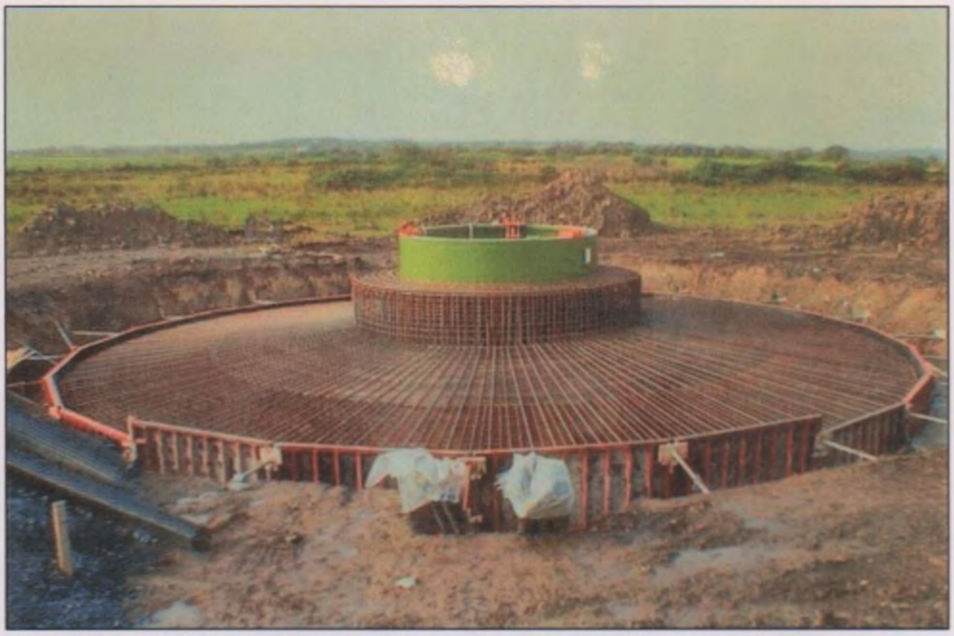


Plate 4-5 Image of Foundation at Ballywater Wind Farm taken during original Construction Phase

4.3.3.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base when constructing a wind farm, to facilitate access, turbine assembly and turbine erection. The hardstanding areas provide a safe, level working area around each turbine position. The hardstanding area is also intended to accommodate a crane during turbine decommissioning and disassembly, and if necessary, during maintenance works.

There will be no changes to the existing hardstanding areas as part of the Project. The existing hardstanding areas vary in size at each of the 21 no. turbines, with an average area of approximately 2100m^2. Plate 4-6 below depicts an existing hardstand at the site. The existing hardstanding areas shown on the detailed layout drawings included in Appendix 4-2 to this report will be maintained.

Plate 4-6 Existing hardstand within the site

4.3.3.5 Power Output

The existing wind turbines have a rated power output in the range of 2 megawatts (MW) per turbine, resulting in an estimated calculated maximum installed capacity of 42 MW. The wind farm therefore has a calculated maximum average annual power output of 77,325 Megawatt hours per year (MWh/yr), based on the following calculation:

A X B X C = Megawatt Hours of electricity produced per year

Where:

- A = The number of hours in a year = 8,760 hours
- B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A site-specific capacity factor of 21% is applied here, which is based on observed energy production at the existing Wind Farm.
- C = Rated output of the wind farm: 42MW

This calculation is based on the turbines operating at full capacity for the duration of the year. In the context of the age of the existing wind farm, this likely means that the overall generation of the wind farm will be lower than the calculated figure.

The calculated 77,325 MWh/yr of electricity produced by the Project would be sufficient to supply approximately 18,411 Irish households with electricity per year, based on the average Irish household using 4.2MWh of electricity.

The 2022 Census of Ireland recorded a total of 59,367 occupied houses in Co. Wexford. Per annum, based on the calculated electricity as produced, the Project has the potential to produce sufficient electricity for the equivalent of approximately 31% of all houses in Co. Wexford.

4.3.4 Site Roads

During initial construction of the existing wind farm, existing tracks were upgraded, and new access roads were constructed to provide access within the wind farm site and to connect wind turbines and associated infrastructure. Site roads were constructed of consolidated gravel with an average running width of 4m and a total length of c. 5.8km. A representative section through an excavated site road is shown in Figure 4-6. Imagery of the existing site roads can be seen in Plate 4-7 and Plate 4-8.

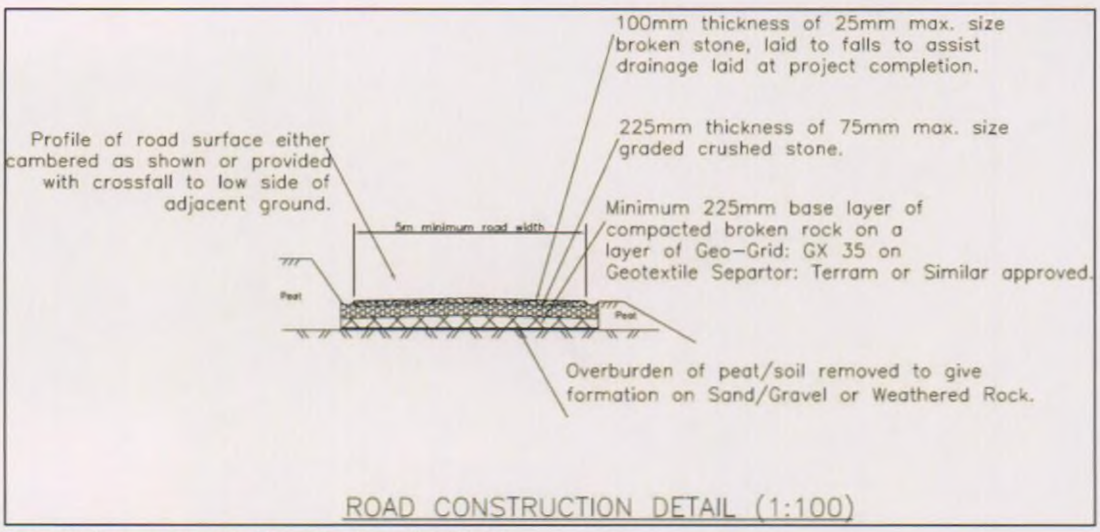


Figure 4-6 Representative Wind Farm Site Access Road Detail

Plate 4-7 Existing internal site access road – paved

Plate 4-8 Existing internal site access road

A photograph of an existing turbine access road is included in Plate 4-9. There will be no changes to the existing sites roads required as part of the Project.

Plate 4-9 Existing Access to T20 facing northeast

4.3.4.1 Site Access

Access to the southern site cluster for general traffic, such as maintenance vehicles, is via the current existing entrance at the R742 Regional Road, which runs along the western side of the site boundary. Access to the northern cluster of the site is via the Cahore Local Road which runs along the northern side of the site boundary, off the R742 Regional Road. No changes to these site entrances are proposed.

4.3.5 Site Cabling

Each turbine is connected to the onsite electricity substation through 20kV underground cabling. Multicore fibre-optic cabling connects each wind turbine to the wind farm control building. The electricity and fibre-optic cabling are direct-buried at a depth of approximately 2 metres beneath the ground surface. The cables are laid within the sides of or underneath the internal roadways, and also underneath some of the agricultural fields within the site.

4.3.6 Site Drainage

There are no groundworks involved in the operational phase of the Project, and therefore no existing drainage features will be altered and there will be no direct or indirect discharges to natural watercourses.

During decommissioning of the wind farm, it is intended to limit groundworks other than to rehabilitate constructed areas such as turbine bases and hardstanding areas. This will be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation. Electrical cabling connecting each turbine to onsite substation will remain in-situ. This is considered the most environmentally prudent option because the site cabling is direct-buried and not within any ducting which would allow the cables to be pulled through and with only limited groundworks. Leaving the cables in-situ will avoid any unnecessary ground disturbance and excavations which could result in direct or indirect discharges to natural watercourses. The turbine components will be removed and transported off-site along a pre-determined route, and the turbine concrete bases will remain in the ground and backfilled. With the implementation of the decommissioning phase drainage measures as outlined in Chapter 8: Hydrology and Hydrogeology, the residual effects will be negative, imperceptible, indirect, short-term, likely effects on downstream water quality.

Further details on the site hydrology are provided in Chapter 8: Hydrology and Hydrogeology of this EIAR.

4.4 Substation and Grid Connection

The existing Ballywater Wind Farm is connected to the National Grid via the existing Ballywater 110kV Substation, which connects via underground cabling to Crane 110kV Substation, which is located approximately 18km west of the Proposed Development. The length of the cable connecting the existing Ballywater 110kV Substation to Crane 110kV Substation is approximately 21km long. The Underground Grid Connection travels mostly through the public road network, with smaller sections of the cable travelling through private farm access roads and agricultural fields. Upon exiting the onsite substation, the cabling travels off-road through private agricultural land for approximately 1,550m and joins an unnamed Local Road for approximately 1km, and is then routed north along another unnamed Local Road for 850m. At this point the cable is routed southwest along another unnamed Local Road for approximately 4.6km, crossing Owenavorragh River and joining the L1023 Local Road for 6.75km, crossing the R741 and Ballyredmond River, and is then routed southwest along an unnamed Local Road for approximately 1.6km. The cable then joins the L2021-2 Local road for 4.9km, crosses under the M11 Motorway, and connects into Crane 110kV Substation. As detailed in Section 2.1 of Chapter 2: Background and Policy, the onsite substation was permitted under a separate planning permission to the existing wind turbines, (WCC Pl. Ref. 2004/2901).

The existing Ballywater 110kV Substation was constructed in 2005 and commissioned alongside the rest of the wind farm in the same year. Although the onsite substation was originally permitted under the provisions of a separate planning application (WCC Pl. Ref 2004/2901, Condition 2 of this planning permission states

> *"This planning permission is for construction of a 110kV Substation, perimeter fence, storeroom, and incidental site works (to service Ballywater windfarm) only. The proposed development shall be carried out strictly in accordance with the plans and particulars lodged with the planning application, and the terms and conditions of the original planning permission for the windfarm, granted under planning registration number 2001 0458."*

The onsite substation measures approximately 750 square metres (m^2). There are no changes to the existing substation, control buildings or grid connection proposed as part of the Project.

Imagery of the existing Ballywater 110kV Substation can be seen in Plate 4-10 and Plate 4-11 below:

Plate 4-10 Existing Ballywater 110kV Substation

Plate 4-11 Existing Ballywater 110kV Substation Office, Control Room and Switch Room

There are no changes to the onsite substation or control buildings proposed as part of the Project.

4.5 Construction Stage

No construction activities, groundworks or alterations to the existing wind farm and substation infrastructure is proposed as part of the Proposed Development.

4.6 Operational Stage

4.6.1 Operation

The Proposed Development is expected to have a lifespan of 10 years, commencing from the date of expiration of the existing wind farm and substation permission in June 2025.

During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The monitoring of the turbine output, performance, wind speeds and responses to any key alarms will continue to be monitored. All operational works on-site will be carried out in strict adherence with the Applicant's Health and Safety Policies and Procedures.

4.6.2 Maintenance

Each turbine and the substation will continue to be subject to a routine maintenance programme involving monthly checks and intermittent changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The wind farm manager will continue to attend the site regularly to perform inspections and oversee maintenance works.

The maintenance contractor for Ballywater Windfarm Ltd. will be responsible for ensuring each turbine is well maintained. Each turbine is subject to a yearly maintenance schedule which includes yearly master maintenance and visual blade inspections. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes. The use of a crane on site may be required but this is only for major component repairs/change. All site roads and public roads are suitable for this access if required and no modifications are required. Typically, maintenance traffic will consist of four-wheel drive LGVs. The wind farm manager will continue to attend the site regularly (in recent years this has averaged approximately 8 no. visits per year) to perform inspections and oversee maintenance works. The onsite substation and site tracks will also require periodic maintenance. The existing Ballywater 110kV Substation will continue to be operational 24 hours per day, 7 days a week throughout the year. Substations can be operated remotely and manually. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link.

The following maintenance procedures will also be adhered to:

- Periodic service and maintenance works which include some vehicle movement;
- For operational and inspection purposes, substation access is required;
- Servicing of the substation equipment will be carried out in accordance with the manufacturer's specifications, which would be expected to entail the following:
  - Yearly service – three-day visit
  - 4-year master maintenance – 1 week visit

Occasional technical problems may require maintenance visits by technical staff. During the six-month and annual service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Wind Farm Site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised facility. Oils for the purposes of cooling the turbine transformers are stored in bunded tanks within the turbine foundations, so any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to ground.

It is estimated that 1-2 daily visits will be made to the site for authorised persons and vehicles to undertake minor routine maintenance and inspection, if and when required. Although the level of activity required for the maintenance of the both the existing Ballywater Wind Farm and existing Ballywater 110kV Substation infrastructure is minimal.

Other maintenance trips which are taken to the site include a contractor who is responsible for conducting 6 monthly statutory inspections on internal ladders and yearly inspections on first aid equipment and firefighting equipment including hose reels and fire extinguishers.

An Operation and Environmental Management Plan (OEMP) has been prepared for the Proposed Development and is included as Appendix 4-4 of this EIAR.

4.6.3 Monitoring

Section 5 of the OEMP sets out a programme of monitoring required for the operational phase of the Proposed Development. The OEMP should be consulted for detailed information on the monitoring requirements during the operational stage.

4.7 Decommissioning Stage

Decommissioning of the existing wind farm and substation is required to be carried out in June 2025, i.e. 10 years from the grant of permission for 21 no. of the turbines, under the current planning permission. The Proposed Development would extend the operation of the existing wind farm and substation for a further 10 years, thereby postponing decommissioning until 2035.

Condition no. 17 of the existing planning permission for Ballywater Wind Farm states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months." (WCC Pl. Ref 2001/0458)*

It is considered that this Condition is not optimal in the current context, as returning the site to its original condition would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. A more environmentally sensitive Decommissioning Plan is presented in Appendix 4-5 of this EIAR and outlined below.

Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling.

The Applicant has made a commitment not to send turbine blades to a landfill or incineration facility. Instead, the Applicant is committed to recycling the wind turbine components, insofar as possible. The exact approach for recycling the turbines has yet to be determined as it will be 10 years from now, however recycling will be carried out in accordance with best practice at that time.

It is proposed to leave the turbine foundations in place underground and to cover them with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisance such as noise, dust and/or vibration.

It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going access to agricultural holdings. If it were confirmed that the roads were not required in future for any other purpose, they could be removed where required, however, this is not envisaged at this time. It is proposed to leave underground cables in place where they are below a level likely to be impacted by typical agricultural works.

Decommissioning of the onsite substation will involve the stripping-out and removal of steel, conductors, switches and other materials and equipment. These materials will then be reconditioned and reused or recycled. A soft strip of the building shall ensure that all fixtures and fittings are removed prior demolition, which will take place using conventional demolition works.

During decommissioning, it may be possible to reverse some of the potential impacts caused during the initial construction of the Proposed Development by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by allowing these areas to naturally revegetate and regenerate which reduces run-off and sedimentation.

In November 2020, Wind Europe published the '*Decommissioning of Onshore Wind Turbines*'[1] in which EU-wide industry guidelines were amalgamated and put forward. This document was submitted to the International Electrotechnical Commission TC88 for Wind Turbines, as a starting point towards the creation of an international standard for the decommissioning of onshore wind turbines. These guidelines present the main steps a decommissioning project should perform. This document outlines that the decommissioning plan is the key document for the decommissioning of a wind farm. A decommissioning plan of a wind farm must reflect national and, in some cases, regional or local legislation. The guidelines provided in this document provide key examples of decommissioning plans from several European countries, including Germany, France, Denmark and the Netherlands. Wind turbines are a valuable source of resources that can be reintroduced into the circular economy. The aim should be for use over a long period of time. However, at some point, wind turbines need to be decommissioned as they reach the end of their operational life. The '*Decommissioning of Onshore Wind Turbines*' report therefore presents a number of scenarios in which wind turbines can be decommissioned in a safe and more sensitive manner than has been put forward in the past.

As noted in the Scottish Natural Heritage (SNH) report *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013)[2] reinstatement proposals for a wind farm are typically made far in advance, so within the proposed (10)-year extension of operation of the site, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore "*best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm*".

The final Decommissioning Plan will therefore be prepared in line with the above guidance and agreed with the Local Authority at least three months prior to decommissioning of the Proposed Development.

4.8 Community Gain Proposal

Ballywater Wind Farm does not currently contribute to a Community Benefit Fund of any kind. An informal fund was established early in the project's development circa 2005, but that fund was discontinued soon after.

Newly built wind energy developments which operate under the Renewable Energy Support Scheme (RESS) structures are now obliged to establish a Community Fund for the area in which they are situated. The developer allocates a minimum of €2 per MWh from the revenues generated by the wind energy development towards the fund, which is available for local community groups, sports clubs, etc.

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[1] Wind Europe (2023). Decommissioning of Onshore Wind Turbines. https://windeurope.org/intelligence-platform/product/decommissioning-of-onshore-wind-turbines/
[2] Scottish Natural Heritage (2013). Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms Commissioned Report No. 591/ SNH, Stirling.

Ballywater Wind Farm does not operate under RESS and is therefore not obliged to provide a Community Benefit Fund. However, the Applicant made the decision, as part of the application for an extension of life, to establish a fund to demonstrate their commitment to the local area and their desire to support the local community. This fund will be to the minimum value of €30,000 per annum for the remaining lifespan of the Ballywater Wind Farm.

If the extension of life is granted, the Community Benefit Fund will begin in 2025 and run annually for the remainder of the operational lifespan of the wind farm. The fund will be made available for the local community for projects and/or developments of social and environmental benefit.

The developers have partnered with the Community Foundation Ireland (CFI) to operate the fund. CFI are a team of professional advisors, strategists and activators with over 20 years of experience providing the expertise to enable donors to positively impact Irish communities through strategic giving.

The Community Benefit Fund would be administered and controlled entirely by CFI in partnership with the local community. The Applicant will have no say or involvement in how the funds are used.

The establishment of the Community Benefit Fund was announced to residents via the initial leafletdrop undertaken January 2024 as part of the community engagement process for the Project. Along with being provided with background information on the fund, its intended function and the involvement of CFI, residents were asked, via the feedback questionnaires, what types of benefits they felt the fund should provide to the local community, and whether there were any specific groups, associations, clubs, etc, that they felt should benefit from the fund. Residents were enthusiastic in their suggestions, both via the questionnaires and at the in-person Public Information Event hosted by MKO and the Applicant Ballygarrett Réalt na Mara GAA Club in March 2024. Further details of the suggested bodies that may benefit from the fund are included in Appendix 2-2 of this EIAR.

5. POPULATION AND HUMAN HEALTH

5.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the potential effects of the Project on Human Beings, Population and Human Health and has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction of this EIAR.

A full description of the Project is provided in Chapter 4 of this EIAR.

As detailed in Section 1.1 of Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: the 'Project' and the 'Proposed Development'.

One of the principal concerns in the development process is that human beings, as individuals or communities, should experience no significant diminution in their quality of life from the direct, indirect or cumulative effects arising from the construction, operation and decommissioning of a development. Ultimately, all the impacts of a development impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this chapter of the EIA include population, human health, employment and economic activity, land-use, residential amenity, property values and health and safety.

5.2 Statement of Authority

This section of the EIAR has been prepared by Keelin Bourke and Robert Kennedy, and reviewed by Sean Creedon, all of MKO. Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin. Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

5.3 Population

5.3.1 Receiving Environment

This socio-economic study of the receiving environment included an examination of the population and employment characteristics of the area. Information regarding population and general socio-economic data was sourced from the Central Statistics Office (CSO), the Wexford County Development Plan 2022-2028, Fáilte Ireland and any other literature pertinent to the area. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2022, which is the most recent census for which a complete dataset is available, and also the Census of Ireland 2016, the Census of Agriculture 2010 and from the CSO website (www.cso.ie)[1]. Census information is divided into State, Provincial, County, Major Town and Electoral Division (ED) level.

Ballywater Wind Farm is located on the coast of county Wexford, approximately 4km northeast of Kilmuckridge Village and approximately 15.5km southeaset of Gorey; please refer to Figure 1-1 of Chapter 1: Introduction, for the exact site location. The existing wind farm site comprises lands in the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, and Templederry. The Underground Grid Connection is located within the townlands of Ballywater Lower, Killannaduff, Raheenlusk, Ballinvunnia, Barnaree, Coolatrindle, Corbally, Boira North, Craan, Greenhall, Ballinvally, Kilpatrick, Ballyrea, Ballyedmond, Ballyshane, Ballynamire, Ballymurragh, Clone West, Raheendarrig, Tomnaboley Lower, Tomnaboley Upper, Tobergal, Knocknaskeagh, Myaugh, Ballydonigan, Tinnacross, Oulartard, and Crane. The existing Project site (EIAR Site Boundary) covers an area of approximately 472 hectares (ha) with a development footprint of approximately 7.52 hectares, and also includes the townland of Fodagh. Ballywater Wind Farm consists of two clusters, the smaller of which is located to the northeast of the site and comprises 4 no. turbines, and the larger which comprises no. 17 turbines, along with the onsite 110kV substation.

Current land-use within the Proposed Development site is predominantly agricultural. Within the wider landscape of the existing Ballywater Wind Farm, land use bordering the site comprises of agricultural grassland, tillage and one-off housing. No additional changes to the current land uses of agricultural and pastoral grassland and tillage are proposed for the site. The existing land uses of the Proposed Development will continue in conjunction with the existing wind farm and substation should planning permission be granted for a lifetime extension.

In order to assess the population in the vicinity of the Project, the Population Study Area for the Population section of this EIAR was defined in terms of the Electoral Divisions (EDs) where the Project site is located, and where relevant, nearby EDs which may be affected by the Project. The existing Ballywater Wind Farm and Ballywater 110kV Substation lies within one ED: Cahore, while other EDs within the EIAR Site Boundary which the Underground Grid Connection passes through are also considered; Ballygarrett, Ford, Kilenagh, Wells, Monamolin, Kilcormick, Tinnacross, and The Harrow, as shown in Figure 5-1. Collectively and for the purposes of this chapter, each of these EDs will be referred to hereafter as the Population Study Area. The Population Study Area has a population of 6,815 persons, as of 2022 and comprises a total land area of 178.4 km^2 (Source: CSO Census of the Population 2022)[2].

[1] *Central Statistics Office Ireland (2023). Census of Agriculture 2020 Detailed Results. www.cso.ie*
[2] *Central Statistics Office Ireland (2023). Census Results 2016 & 2022. www.cso.ie*

A total of 128 no. properties are located within 1km of the existing turbine locations. Of these, 123 no. are inhabitable dwellings, 1 no. is derelict, and 3 no. have been granted planning permission. In addition, 1 no. property belongs to the participating landowners of the existing wind farm and substation. 90 no. properties exist within 700m of the existing turbine locations, within the Shadow Flicker Study Area (700m), further defined in Section 5.8.5 below.

There are 4 no. mobile homes within the EIAR Site Boundary that are in the ownership of the participating landowners, and a number of other mobile homes within 1km of the existing wind farm and substation. As mobile homes do not conform to the definition of sensitive receptors as set out in the '*Wind Energy Development Guidelines for Planning Authorities 2006*' (DoEHLG) (referred to as 'the Guidelines'), they have not been considered any further within this impact assessment. The closest inhabitable dwelling is located approximately 324 metres from the nearest turbine location (T21). There is a derelict property that is located approximately 84 metres from the nearest turbine location T8, owned by the participating landowners.

5.3.2 Baseline Population

The existing Ballywater Wind Farm and Ballywater 110kV Substation consist of 21 no. Enercon E70 model wind turbines, with a maximum tip height of 99 metres, a rotor diameter of 70 metres, and a hub height of 64 metres and an existing onsite 110kV Substation and control room. As set out in Chapter 1 of this EIAR, the Proposed Development is an extension of lifetime of 10 years for the existing wind farm and substation. The continued operation of the Underground Grid Connection is also assessed as part of the Project.

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 Wexford grew by 9.5% to a 163,919 populace. Other population statistics for the State, County Wexford, and the Population Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-1.

Table 5-1 Population 2016 and 2022 (Source: CSO)

Area	Population Change		% Population Change
	2016	2022	2016-2022
State	4,761,865	5,149,139	8.1%
County Wexford	149,722	163,919	9.5%
Population Study Area	6,055	6,815	12.6%

The data presented in Table 5-1 shows that the population of the Population Study Area increased by 12.6% between 2016 and 2022. There is a significant increase in population growth for the Population Study Area and the population growth rate is above that of County Wexford and the State. When the population data is examined in closer detail, it shows that the rate of population increase within the Population Study Area differs between the EDs comprising the Population Study Area. Smaller population increases are seen in the EDs of Tinnacross, Kilcormick and The Harrow at 5.2%, 6.3% and 9.9% respectively, while other EDs saw larger increases. The Ballygarret ED saw its population increase by 10.8%, the Monamolin ED saw an increase of 11.9%, along with the EDs of Wells, and Cahore which both saw population increases of 15.95%, and Kilenagh ED at an increase of 16.2%. Ford ED had the largest percentage population increase of 28.9% to 691 persons.

5.3.3 Population Density

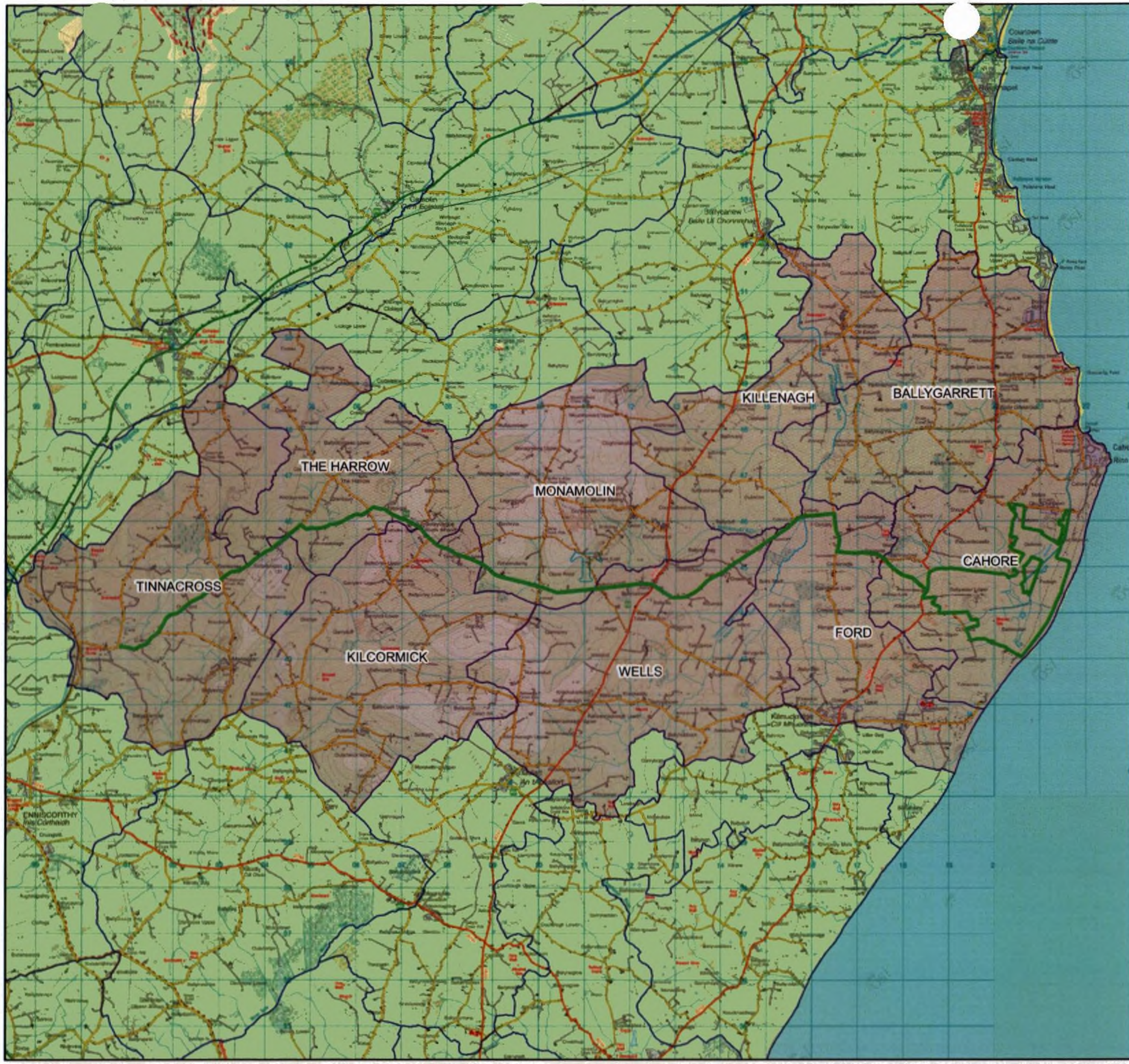
The population densities recorded within the State, County Wexford, and the Population Study Area during the 2016 and 2022 Census are shown in Table 5-2.

Table 5-2 Population Density in 2016 and 2020 (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2016	2022
State	67.76	73.27
County Wexford	63.25	69.25
Population Study Area	33.94	38.2

The population density of the Population Study Area recorded during the 2022 Census was 38.2 persons per km^2. This figure is significantly lower than the national population density of 73.27 persons per km^2 and the Wexford County population density of 69.25 persons per km^2. These findings indicate that the Population Study Area has a low population density.

Similar to the trends observed in Section 5.3.2 above, the population density recorded across the Population Study Area varies between EDs. Ballygarrett, Ford and Monamolin EDs have a significantly higher population density of 45.42/km^2, 45.46/ km^2 and 45.73/ km^2 respectively. In comparison, Tinnacross, Kilenagh, Wells and The Harrow EDs have population densities at 40.35/km^2, 39.4/km^2, 35.48/km^2 and 34.1/km^2 respectively. The lowest population densities exist in Kilcormick ED at 32.06/km^2 and Cahore ED at 27.22/km^2.



Map Legend

- EIAR Site Boundary
- Population Study Area
- Electoral Divisions

N

Drawing Title: Population Study Area

Project Title: Proposed Lifetime Extension of Ballywater Wind Farm

Drawn By	Checked By
CF	KB
Project No.	**Drawing No.**
230417	Figure 5-1
Scale	**Date**
1:80,000	2024-09-16

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5.3.4 Age Structure

Table 5-3 presents the population percentages of the State, County Wexford, and the 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 5-2.

Table 5-3 Population per Age Category in 2022 (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 Wexford	19.8%	11.8%	25.0%	26.7%	16.7%
Population Study Area	20.9%	11.5%	23.7%	28%	15.9%

The age structure of the Population Study Area population is broadly similar to those recorded at State and county level for most categories. Within the 25-44 age category, the population study areas population percentage is lower than both than State and County at 23.72%. In contrast, the age range 45-64 has a higher percentage in the Population Study Area when compared with a County and State level. For the Population Study Area, the highest population percentage also occurs within this 45-64 age category, similar to the County level, whereas the State level's highest population percentage occurs in the 25-44 age bracket.

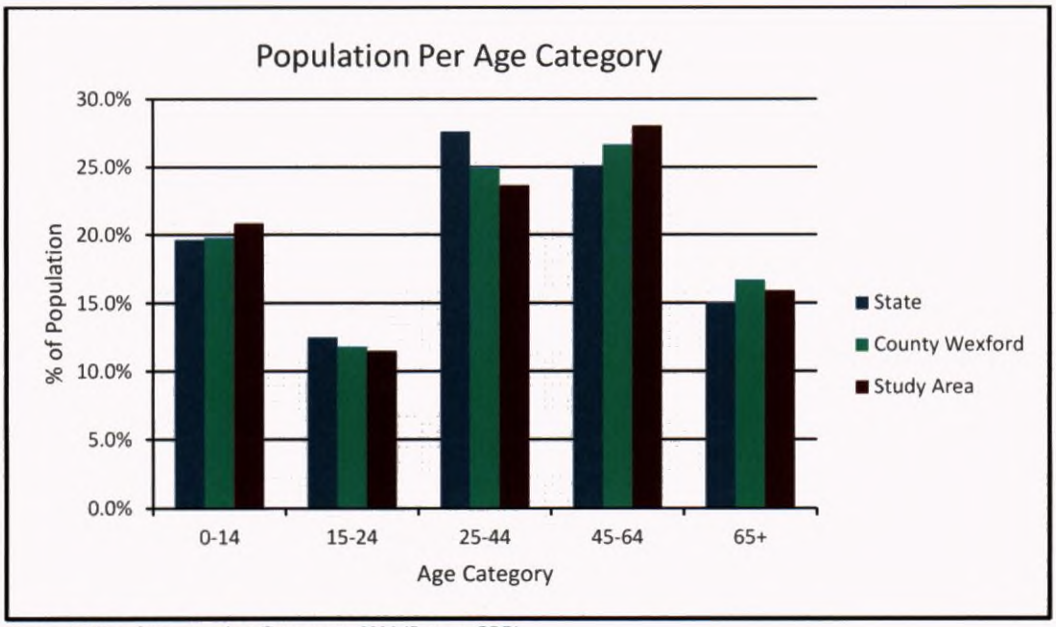

Figure 5-2 Population per Age Category in 2022 (Source: CSO)

5.3.5 Employment and Economic Activity

5.3.5.1 Economic Status of the Population Study Area

The labour force consists of those who are able to work, i.e., those who are aged 15+, no longer in full-time education and are not performing duties that prevent them from working. In 2022, there were 2,531,099 persons in the labour force in the State. Table 5-5 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 5-4 Economic Status of the Total Population Aged 15+ in 2022 (Source: CSO)

Status		State	County Wexford	Population Study Area
% of population aged 15+ who are in the labour force		**61.2%**	**58.64%**	**59.33%**
% of which are:	At work	91.67%	90.16%	93.19%
	Looking	1.36%	1.49%	0.72%
	Unemployed	6.96%	8.35%	6.09%
% of population aged 15+ who are not in the labour force		**38.82%**	**41.36%**	**40.67%**
% of which are:	Student	28.6%	22.89%	24.82%
	Home duties	16.96%	18.95%	22.22%
	Retired	40.96%	42.92%	38.43%
	Unable to work	11.79%	13.45%	12.3%
	Other	1.69%	1.79%	2.23%

Overall, the principal economic status of those living in the Population Study Area is higher than that recorded at State and at County 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 Population Study Area level, and was overall slightly lower than within the State, with 59.3% of people over the age of 15 in the labour force within the Population Study Area. Of those who were not in the labour force during the 2022 Census, the highest percentage of those living in the Population Study Area were 'Retired' individuals, similar to state and county populations.

5.3.5.2 Employment by Socio-Economic Group

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. The 'Higher Professional' category includes scientists, engineers, solicitors, town planners and psychologists. The 'Lower Professional' category includes teachers, lab technicians, nurses, journalists, actors and driving instructors. Skilled occupations are divided into manual skilled such as bricklayers and building contractors; semi-skilled such as roofers and gardeners;

and unskilled, which includes construction labourers, refuse collectors and window cleaners. Figure 5-3 shows the percentages of those employed in each socio-economic group in the State, County Wexford, and the Population Study Area during 2022.

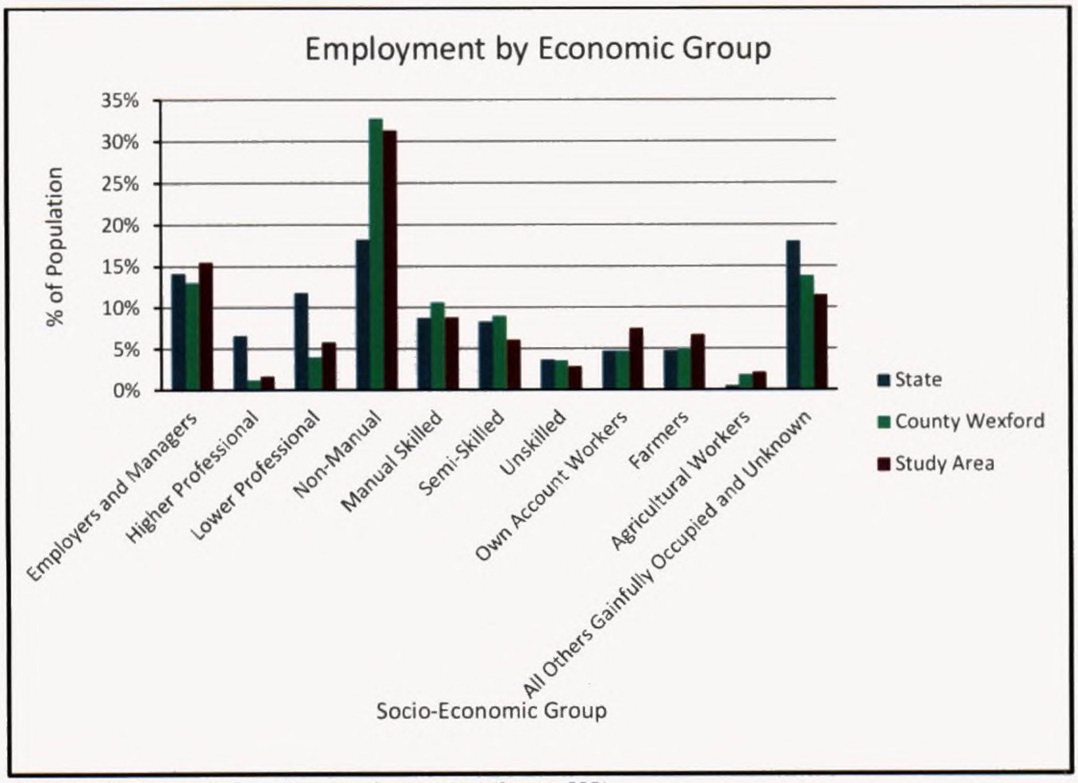

Figure 5-3 Employment by Socio-Economic Group in 2022 (Source: CSO)

The highest level of employment within the Population Study Area was recorded in the Non-Manual category. The levels of employment within the Employers and Managers, Own Account Workers and Farmers and Agricultural Workers were higher than those recorded for the State and Wexford County, while those recorded within the Unskilled, Semi-Skilled and All Other Gainfully Occupied and unknown were lower. The remaining categories, Higher Professionals, Lower Professional, Manual Skilled, Non-Manual, fall in the middle of State and County averages.

The CSO employment figures grouped by socio-economic status includes the entire population for the Population 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.

5.3.5.3 Employment and Investment Potential in the Irish Wind Energy Industry

5.3.5.3.1 *Background*

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

> *"Ireland is fortunate to enjoy one of the best wind resources in the world. Developing this resource will reduce and stabilise energy prices in Ireland and boost our long-term*

competitiveness as an economy. It will also significantly reduce our dependence on imported fossil fuels."

More recently, a report published in 2014 by Siemens entitled '*An Enterprising Wind - An economic analysis of the job creation potential of the wind sector in Ireland*', also in conjunction with the Irish Wind Energy Association (IWEA), concluded that, *'a major programme of investment in wind could have a sizeable positive effect on the labour market, resulting in substantial growth in employment.'*

The report considers the three potential types of direct employment created, as a result of increased investment in wind energy, to be:

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

5.3.5.3.2 Energy Targets

The Climate Action Plan 2024 (CAP)[3] was published on the 20th of December 2023 by the Department of Communications, Climate Action and Environment. Following on from Climate Action Plans 2019, 2021 and 2023, CAP 2024 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021 which commits Ireland to a *"legally binding target if net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030"*. The CAP 2024 sets out an ambitious course of action over the coming years to address the impacts which climate may have on Ireland's environment, society, economic and natural resources and indicative ranges of emissions reductions for each sector of the economy. The CAP includes a commitment that 80% of Ireland's electricity needs will come from renewable sources by 2030 and a revised target of 6 GW of onshore wind energy by 2025, to increase to 9 GW of onshore wind energy by 2030, with at least 5 GW of offshore wind energy by the end of 2030.

5.3.5.3.3 Employment Potential

A 2014 report entitled *'An Enterprising Wind: An economic analysis of the job creation potential of the wind sector in Ireland'*[4] 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 wind farms, 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 4.2GW as of February 2021, which would support employment during the last decade. Ireland must achieve a total of 8.2GW of onshore wind by 2030, which will further support employment in this sector.

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[3] *Department of Environment, Climate and Communications (2023). Climate Action Plan 2024. Available at: https://www.gov.ie/pdf/?file=https://assets.gov.ie/284675/70922dc5-1480-4c2e-830e-295afd0b5356.pdf#page=null*

[4] *ESRI (2014). – An Enterprising Wind: An Economic Analysis pf the Job Creation Potential of the Wind Sector in Ireland. Available at: https://www.esri.ie/publications/an-enterprising-wind-an-economic-analysis-of-the-job-creation-potential-of-the-wind*

The Sustainable Energy Authority of Ireland estimates in their '*Wind Energy Roadmap 2011-2050*'[5] 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. 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 recent report published by MaREI, the SFI Research Centre for Energy, Climate and Marine, hosted by University College Cork4 (March 2021)[6] details that in order to meet the government target of net-zero carbon emissions by 2050, at least 25,000 jobs will be created in the development of onshore and offshore wind to meet our zero carbon targets.

A more recent report which was issued by WindEurope in February 2022, titled *'Wind Energy in Europe: 2021 Statistics and the Outlook for 2022-2026'* details various scenarios in Europe in respect to the EU target for renewable energy. According to WindEurope's report, *"Europe installed 17GW (11 GW in the EU-27) of new wind capacity in 2021. This is not even half of what the EU should be building to be on track to deliver its 2030 Climate Energy Goals."* The report continued 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 February 2024, there were 6,094 Megawatts (MW) of wind energy capacity installed on the island of Ireland[7]. Of this, 4,730.4 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.

5.3.5.3.4 Economic Value

The 2009 Deloitte report titled *'Jobs and Investment in Irish Wind Energy – Powering Ireland's Economy'*[8] states that the construction and development of wind energy projects across the island of Ireland would involve approximately €14.75 billion of investment from 2009 up to 2020, €5.1 billion of which would be retained in the Irish economy (€4.3 billion invested in the Republic of Ireland and €0.8 billion in Northern Ireland).

[5] *Sustainable Energy Authority of Ireland (2019). 'Wind Energy Roadmap 2011-2050'. SEAI, Dublin. Available at:* https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf
[6] *MaREI and WEI (March 2021). Our Climate Neutral Future – Zero by 50. Available at:* https://www.marei.ie/our-climate-neutral-future-zeroby50/
[7] *EirGrid (2024). System and Renewable Data Reports. Available at:* https://www.eirgrid.ie/grid/system-and-renewable-data-reports
[8] *Deloitte, Irish Wind Energy Association (2009) Jobs and Investment in Irish Wind Energy Powering Ireland's Economy. Deloitte. Available at: https://windenergyireland.com/images/files/9660bd5e72bcac538f47d1b02cc6658c97d41f.pdf*

The report also states that increasing the share of our energy from renewable sources will deliver significant benefits for the electricity customer, the local economy and society. It estimates that between 25 and 30% of capital investment is retained in the local economy. This typically flows to companies in construction, legal, finance and other professional services. The report states:

> *".. the framework acknowledges the need to put the energy/climate change agenda at the heart of Ireland's economic renewal. Every new wind farm development provides a substantial contribution to the local and national economy through job creation, authority rates, land rents and increased demand for local support services. More wind on the system will also result in lower and more stable energy prices for consumers while helping us achieve our energy and emissions targets."*

A 2019 report by Baringa, *'Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020'*,[9] 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 4.1GW 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 70 by 30 Implementation Plan Reports[10] 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".*

If consent is granted for the Proposed Development, the Project will continue to contribute to the economic value that renewable energy brings to Ireland by reducing the reliance of fossil fuels in Ireland and assist in meeting our renewable energy targets as set out by the EU.

5.3.6 Land-Use

The Project site is currently operational as a wind farm, 110kV substation and grid connection and has been since 2005.

The predominant land-use within the overall Population Study Area is agricultural split between arable and pastoral land throughout the existing wind farm and substation site and public road corridor. with the data contained in Table 5-5 below.

The total area of farmland within the Population Study Area measures approximately 15,411.7 hectares, comprising approximately 86.4% of the Population Study Area, according to the CSO Census of Agriculture 2020. There are 331 agricultural holdings within the Population Study Area, with an average farm size of 46.56 hectares.

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[9] Baringa (2019). Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020
[10] IWEA, (2020). 70by30 Implementation Plan (Four Reports). Available at: https://windenergyireland.com/images/files/70by30-implementation-plan-reports.pdf

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

Characteristic	Value
Size of Population Study Area	**17,838 ha**
Total Area Farmed within Population Study Area	**15,411.7 ha**
Farmland as % of Population Study Area	**86.4%**
Breakdown of Farmed Land in Population Study Area	Area (hectares)
Total Grassland	**12,047**
Total Cereals	**2,681**
Total Cattle Herd (Beef)	**31,554**
Total Dairy Cows	**10,150**
Total Sheep	**13,265**

5.3.6.1 Equine Industry

There are 4 stud farms or equestrian facilities identified within 10km of the existing wind farm and substation. The closest such facility is Ballywalter Stables/Newton Stables which is located approximately 335m to the northwest of the EIAR site boundary in the townland of Newtown, and is owned by the existing participating landowners. Shrule Equestrian Centre, Model Country Sport Horses and Ballycanew Riding Centre are located southeast of the Proposed Development at an approximate distance of 1.7km, 7.2km, and 8.9km respectively.

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

Horses in Stables

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

Breeding Mares

A study by Le Blanc et al (1991) and summarised by Marshall Day studied the effects of simulated aircraft noise over 100 dB and visual stimuli on pregnant mares. The study focused on pregnancy success, behaviour, cardiac function, hormonal production and rate of habitation. Le Blanc concluded the following:

> *Le Blanc et al (1991) found that birth success of pregnant mares was not affected by F-14 jet aircraft noise. While the 'fright-flight' reaction was initially observed, the mares did adapt to the noise.*

Racehorses

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

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

5.3.6.1.2 Guidance

In the absence of national policy or guidance in relation of the development of wind farms near stud farms/equestrian centres, MKO have reviewed the British Horse Society's *'Advice on Wind Turbines and Horses – Guidance for Planners and Developers'*[11]. A copy of the guidance document is included in Appendix 5-1 of this EIAR.

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

> *The BHS strongly recommends that the views and concerns of local equestrians should be recognised and taken into account when determining separation distances and that normally a minimum separation distance of 200m or three times blade tip height (whichever is greater) will be required between a turbine and any route used by horses or a business with horses.*

As mentioned previously, the closest stud farm or equestrian facility is located approximately 335m from Ballywater Wind Farm site and is owned by the participating landowners. The existing turbines and closest equestrian centre are at a distance beyond that of the British Horse Society's recommended minimum separation distance of 200 metres as noted above. The minimum separation distance from existing turbines exceeds the 297 metres separation distance (based on the recommended three times the turbine blade tip height 99 metres) between a turbine and any business with horses.

5.3.7 Services

The main services for the Population Study Area are located within the town of Gorey, approximately 15.5 kilometres northwest of the Project. Other settlement centres in the wider region which provide retail, recreational, educational, and religious services include Enniscorthy Co. Wexford, approximately 22.5 kilometres to the southwest of the Project, and Wexford Town, Co. Wexford, approximately 27 kilometres to the south of the Project.

5.3.7.1 Education

The nearest school to the Project is Boolavogue National School, situated along the grid connection route, approximately 7km southwest of Crane 110kV Substation, while Kilnamanagh National School is situated approximately 2.5 south of the grid connection. Monageer National School is siutaed approximately 1.7km northeast of the grid connection route, approximately 2.4km from Crane Substation.

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[11] *British Horse Society (2015). Advice on Wind Turbines and Horses – Guidance for Planners and Developers.*

The nearest school to the Proposed Development is the Ballygarrett National School, located in County Wexford, approximately 2.9km northwest of the Proposed Development at its closest point (T21). St. Josephs Primary School, the next closest National School, is located approximately 4.3km south of the Proposed Development at its closest point (T03).

The closest secondary school is Coláiste an Átha, situated approximately 4km south of the Proposed Development at its closest point (T03). The closest third-level institute to the site is the Waterford and Wexford Training Centre. It is located approximately 28.5km to the south of the Proposed Development at its closest point (T03).

5.3.7.2 Access and Public Transport

Access to the existing Ballywater Wind Farm and Ballywater 110kV Substation is via two existing roads, one in the smaller northeast cluster connecting to the local road into Oldbawn, and another access track to the west adjoining the R742 to Kilmuckridge. The Proposed Development is served by several existing agricultural roads and tracks, and existing wind farm maintenance tracks. The current entrances to Ballywater Wind Farm will remain the primary entrances, utilising the existing access roads and infrastructure. No additional access routes or internal site tracks are required to be built for construction machinery as this site is currently operational and does not require any further construction work.

There are no public transport routes available to access this site. The nearest bus stop is 1.63km away in Clonevin, serviced by Bus Eireann route 379 daily.

5.3.7.3 Amenities and Community Facilities

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 Kilmuckridge, and Courtown and Blackwater. The towns of Gorey and Enniscorthy also offer a large selection of amenities and community facilities. There are several GAA clubs in the areas in the vicinity of the Project, some of which are the Ballygarrett GAA Club, Buffers Alley GAA Club, St. Brigid's Blackwater and Oulart the Ballagh GAA Club. There are also a number of football clubs within the areas surrounding including St. Josephs AFC, Killenagh Wanderers AFC, St. Cormac's AFC, The Ballagh Utd FC and Blackwater Football Club.

The varied environment of this area of County Wexford provides many opportunities for walking, cycling and playing golf. Courtown Golf Course, Ballymoney Golf Club and Tara Glen Golf and Country Club are all located in in the area surrounding Courtown village approximately 19km north of the Project. There are a number of beaches which run along the east coast of County Wexford located in the area surrounding the Project, including Ballinoulart Bay Beach, Old Bawn Beach, and Morriscastle Beach, with access points to each beach located 700m, 1.7km, and 2.3km respectively from the closest turbine. Cahore Pier and Cliff Walk is located approximately 2.6km from the Project.

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

5.4 Tourism

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. Fáilte Ireland's *Tourism Barometer: Strategic Research and Insight*[12]

[12] *Fáilte Ireland (September 2023). Tourism Barometer Strategic Research and Insight. Available at: (September 2023) Fáilte Ireland* https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/failte-ireland-tourism-barometer-september-2023.pdf?ext=.pdf

document notes that 52% of the Irish businesses surveyed have reported an increase in tourism numbers and revenue in 2023 in comparison to 2022.

5.4.1 Tourist Numbers and Revenue

5.4.1.1 Overseas Tourism and Revenue

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 (*Key Tourism Facts 2019 Fáilte Ireland, March 2021*).[13] 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.

The Republic of Ireland is divided into seven tourism regions.

Table 5-6 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2019 (T*ourism Facts 2019*, Fáilte Ireland, March 2021).

Table 5-6 Overseas Tourists Revenue and Numbers 2019 (Source: Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Non-Domestic Tourists (000s)
Dublin	€2,305m	6,927
Mid-East/Midlands	€400m	1,124
South-East	**€282m**	**995**
South-West	€995m	2,373
Mid-West	€480m	1,455
West	€701m	2,056
Border	€411m	1,365
Total	€5,574 m	16,295

The South-East Region, in which the site of the Project is located, comprises Counties Carlow, Kilkenny, Waterford and Wexford. This Region benefited from approximately 13% of the total number of overseas tourists to the country and approximately 13% of the total tourism income generated in Ireland in 2019.

Table 5-7 presents the county-by-county breakdown of overseas tourist numbers and revenue to the South-East Region during 2017 (*'2017 Topline Tourism Performance By Region', Fáilte Ireland, August 2018*)[14]. There is no published County by County tourism breakdown for 2018 to 2022 to date. As can be observed, County Wexford had a tourism revenue of €886 million in 2017.

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[13] *Fáilte Ireland (March 2021). Key Tourism Facts 2019. Available at: www.failteireland.ie*
[14] *Fáilte Ireland (August 2018). 2017 Topline Tourism Performance By Region. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf*

Table 5-7 Overseas Tourism to South-East Region during 2017 (Source: Fáilte Ireland)

County	Revenue Generated by Overseas and domestic Tourists (€m)	No. of Overseas Tourists (000s)
Carlow	**273**	**79**
Kilkenny	613	315
Waterford	**582**	**255**
Wexford	**886**	**232**

5.4.1.2 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[15]. During 2022, total domestic expenditure was approximately €2,930 million, an increase from €2,146.6 million in 2019 and €2,006 million in 2018.

Table 5-8 shows the total estimated expenditure and breakdown of domestic tourist trips numbers to each of Irelands seven tourist regions during 2022.

Table 5-8 Domestic Tourism Expenditure and Trips (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 South-East Region, benefitted from approximately 14.3% of total domestic trips and 13% of associated estimated expenditure in Ireland in 2022.

5.4.2 Tourist Attractions

County Wexford is located within Ireland's Ancient East. This section of Ireland is contained in Fáilte Ireland's 2013 Path to Growth Document, which claims that the Ancient East '*will be an immersive experience of living culture, breath-taking landscape, and hidden history made remarkable by vibrant communities, local lore and the authentic character of the real Ireland.*' Wexford County Council is

[15] *Fáilte Ireland, (October 2023). Key Tourism Facts 2022. Available at:* *https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/2022-key-tourism-facts.pdf?ext=.pdf*

playing a direct role in delivering sustainable tourism related developments throughout the county in their 2022-2028 County Development Plan.

County Wexford has several views, prospects and scenic routes, which are identified for protection in the Wexford County Development Plan 2022-2028. These include views to and from upland areas, views of heritage features, and views at several waterbodies and coastal promontories.

There is one key identified tourist attractions pertaining specifically to the site of the Project itself. Wells House and Gardens, which is host to a number of tours and woodland walks, is located approximately 1.5 kilometres south of the Underground Grid Connection, at its closest point. 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, as discussed above.

The nearest tourist information centre to the Project site is located approximately 30km from the site in Wexford Town, which operates seasonally during the summer months. Tourist attractions within these centres include gardens, museums, art collections and galleries, farmers markets and food outlets, heritage sites, breweries, historical sites and touring routes to other tourism activities in Ireland.

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

- **Hook Lighthouse** – the oldest intact operational lighthouse in the world, providing tours to the public.
- **Dunbrody Famine Ship** – an authentic reproduction of an 1840's emigrant vessel.
- **Tintern Abbey** – a Cistercian Monastery founded in 1200, surrounded by woodlands and walking trails.
- **JFK Homestead and Arboretum** – a 623-acre arboretum containing several walks and hilltop views.
- **Irish National Heritage Park** – containing 35 acres of reconstructed historic villages with hillside, woodland and riverbank walks.
- **Secret Valley Wildlife Park** – 14 acre facility hosting both exotic and native wildlife, with activities such as animal feeding, pony rides and educational talks.

The following are located within 10km of the Project site:

- **Wells House and Gardens** – host to a number of mythical woodland walks and historic tours.
- **Ferns Castle** – an historic pre-Norman castle in the centre of Ferns Town.
- **Seal Rescue Ireland** – a dedicated seal rescue and rehabilitation centre, providing educational tours and information to the public.
- **Enniscorthy Castle** – built in the 13th century, Enniscorthy Castle now acts as an historical hub which explores the history of the town and Castle itself from its Anglo-Norman origins, with tours and historical and art exhibitions.

5.4.2.1 Tourist Attitudes to Wind Farms

5.4.2.1.1 *Scottish Tourism Survey 2021*

BiGGAR Economics undertook an independent study in 2021, entitled *'Wind Farms and Tourism Trends in Scotland: Evidence from 44 Wind Farms'*[16], to understand the relationship, if any, that exists between the development of onshore wind energy 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

[16] *BiGGAR Economics (2016). Wind Farms and Tourism Trends in Scotland. Midlothian, Scotland.*

wind energy and tourism, it would be at a more local level. The 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.

5.4.2.1.2 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 or not 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.

With regard to 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 Project throughout the site design and assessment processes. Reference has been had to the Department of the Environment, Heritage and Local Government's *'Planning Guidelines on Wind Energy Development 2006'* and the Draft Revised Wind Energy Development Guidelines December 2019 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 public perception of wind energy, including those living in the vicinity of a wind farm, are presented in Section 5.5 below.

5.5 Public Perception of Wind Energy

5.5.1 Sustainable Energy Ireland Survey 2003

5.5.1.1.1 *Background*

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

5.5.1.1.2 *2003 Findings*

The SEAI survey published in 2003, found that the overall attitude to wind farms is very positive, with 84% of respondents rating it positively or very positively. One percent rates it negatively and 14% had no opinion either way. Approximately two thirds of respondents (67%) were found to be positively disposed to having a wind farm in their locality. Where negative attitudes were voiced towards wind farms, the visual 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 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.

5.5.1.2 Survey Update 2017

Additionally, a survey carried out by Interactions in October 2017, published by the SEAI, show 47% of Irish adults polled said they 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 while fewer people, just over two in three, cited cheaper electricity.

5.5.1.2.1 Conclusions

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

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

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

5.5.1.3.1 Background

A survey of the public perception of wind power in Scotland and Ireland was carried out in 2003/2004 by researchers at the School of Geography & Geosciences, University of St. Andrews, Fife and The Macaulay Institute, Aberdeen *('Green on Green: Public Perceptions of Wind Power in Scotland and Ireland'*, 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.

5.5.1.3.2 Study Area

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

5.5.1.3.3 Findings

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

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

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

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

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

With regards to wind farm size, 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.

5.5.1.3.4 **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 syndrome does not adequately explain variations in public attitudes due to the degree of subjectivity involved.

5.5.2 WEI 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[17]. 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 2022, 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, which is a 6% increase on the 2021 results (54% of those in favour were 'strongly in favour'). Amongst rural residents, 4 in 5 (85%) were recorded as having favourable attitudes towards wind power. The survey has been run annually since 2017 and while there has been a marginal decrease in those in favour of wind power nationally during this time (from 85% to 80%) there has been an increase in those in favour from the rural population (from 79% to

[17] *WEI (2024). 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.*

85%). The 2023 surveys results are largely in line with those of 2022, showing a consistent level of support and a positive attitude toward wind energy in Ireland.

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

When 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.

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.

5.6 Human Health

5.6.1 Health Effects of Wind Farms

The 2022 Census of Ireland as carried out by the Central Statistics Office provides the general health conditions of the population of the EDs which make up the Population Study Area for the Project. The vast majority of those within the Population Study Area marked their general health as being 'very good' across all EDs. It is not anticipated that the general health of the population of the Population Study Area will be altered due to the Project.

5.6.1.1 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 also 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 arising 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*[18]

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 'infrasound's' 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*[19]

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, in particular, 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."*

[18] American Wind Energy Association and Canadian Wind Energy Association (2009). Wind Turbine Sound and Health Effects - An Expert Panel Review, USA and Canada.
[19] Australian Government National Health and Medical Research Council (NHMRC) Wind Turbines & Health (2010). A Rapid Review of the Evidence. Australia.

4. ***Position Statement on Health and Wind Turbines'**, Climate and Health Alliance, (February 2012)*[20]

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, is in contrast to 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 a number of 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."*

[20] *Climate and Health Alliance (2012). Position Statement on Health and Wind Turbines. Australia.*

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 201 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. Another recent publication by Chapman and Crichton (2017) entitled *'Wind turbine syndrome; A communicated disease*[21] critically discusses why certain health impacts might often be incorrectly attributed to wind turbines.

[21] *Chapman and Crichton (2017). Wind turbine syndrome; A communicated disease.*

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.

The HSE position paper determines that current scientific evidence on adverse impacts of wind farms on health is weak or absent. Further research and investigative processes are required at a larger scale in order to be more informative for identifying potential health effects of exposure to wind turbine effects. They advise developers on making use of the Draft Revised Wind Energy Development Guidelines (2013), as a means of setting noise limits and set back distances from the nearest dwellings.

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, therefore, 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, however, it states that no evidence is available to facilitate the recommendation of one type of intervention over another.

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***

The purpose of this 2022 study was to examine the potential health effects of audible sound and inaudible infrasound has on noise sensitive adults over a period of 72 hours. Sufferers of wind turbine syndrome (WTS) have attributed their ill-health and particularly their sleep disturbance to the signature of infrasound. On this basis, the objectives of the study were to test the effects of 72 hours of infrasound exposure on human physiology, particularly sleep. The results of the study are outlined below:

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

5.6.2 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s *'Wind Energy Development Guidelines for Planning Authorities 2006'* 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 DoEHLG Guidelines 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 will be 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.

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

5.6.3 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: Information about Electric & Magnetic Fields and the electricity network in Ireland*'[22] provides further practical information on EMF. Further details on the potential impacts of electromagnetic interference to telecommunications and aviation are presented in Chapter 13: Material Assets.

5.6.4 Assessment of Effects on Human Health

As set out in the Department of Housing, Planning, Community and Local Government '*Key Issues Consultation Paper on the Transposition of the EIA Directive 2017*' 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 should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters. The EPA Guidelines 2022 reiterates that the EIAR should assess the potential impacts on population & human health under the environmental categories addressed elsewhere in the EIAR such as air, water and soil and other health and safety issues as relevant. Chapter 7: Land, Soils & Geology, Chapter 8: Hydrology & Hydrogeology, Chapter 9: Air & Climate, Chapter 10: Noise & Vibration and Chapter 13: Material Assets provide an assessment of the effects of the Project on these areas of consideration. As the existing wind farm and substation are already operational and require no additional infrastructure, the potential for health effects associated with the construction phase of the Project is not applicable.

The existing site design and mitigation measures outlined in Chapter 7: Land, Soils & Geology and Chapter 8: Hydrology & Hydrogeology ensures that the potential for effects on the water environment are not significant. No impacts on local water supplies are anticipated.

As set out in Chapter 8: Hydrology & Hydrogeology, potential health effects are associated with negative impacts on public and private water supplies and potential flooding. There are no mapped public or group groundwater scheme protection zones in the vicinity of the Project

A wind farm is not a recognised source of pollution. It is not an activity which requires Environmental Protection Agency licensing under the Environmental Protection Act 1992, as amended. As such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects.

The Proposed Development is for the extension of lifetime of the existing Ballywater Wind Farm and Ballywater 110kV Substation, capable of offsetting carbon emissions associated with the burning of fossil fuels. During the operational phase, the wind farm has had, and will continue to have, a long term, significant, positive effect on air quality, as set out in Chapter 9: Air & Climate, which will contribute to positive effects on human health.

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 at Ballywater Wind Farm. This is a safety requirement of the Irish Aviation Authority (IAA). An updated lighting plan, if required, will be committed to through communication and engagement between the Applicant and the IAA as part of the extension of operation of the existing Ballywater Wind Farm.

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. It is considered that aviation lighting will continue to have no significant effect on human health, beyond increasing aircraft safety in the context of the Project. The applicant will continue its engagement with IAA as required in relation to aviation lighting.

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22 ESB (2017). EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland. Available at: https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0

5.6.5 Vulnerability of the Project to Natural Disaster and Major Accidents

An assessment of the Project's vulnerability to natural disasters can be found in Chapter 15 of this EIAR. A brief discussion can be found below.

As outlined above, a wind farm is not a recognised source of pollution. Should a major accident or natural disaster occur the potential sources of pollution onsite during the operational and decommissioning phases are limited. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health such as bulk storage of hydrocarbons or chemicals, storage of wastes etc., are limited.

There is limited potential for significant natural disasters to occur at the Project site. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to flooding, fire, and landslide events. The risk of flooding is addressed in Chapter 8: Hydrology & Hydrogeology. It is considered that the risk of significant fire occurring, affecting the wind farm and causing the wind farm to have significant environmental effects is limited. As described previously, there are no significant sources of pollution in the wind farm 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. The issue of turbine safety is addressed in Section 5.6.2 above.

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 Project is not regulated 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 is no potential effects from this source. The nearest SEVESO site to the Project site is European Refreshments ULC located over 30 kilometres away from the Project.

5.7 Property Values

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'*.[23] 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 disproportionately impact on the local housing market, further research is required before relying on its findings.

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

One of the largest studies of the impact of wind farms on property values has been carried out in the United States. *'The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis'*, December 2009, was carried out by the Lawrence Berkley National Laboratory (LBNL) for the U.S Department of Energy. This study collected data on almost 7,500 sales of single-family homes situated within ten miles of 24 existing wind farms in nine different American states over a period of approximately ten years. The conclusions of the study are drawn from eight different pricing models including repeat sales and volume sales models. Each of the homes included in the study were visited to demonstrate the degree to which the wind facility was visible at the time of the sale, and the conclusions of the report state that "The result is the most comprehensive and data rich analysis to date on the potential impacts of wind energy projects on nearby property values."

The main conclusion of this study is as follows:

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

This study has been updated by LBNL who published a further paper entitled "*A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States*", 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.

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

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

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[24] *Energy Policy (September 2023). Available at:* https://www.sciencedirect.com/science/article/pii/S0301421523004226

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*'[25] 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*' was published by Climate Exchange[26]. 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 5-3 of this EIAR.

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

- No evidence of a consistent negative effect on house prices: Across a very wide range of analyses, including results that replicate and improve on the approach used by Gibbons (2014), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 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.

A recent large study conducted in the USA on *"The visual effect of wind turbines on property values is small and diminishing in space and time"*[27] investigated the impact on house prices within the viewshed of a property, in an assessment of the externality cost of visibility of wind turbines and wind farms on house prices. The study focused on the effect of wind turbine visibility, rather than just proximity which has been the basis of assessment of other similar studies. On composing a geospatial database of wind turbine visibility across the USA, the potential change in house prices in locations with visible turbines, on the beginning of their operation, was assessed. The study found that on average, wind turbine visibility negatively affects home values in an economically and statistically significant way in close proximity (5 miles/8 km). However, the effect diminishes over time and in distance and is indistinguishable from zero for larger distances and toward the end of the study sample.

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 referred to previously 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 continued operation of the existing Ballywater Wind Farm.

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[25] *CEBR (March 2014).* The effect of wind farms on house prices. ***Available at:*** https://www.renewableuk.com/news/304411/RenewableUK-Cebr-Study--The-effect-of-wind-farms-on-house-prices.htm
[26] *Climate Exchange (October 2016). Impact of Wind Turbines on House Prices in Scotland.*
[27] *Guo W., et al., (2024). Available at:* https://www.pnas.org/doi/epub/10.1073/pnas.2309372121

5.8 Shadow Flicker

5.8.1 Background

Shadow flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in a nearby property. Shadow flicker is an indoor phenomenon, which may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine's blade. Outside in the open, light reaches a viewer (person) from a much less focused source than it would through a window of an enclosed room, and therefore shadow flicker assessments are typically undertaken for the nearby adjacent properties around a proposed wind farm site[28].

The frequency of occurrence and the strength of any potential shadow flicker impact depends on several factors, each of which is outlined below.

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

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

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

[28] 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

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

At distances of greater than approximately 500 metres between a turbine and a receptor, shadow flicker generally occurs only at sunrise or sunset when the shadow cast by the turbine is longer. At distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low (*'Wind Energy Development Guidelines for Planning Authorities'*, DoEHLG, 2006). Figure 5-4 illustrates the shadow cast by a turbine at various times during the day, where 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.

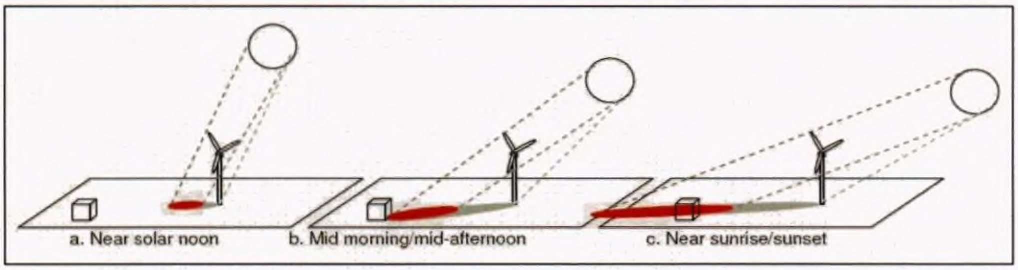

Figure 5-4 Shadow-Prone Area as a Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, December 2008)

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 impact 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 distance, the turbine blades do not cover the sun but only partly mask it, substantially weakening the shadow. This impact occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a very weak impact is observed at a 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 have to 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 5-5.

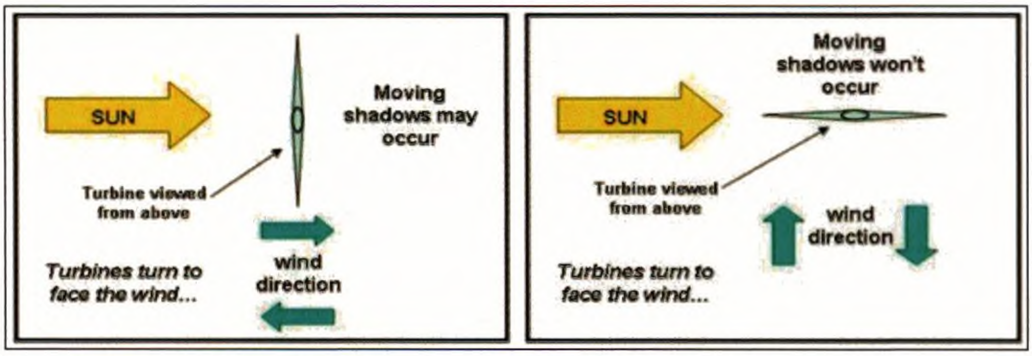

Figure 5-5 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environmental Power LLC)

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.

5.8.2 Guidance

The relevant Irish guidance for shadow flicker is derived from the '*Wind Energy Development Guidelines for Planning Authorities*' (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) and the '*Best Practice Guidelines for the Irish Wind Energy Industry*' (Irish Wind Energy Association, 2012).

The DoEHLG 2006 wind energy guidelines recommend that shadow flicker at dwellings within 500 metres of a proposed turbine location should not exceed a total of 30 hours per year or 30 minutes per day.

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

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

Although the DoEHLG thresholds apply to dwellings located within 500 metres of a wind turbine location, for the purposes of this assessment, the guideline thresholds of 30 hours per year or 30 minutes per day have been applied to all properties located within ten rotor diameters of the existing turbines (700 metres in this case) within the existing Ballywater Wind Farm and Ballywater 110kV Substation site (as per IWEA guidelines, 2012). The DoEHLG Guidelines state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low.

The adopted 2006 DoEHLG guidelines are currently under review. The DoEHLG released the 'Draft Revised Wind Energy Development Guidelines' in December 2019. The Draft 2019 guidelines recommend 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 Draft 2019 Guidelines are based on the recommendations set out in the *'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review'* (December 2013) and the *'Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'* (June 2017).

The assessment herein is based on compliance with the current DoEHLG Guidelines limit (30 hours per year or 30 minutes per day). However, it should also be noted the Proposed Development will be capable of complying with the shadow flicker requirements of the 2019 draft guidelines, should they be adopted while this application is in the planning system, through the implementation of the mitigation measures outlined in Section 5.10.3.10.

5.8.3 Shadow Flicker Prediction Methodology

Shadow flicker occurs only under certain, combined circumstances, as detailed above. Where shadow flicker does occur, it is generally short-lived. The Department of the Environment, Heritage and Local Government (DoEHLG) guidelines state that careful site selection, design and planning, and good use of relevant software can help avoid the possibility of shadow flicker in the first instance, all of which have been employed at the site of the Proposed Development. Proper siting of wind turbines is key to reducing or eliminating shadow flicker.

The occurrence of shadow flicker can be precisely predicted using specialist computer software programmes specifically developed for the wind energy industry, such as WindPRO: Shadow, WindFarm (ReSoft), 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 shadow flicker impact can be precisely modelled to give the start and end time (accurate to the second) 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 if the model indicates that an exceedance of the shadow flicker guideline limit might occur, as detailed further below.

For the purposes of this shadow flicker assessment, the software package WindPRO: Shadow (Version 4.0.423) has been used to predict the level of shadow flicker associated with the proposed wind farm development. WindPRO is a commercially available software tool that enables developers to analyse, design and optimise proposed wind farms. It allows proposed turbine layouts to be optimised for maximum energy yield whilst taking account of environmental, planning and engineering constraints.

5.8.4 Shadow Flicker Assessment Criteria

5.8.4.1 Turbine Dimensions

The existing turbine dimensions of rotor diameter 70 metres and hub height 64 metres and tip height 99 metres have been modelled for this assessment.

Digital Terrain Modelling (DTM) was used to determine the approximate ground elevation at which the wind turbines and surrounding properties are located for the purposed of running the model. The use of DTM data ensures that realistic elevation variations between the turbines and properties is accounted for.

With the benefit of the mitigation measures outlined in Section 5.10.3.1, all turbines installed on-site will comply with the current adopted 2006 DoEHLG guideline thresholds of 30 minutes per day, or 30 hours per year, or with any revised guidelines if required. This will be achieved through the use of turbine control software throughout the entire operational period of the Proposed Development.

5.8.5 Study Area

There is a total of 90 no. residential buildings including occupied, unoccupied/derelict and permitted, located within a distance of ten maximum rotor diameters (700 metres) from the existing turbine locations.

The study area for the shadow flicker assessment is 700m, which is ten times the rotor diameter from each turbine, as set out in the *'Wind Energy Guidelines for Planning Authorities'*, DoEHLG, 2006 guidelines. All residential properties located within 700m have been included in the assessment. The study area was also the subject of a planning history search, to identify properties that may have been granted planning permission, but not yet been constructed. The locations of all dwellings in the study area are shown in Figure 5-6, with all dwellings detailed in Table 5-9 in Section 5.8.6 below.

The closest dwelling to the Proposed Development is located approximately 324m from the nearest existing turbine (T21). The nearest derelict property, which is under the ownership of the participating landowners, is located 87 metres from the nearest turbine, T8.

The shadow flicker study area and sensitive receptor locations are shown in Figure 5-6.

Map Legend

- EIAR Site Boundary
- Existing Turbines
- 700m Turbine Buffer (10 Rotor Diameter)
- Dwellings within Shadow Flicker 700m Assesment Area

N

Drawing Title

Shadow Flicker Study Area

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm

Drawn By	Checked By
CF	RK
Project No. 230417	Drawing No. Figure 5-6
Scale 1:14,000	Date 2024-09-24

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5.8.5.1 Assumptions and Limitations

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

No screening due to trees or other buildings or vegetation is assumed. It was not considered necessary or practical to measure the dimensions of every window on every property in the Shadow Flicker Study Area. While the actual size of a window will marginally influence the incidence and duration of any potential shadow flicker impact, with larger windows resulting in slightly longer shadow flicker durations, any additional incidences or durations or shadow flicker over and above those predicted in this assessment can be countered by extending the mitigation strategies outlined in Section 5.10.3.10.

At each property, shadow flicker calculations were carried out based on 4 no. notional windows facing north, east, south and west, labelled Windows 1, 2, 3 and 4 respectively. 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 tilt angle is assumed to be zero. 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, any additional incidences or durations or shadow flicker over and above those predicted in this assessment can be countered by extending the mitigation strategies outlined in Section 5.10.3.

The use of computer models to predict the amount of shadow flicker that will occur is known to produce an over-estimate of possible impact, referred to as the *'worst-case impact'*, due to the following limitations:

- The sun is assumed to be shining during all daylight hours such that a noticeable shadow is cast. This will not occur in reality.
- The wind is always assumed to be within the operating range of the turbines such that the turbine rotor is turning at all times, thus enabling a periodic shadow flicker. Wind turbines only begin operating at a specific 'cut-in speed', and cease operating at a specific 'cut-out speed'. In periods where the wind is blowing at medium to high speeds, the probability of there being clear or partially clear skies where the sun is shining and could cast a shadow, is low.
- The wind turbines are assumed to be available to operate, i.e., turned on at all times. In reality, turbines may be switched off during maintenance or for other technical or environmental reasons.
- The turbine rotor is considered (as a sphere) to present its maximum aspect to observers in all directions. In reality, the wind direction and relative position of the turbine rotor would result in a changing aspect being presented by the turbine. The rotor will actually present as ellipses of varying sizes to observers from different directions. The time taken for the sun to pass across the sky behind a highly elliptical rotor aspect will be shorter than the modelled maximum aspect.

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 35.97% of the daylight hours per year. This percentage is based on Met Éireann data recorded at Rosslare, Co. Wexford over the 30-year period from 1978-2007 (https://www.met.ie/climate/30-year-averages). The actual sunshine hours at the Proposed Development site and therefore the percentage of time shadow flicker could actually occur is 35.97% of daylight hours. Table 5-9 below lists the annual shadow flicker calculated for each property when the regional average of 35.97% sunshine is taken into account, to give a more accurate annual average shadow flicker prediction. Table 5-9 below 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.

5.8.6 Shadow Flicker Assessment Results

5.8.6.1 Daily and Annual Shadow Flicker

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

The model results assume worst-case conditions, including:

- 100% sunshine during all daylight hours throughout the year,
- An absence of any screening (vegetation or other buildings),
- That the sun is behind the turbine blades,
- That the turbine blades are facing the property, and
- That the turbine blades are moving.

The maximum daily shadow flicker model is based on the assumption 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 35.97% 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 5-9.

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

The DoEHLG Wind Energy Guidelines 2006 recommend that shadow flicker at dwellings should not exceed a total of 30 hours per year. For the purposes of this assessment, the guideline threshold has been applied to all sensitive receptors, as defined in the Guidelines, within 700 metres of the existing turbine locations. A total of 90 no. residential buildings have been included in the shadow flicker assessment, the results of which are presented in Table 5-9 below.

Properties which are in a derelict condition (i.e., uninhabitable) will not require mitigation measures to be implemented. Additionally, it is worth reiterating that the predicted shadow flicker listed in Table 5-9 is considered conservative and in reality, the occurrence and/or duration of shadow flicker at these properties is likely to be eliminated or significantly reduced as the following items are not considered by the model:

- Receivers may be screened by topography, cloud cover and/or vegetation/built form i.e., adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions onto the wind farm.

Table 5-9 Maximum Potential Daily and Annual Shadow Flicker Results for Ballywater Wind Farm, Co. Wexford.

House ID*	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest 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)	Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
5	719474	644442	Dwelling**	87	T8	02:03:00	491:12:00	176:41:44	T03, T05, T06, T09, T12, T13, T15, T16, T17	Yes	No
6	720401	645669	Dwelling	324	T21	00:46:00	118:00:00	42:26:50	T21, T22, T23, T24	Yes	Yes
7	720383	645651	Dwelling	349	T21	00:41:00	111:11:00	39:59:42	T21, T23, T24	Yes	Yes
8	720441	646118	Dwelling***	365	T21	01:12:00	82:54:00	29:49:15	T21, T22	Yes	No
9	720358	645657	Dwelling	367	T21	00:47:00	118:39:00	42:40:52	T21, T23, T24	Yes	Yes
10	720067	643302	Dwelling	366	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
11	720165	643265	Dwelling	366	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
12	719806	643398	Dwelling	377	T18	00:36:00	45:29:00	16:21:41	T20	Yes	Yes
13	719902	643397	Dwelling	382	T19	00:00:00	0:00:00	0:00:00	N/A	No	No
14	720041	643295	Dwelling	385	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
15	720175	643235	Dwelling	394	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
16	720596	646235	Dwelling	404	T21	00:30:00	14:17:00	5:08:17	N/A	No	No
17	720307	645665	Dwelling	409	T21	00:43:00	111:14:00	40:00:47	T21, T23, T24	Yes	Yes
18	720352	645584	Dwelling	413	T21	00:37:00	63:02:00	22:40:28	T24, T23	Yes	Yes
19	719859	643375	Dwelling	414	T18	00:37:00	29:12:00	10:30:14	T20	Yes	Yes
20	720308	645638	Dwelling	420	T21	00:42:00	100:21:00	36:05:53	T21, T23, T24	Yes	Yes
21	720204	643204	Dwelling	421	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
22	720144	643214	Dwelling	421	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
23	718817	643994	Dwelling	422	T3	00:32:00	16:48:00	6:02:36	T09	Yes	Yes

**Note on House IDs: Initial dwellings list for the purposes of shadow flicker assessment contained possible dwellings identified as House ID 1, 2, 3 and 4. It was subsequently confirmed that these were not inhabited dwellings and therefore did not need to be considered in the shadow flicker assessment. House IDs 1-4 were then removed from the list, but the House IDs for the remainder of the dwellings remained the same in order stay consistent with the numbering for dwellings used in the Noise Assessment undertaken in Chapter 10 of this EAIR.*
***Derelict; ***Participating Landowner*

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest 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)	Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
24	718680	644054	Dwelling	428	T3	00:31:00	37:51:00	13:36:56	T06	Yes	Yes
25	720287	645643	Dwelling	436	T21	00:40:00	99:13:00	35:41:26	T21, T23, T24	Yes	Yes
26	720294	645412	Dwelling	440	T24	00:37:00	42:09:00	15:09:44	T23, T24	Yes	Yes
27	720318	645493	Dwelling	445	T24	00:37:00	56:38:00	20:22:20	T23, T24	Yes	Yes
28	720110	643198	Dwelling	445	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
29	720307	645587	Dwelling	447	T21	00:34:00	73:16:00	26:21:20	T21, T23, T24	Yes	Yes
30	720332	645528	Dwelling	449	T24	00:37:00	58:49:00	21:09:28	T23, T24	Yes	Yes
31	719281	643650	Dwelling	446	T9	00:37:00	27:55:00	10:02:32	T18	Yes	Yes
32	719427	643412	Dwelling	457	T18	00:25:00	24:29:00	8:48:26	N/A	No	No
33	718630	644054	Dwelling	460	T3	00:28:00	18:38:00	6:42:10	N/A	No	No
34	718598	644083	Dwelling****	461	T3	00:27:00	14:23:00	5:10:26	N/A	No	No
35	719411	645236	Dwelling	479	T7	00:29:00	20:43:00	7:27:08	N/A	No	No
36	720248	643148	Dwelling	475	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
37	718524	644133	Dwelling	488	T3	00:35:00	38:23:00	13:48:26	T3	Yes	Yes
38	720359	643148	Dwelling	489	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
39	719346	643441	Dwelling	493	T18	00:00:00	0:00:00	0:00:00	N/A	No	No
40	720651	646341	Dwelling	502	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
41	720224	645390	Dwelling	503	T24	00:32:00	45:00:00	16:11:15	T24, T23	Yes	Yes
42	720372	644890	Dwelling	509	T11	00:32:00	36:55:00	13:16:47	T11. T15	Yes	Yes
43	720298	643120	Dwelling	506	T20	00:00:00	0:00:00	0:00:00	N/A	No	No
44	720235	645477	Dwelling	515	T24	00:32:00	31:02:00	11:09:48	T24, T23	Yes	Yes
45	720241	645509	Dwelling	522	T24	00:32:00	39:06:00	14:03:54	T24, T23	Yes	Yes

*****Planning Permission*

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest 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)	Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
46	720972	646273	Dwelling	525	T21	00:34:00	31:46:00	11:25:38	T21	Yes	Yes
47	718532	644066	Dwelling	522	T3	00:24:00	10:26:00	3:45:11	N/A	No	No
48	721030	646261	Dwelling	532	T22	00:32:00	36:26:00	13:06:21	T21	Yes	Yes
49	720822	646357	Dwelling	538	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
50	720781	646367	Dwelling	538	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
51	721195	646215	Dwelling	539	T22	00:26:00	23:21:00	8:23:58	N/A	No	No
52	720800	646363	Dwelling	538	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
53	720732	646376	Dwelling	539	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
55	721055	646272	Dwelling	547	T22	00:31:00	34:11:00	12:17:47	T21	Yes	Yes
56	720759	646381	Dwelling	548	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
57	720696	646388	Dwelling****	549	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
59	720961	646310	Dwelling****	550	T21	00:30:00	20:16:00	7:17:25	N/A	No	No
61	721085	646278	Dwelling	559	T22	00:29:00	28:52:00	10:23:02	N/A	No	No
62	721119	646271	Dwelling	562	T22	00:28:00	20:29:00	7:22:06	N/A	No	No
63	720860	646370	Dwelling	561	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
64	718488	644060	Dwelling	560	T3	00:18:00	7:36:00	2:44:02	N/A	No	No
65	718568	643975	Dwelling	560	T3	00:00:00	0:00:00	0:00:00	N/A	No	No
70	721151	646271	Dwelling	572	T22	00:27:00	16:47:00	6:02:14	N/A	No	No
76	718369	644527	Dwelling	578	T3	00:28:00	12:59:00	4:40:13	N/A	No	No
77	720785	646411	Dwelling	582	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
78	720512	646398	Dwelling	582	T21	00:00:00	0:00:00	0:00:00	N/A	No	No

*****Planning Permission*

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest 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)	Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
79	720494	646395	Dwelling	585	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
80	720728	646424	Dwelling	587	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
87	721210	646278	Dwelling	602	T22	00:25:00	12:40:00	4:33:23	N/A	No	No
88	721033	646333	Dwelling	603	T22	00:29:00	24:19:00	8:44:50	N/A	No	No
89	721006	646346	Dwelling	604	T21	00:28:00	17:52:00	6:25:37	N/A	No	No
92	718492	643979	Dwelling	610	T3	00:00:00	0:00:00	0:00:00	N/A	No	No
93	720586	646449	Dwelling	616	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
95	721112	646335	Dwelling	621	T22	00:27:00	27:06:00	9:44:54	N/A	No	No
96	721167	646319	Dwelling	623	T22	00:26:00	16:44:00	6:01:10	N/A	No	No
97	721138	646329	Dwelling	623	T22	00:26:00	23:06:00	8:18:34	N/A	No	No
98	721196	646320	Dwelling	635	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
100	720332	646375	Dwelling	637	T21	00:09:00	1:42:00	0:36:41	N/A	No	No
101	720398	646420	Dwelling	644	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
102	721102	646363	Dwelling	646	T22	00:26:00	24:36:00	8:50:57	N/A	No	No
103	721127	646360	Dwelling	649	T22	00:26:00	25:14:00	9:04:37	N/A	No	No
104	718932	645281	Dwelling	653	T7	00:26:00	15:47:00	5:40:39	N/A	No	No
105	721257	646316	Dwelling	657	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
106	721160	646359	Dwelling	658	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
107	718314	644181	Dwelling	657	T3	00:26:00	12:54:00	4:38:25	N/A	No	No
108	720273	646370	Dwelling	667	T21	00:23:00	12:27:00	4:28:43	N/A	No	No
109	720241	646346	Dwelling	668	T21	00:27:00	21:08:00	7:36:08	N/A	No	No
110	721279	646319	Dwelling	670	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
111	721216	646351	Dwelling	671	T22	00:00:00	0:00:00	0:00:00	N/A	No	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest 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)	Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
112	718339	644097	Dwelling	667	T3	00:26:00	17:48:00	6:24:11	N/A	No	No
113	721250	646337	Dwelling	673	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
114	718326	644119	Dwelling	669	T3	00:26:00	15:11:00	5:27:42	N/A	No	No
115	720350	646433	Dwelling	677	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
116	721210	646373	Dwelling	689	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
117	721240	646375	Dwelling	703	T22	00:00:00	0:00:00	0:00:00	N/A	No	No
118	720307	646436	Dwelling	702	T21	00:00:00	0:00:00	0:00:00	N/A	No	No
119	721509	645311	Dwelling	702	T22	00:00:00	0:00:00	0:00:00	N/A	No	No

Of the 90 no. properties modelled, it is predicted that 26 no. properties, may potentially experience daily shadow flicker in excess of the DoEHLG guideline threshold of 30 minutes per day, in the absence of mitigation measures. Of the 26 no. properties, 1 no. is derelict, 1 no. is owned by the participating landowners and no mitigation is required. This prediction is assuming worst-case conditions (i.e., 100% sunshine on all days where the shadow of the turbines passes over a house, wind blowing in the correct direction, no screening present, etc.) and in the absence of any turbine control measures.

Of the 90 no. properties modelled, when the regional sunshine average (i.e., the mean number of sunshine hours throughout the year[29]) of 35.97% and is taken into account, the DoEHLG total annual guideline limit of 30 hours is predicted as to being potentially exceeded at 7 no. properties, 1 no. is derelict and 1 no. is owned by the participating landowners.

It is worth nothing that in reality, the 'estimated actual' shadow flicker is considered conservative and likely to be significantly less than predicted in Table 5-9 as the following items are not considered by the model:

- Receivers may be screened by cloud cover and/or vegetation/built form i.e., hedging, adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions onto the wind farm;
- At distances, greater than 500-1000 m *'the rotor blade of a wind turbine will not appear to be chopping the light, but the turbine will be regarded as an object with the sun behind it. Therefore, it is generally not necessary to consider shadow casting at such distances[30]'.*

Section 5.10.3.10 outlines the mitigation strategies which may be implemented at the potentially affected properties to ensure the daily and annual shadow flicker threshold will not be exceeded.

5.9 Residential Amenity

Residential amenity relates to the human experience of one's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced in the residence. The closest occupied dwelling is located approximately 324 metres west of an existing turbine location. The Proposed Development site is located in an area which is currently used for pastureland and land primarily used for agricultural purposes. Agricultural practices will continue to be carried out at the site should the Proposed Development application be successful. Thus, the existing land use will be retained in the surrounding landscape. This continuation of existing activities and land use has previously assisted in the assimilation of the Proposed Development into the previously existing receiving environment.

As noted previously, the Project site is a wind farm, substation and grid connection which has been in operation since 2005.

When considering the amenity of residents in the context of a proposed wind farm, there are four main potential impacts of relevance: 1) Shadow Flicker, 2) Noise, 3) Visual Amenity, and 4) Telecommunications. Shadow flicker and noise are quantifiable aspects of residential amenity while

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[29] *The DoEHLG guidelines acknowledge that shadow flicker can only occur when the sun is shining and is at a low angle (after dawn and before sunset),and the turbine is directly between the sun and the affected property, and there is enough wind energy to ensure that the turbine blades are moving.*

[30] *Danish Wind Energy Association, (2003). Shadow Variations from Wind Turbines. Available at: http://xn--drmstrre-64ad.dk/wp-content/wind/miller/windpower%20web/en/tour/env/shadow/shadow2.htm*

visual amenity is more subjective. Detailed shadow flicker and noise modelling have been completed as part of this EIAR (Section 5.8 above refers to shadow flicker modelling, Chapter 10 of this EIAR addresses noise). A comprehensive landscape and visual impact assessment has also been carried out, as presented in Chapter 12 of this EIAR. Effects on human beings during the operational and decommissioning phases of the Project are assessed in relation to each of these key issues and other environmental factors such as traffic and dust; see Impacts in Section 5.10 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.

5.10 Likely Significant Effects 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 Project.

5.10.1 'Do-Nothing' Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm and substation once the current planning permission expires in 2025 and restoration of the site to its original use as agricultural lands for pasture and crops.

Condition no. 17 of the existing planning permission for Ballywater Wind Farm and by consequence, for the existing Ballywater 110kV Substation states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."*

Similarly, condition no. 13 of the current planning permission states:

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"* (WCC Pl. Ref. 2001/0458)"

Should the Decommissioning Plan as set out in the Planning Conditions for the existing Ballywater Wind Farm be implemented, it may lead to environmental effects on population and human health due to the potentially extensive groundworks required to remove existing access tracks and the turbine foundations. the removal of the access roads has the potential to create significant noise and dust issues as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm infrastructure a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

5.10.2 Construction Phase

As has been detailed in Chapter 1 and Chapter 4 of this EIAR, no construction works or ground works are required as part of the Project, as the proposal seeks to extend the operational life of the existing wind farm and substation.

Therefore, there is no potential for construction phase related impacts commonly discussed, such as may relate to Population and Human Health, including Health and Safety, Noise, Dust, and Traffic related impacts.

5.10.3 Operational Phase

5.10.3.1 Health and Safety

Pre-Mitigation Impact

The continuation of the operational phase of the Project poses 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 DoEHLG 2006 Guidelines 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 typically manufactured of wood and laminated layers of glass fibre which will prevent any likelihood of an increase in lightning strikes within Project site 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 continued operation of the Project will not present a danger to the public or livestock. Rigorous safety checks are conducted on the turbines during design, construction, commissioning, and operation to ensure the risks posed to staff, landowners and general public are **negligible**.

Proposed Mitigation Measures

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

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

Signs have also been erected at suitable locations across the site as required for the ease and safety of operating the various components of the Project. 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.

Other operational health and safety measures which are currently in operation at the site include:

- All site visitors must complete a site-specific health and safety induction prior to entering the site;
- Visitors must log onto the site on entry and log the site on exit by contacting a 24-hourly monitored control room;
- Minimum site Personal Protective Equipment (PPE) is necessary in order to enter the site, including a hard hat, safety boots and hi-visibility clothing; and
- Along the grid connection, on the public roadway, underground marker post are present.

An operational phase Health and Safety Plan has been developed to fully address identified Health and Safety issues associated with the operation of the site and provides for access for emergency services at all times. This Health and Safety Plan is updated regularly as necessary.

Wind turbines are designed to last up to 30 years with proper and timely maintenance 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 has been carried out by the turbine manufacturer or appointed service company. Further information on the lifetime of the turbines can be found in Appendix 4-1. A project or 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 Residual Impact** on health and safety during the continuation of the operational life of the Project.

Significance of Effects

Based on the assessment above there will be **No Significant Direct or Indirect Effects**.

5.10.3.2 Employment and Investment

The extension of the operational phase will present an opportunity for mechanical-electrical contractors and craftspeople to become involved with the maintenance and operation of the existing wind farm and substation, and Underground Grid Connection components. On a medium-term scale, the Project will sustain the continued employment of the personnel involved in the maintenance and control of the wind farm. This will have a **Medium-Term Slight Positive Effect**.

5.10.3.3 Population

The extension of the operational phase of the Project will have **No Effect** on the population of the area with regards to changes to trends, population density, household size or age structure.

5.10.3.4 Land-use

The footprint of the Project site, including turbines, roads etc., occupies only a small percentage of the total Study Area defined for the purposes of this EIAR. The primary land-use of agriculture and the public road corridor during the operational phase will continue to co-exist with the wind farm, onsite substation and Underground Grid Connection. The Project will have no effect on other land-uses within the wider area.

5.10.3.5 Property Values

As noted in Section 5.7 above, the conclusions from available international literature indicate that property values are not impacted by the positioning of wind farms near houses. It is on this basis that it can be reasonably concluded that there would be a **Medium-Term Imperceptible Effect** from the Project.

5.10.3.6 Noise

A baseline assessment of the predicted background noise conditions was carried out, the results of which are presented in Chapter 10 of the EIAR. A noise assessment of the operational phase of the Project has also been carried out through modelling of the development using noise prediction software. The predicted noise levels for the Project have been derived based on guidance in the Institute of Acoustics (IOA) document *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (2013) (IOA GPG).[31]

Details of the omni-directional noise prediction assessment carried out by AWN Consulting are presented in Chapter 10 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, medium-term nature. It is noted that, Ballywater Wind Farm and Ballywater 110kV Substation have been operating for 19 years and such is it not considered that a significant effect on the noise environment is associated with the continuation of its operation. The noise impact representative of the nearest noise sensitive location has been assessed to identify the potential greatest impact associated with the continued operation of the existing wind farm and substation.

As stated in the noise assessment in Chapter 10, the noise levels associated with the Project at noise-sensitive locations will be within best practice noise criteria recommendations, therefore, it is not considered that **No Significant Effect** is associated with the Project.

5.10.3.7 Traffic

During the continued operational phase, the wind farm will continue to be remotely monitored. Traffic associated with the operational phase of the wind farm will be from Ballywater Windfarm Ltd. personnel visiting the onsite substation and control building, and maintenance personnel who will visit individual turbines. The traffic volumes that will be generated by the Project during its continued operation will be minimal. The site will generate monthly maintenance trips, with approximately two maintenance staff travelling to site at any one time as discussed in Section 4.6.2 of Chapter 4 of this EIAR.

Typically, there are no more than two trips per day to the site made by car or light goods vehicle. The direct effect on the surrounding road network will be **Imperceptible Neutral and Medium-Term** given the very low volume of daily trips to the site.

5.10.3.8 Renewable Energy Production and Reduction in Greenhouse Gas Emissions

Ireland did not meet its 2020 renewable energy target of 16%. The actual renewable energy share for Ireland in 2020 was 13.5%, which translates to a 3.3 TWh shortfall of renewable energy (SEAI Energy in Ireland 2021 Report' (December 2020)). In June 2022, the EPA published an update on *Ireland's Greenhouse Gas Emission Projections 2021-2040* using the latest Inventory data for 2020. The report

[31] *Institute of Acoustics (IOA) (2013). A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA GPG).*

provides an assessment of Ireland's progress towards achieving its emission reduction targets for 2021 and 2030 as set out under the EU Effort Sharing Decision (ESD) and Effort Sharing Regulation (ESR). Under the Additional Measures scenario, renewable energy is projected to increase up to 78% of electricity generated by 2030 with emissions from the Energy Industry decreasing by 10% per annum from 2021-30. Increased coal use from 2021 and growing energy demand, including from data centres, threaten to negatively impact achievement of National targets, particularly for the first carbon budget period. EPA projections show that 'existing measures' (i.e., no additional policies being implemented beyond those already in place by 2020), Ireland will achieve a reduction of 5% on 2005 levels by 2030, which is significantly short of the 2030 target. 'Additional Measures' (i.e., full implementation of policies outlined in the Climate Action Plan 2021) are paramount to achieve our 2030 targets. With Additional Measures it is projected that renewables will make up 80% of Ireland energy generation with the majority being produced by wind energy developments.

The Project will offer significant benefits in terms of renewable energy production and reductions in greenhouse gas emissions. In this regard, it will have a **Medium-Term Significant Positive Effect**. The carbon loss and savings due to the Project are discussed in Chapter 9: Air and Climate of this EIAR.

5.10.3.9 Tourism and Amenity

Pre-Mitigation Impacts

Given that there are currently no tourism attractions or amenity walkways located within the site there are no impacts associated with the operational phase of the development. The Department of the Environment, Heritage and Local Government's (DoEHLG) *Wind Energy Development Guidelines for Planning Authorities* 2006 state that "*the results of survey work indicate that tourism and wind energy can co-exist happily*". It is not considered that the Project would have an adverse impact on tourism infrastructure in the vicinity. Renewable energy developments are an existing feature at the site and in the surrounding landscape.

5.10.3.10 Shadow Flicker

Pre-Mitigation Impacts

As a result of the proposed lifetime extension of Ballywater Wind Farm and assuming worst-case conditions, a total of 26 no. properties may experience daily shadow flicker in excess of the current DoEHLG guideline threshold of 30 minutes per day. The DoEHLG total annual guideline limit of 30 hours is predicted to be exceeded at 7 no. properties when the regional sunshine average of 35.97% is taken into account. As stated in Section 5.8.5 there are 90 no. properties located within 700m (of the existing turbines, (of which 86 no. are inhabited dwellings, 1 no. is an uninhabited derelict building, and 3 no. are dwellings which have been granted planning permission for dwellings that are not yet constructed but are included in this assessment). Of the 26 no. properties predicted to experience daily shadow flicker in excess of the current guideline threshold of 30 minutes per day, 1 no. is a participating landowner and 1 no. is an uninhabited derelict property. 24 no. existing properties may be subject to mitigation measures in order to ensure the Guideline's 30-minute daily and/or 30-hour annual shadow flicker thresholds are not exceeded.

Proposed Mitigation Measures

Where daily or annual shadow flicker exceedances are predicted at any inhabitable or 3rd party dwelling of the identified 24 no. sensitive properties, a site visit will be undertaken firstly to determine the presence of existing screening and window orientation at each potentially affected property. This will determine if the receptor has an actual line of sight to any turbine and actual potential for shadow flicker to occur. Once this exercise is completed and all of the potentially affected properties identified, the following measures will be employed.

Screening Measures

In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including:

- Installation of appropriate window blinds in the affected rooms of the residence;
- Planting of screening vegetation;
- Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation.

If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator.

Wind Turbine Control Measures

If it is not possible to mitigate any identified shadow flicker limit exceedance locally using the measures detailed above, wind turbine control measures will be implemented.

Wind turbines can be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm. The shadow flicker control units will be added to any required turbines.

A shadow flicker control unit allows a wind turbine to be programmed and controlled using the wind farm's Supervisory Control and Data Acquisition (SCADA) system to change a particular turbine's operating mode during certain conditions or times, or even turn the turbine off if necessary.

All predicted incidents of shadow flicker can be pre-programmed into the wind farm's control software. The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to avoid excessive shadow flicker occurrences at properties which are not naturally screened or cannot be screened with measures outlined above. Where such wind turbine control measures are to be utilised, they need only be implemented when the specific combined circumstances occur that are necessary to give rise to the shadow flicker effect in the first instance. Therefore, if the sun is not shining on a particular day that shadow flicker was predicted to occur at a nearby property, there would be no need to shut down the relevant turbines that would have given rise to the shadow flicker at the property. Similarly, if the wind speed was below the cut-in speed that caused the turbine rotor to rotate and give rise to a shadow flicker effect at a nearby property, there would be no need to shut down the relevant turbines that otherwise would have caused shadow flicker.

The atmospheric variables that determine whether shadow flicker will occur or not, are continuously monitored at the Wind Farm Site and the data fed into the wind farm's SCADA control system. The strength of direct sunlight is measured by way of photocells, and if the sunlight is of sufficient strength to cast a shadow, the shadow flicker control mechanisms come into effect. Wind speed and direction are measured by anemometers and wind vanes on each turbine and if wind speed and direction is such that a shadow will be cast, the shadow flicker control mechanisms come into effect. The moving blades of the turbine will require a short period of time to cease rotating and as such there may be a very short period during which the blades are slowed to a complete halt. The turbines giving rise to shadow flicker may be turned off on different days to prevent excessive wear and tear on any single turbine.

In order to ensure that the model and SCADA system is accurate and working well a site visit will be carried out to verify the system. The shadow flicker prediction data will be used to select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered to.

1. *Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e. blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still etc.).*
2. *Recording the house number, time and duration of site visit and the observation point GPS coordinates.*
3. *Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation.*
4. *In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded.*
5. *The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working.*
6. *Following 12 months of full operation of the Project a report can be prepared for the Local Authority describing the shadow flicker mitigation measures used at the wind farm and confirming the implementation and successful operation of the system.*

This method of shadow flicker mitigation has been technically well-proven at wind farms in Ireland and also in areas outside Ireland that experience significantly longer periods of direct sunlight. In order to demonstrate how the SCADA control system can be applied to switch off particular turbines at the relevant times and dates, Table 5-10 below lists the 24 properties at which a shadow flicker mitigation strategy may be necessary to ensure the DoEHLG Guidelines 30-minute per day shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to reduce daily shadow flicker to below the guideline limit of 30 minutes. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree alternative mitigation measures with the relevant property owner. The mitigation strategy outlined in Table 5-10 below is based on the theoretical precautionary scenario. The details presented in Table 5-10 list the days per year and the turbines that could be programmed to switch off at specific times, in order to reduce daily shadow flicker to a maximum of 28 minutes, which is below the guideline limit of 30 minutes.

Where a shadow flicker mitigation strategy is to be implemented, it is likely that the control mechanisms would only have to be applied to a turbine to bring the duration of shadow flicker down to the 28-minute post-mitigation shadow flicker target.

Overall, the details presented in Table 5-10 demonstrate that using the turbine control system, it will be possible to reduce the level of shadow flicker at any affected property to below the daily guideline limit of 30 minutes, by programming the relevant turbines to switch off at the required dates and times.

Table 5-10 Shadow Flicker Mitigation Strategy for Daily Shadow Flicker Exceedance

Property No.	Max. Daily shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) Producing Shadow Flicker Exceedance	No. of Days 30min/day Threshold is Exceeded	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)	Post-mitigation Maximum Annual Shadow Flicker (hrs:min:sec)
6	00:46:00	42:26:50	T21, T23, T24	139	1-24, 61-75, 151-195, 272-287, 323-365	01/01-24/01, 02/03-16/03, 31/05-14/07, 29/09-14/10, 19/11-31/12	≤00:28:00	≤30:00:00
7	00:41:00	39:59:42	T21, T23, T24	115	6-30, 65-78, 155-191, 269-282, 318-341	06/01-30/01, 06/03-19/03, 04/06-10/7, 26/09-09/10, 14/11-07/12	≤00:28:00	≤30:00:00
9	00:47:00	42:40:52	T21, T23, T24	121	12-30, 65-76, 144-202, 271-282, 318-335,	12/01-30/01, 06/03-17/03, 24/05-21/07, 28/09-09/10, 14/11-1/12	≤00:28:00	≤30:00:00
12	00:36:00	16:21:41	T20	72	137-208	17/05-27/07	≤00:28:00	≤30:00:00
17	00:43:00	40:00:47	T21, T23, T24	113	22-31, 68-73, 132-214, 273-280, 317-326	22/01-31/01, 09/03-14/03, 12/05-02/08, 30/09-07/10, 13/11-22/11	≤00:28:00	≤30:00:00
18	00:37:00	22:40:28	T24, T23	40	29-44, 79-91, 256-268, 303-319	29/01-13/02, 20/03-1/4, 13/09-	≤00:28:00	≤30:00:00

Property No.	Max. Daily shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) Producing Shadow Flicker Exceedance	No. of Days 30min/day Threshold is Exceeded	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)	Post-mitigation Maximum Annual Shadow Flicker (hrs:min:sec)
						25/09, 30/10-15/11		
19	00:37:00	10:30:14	T20	39	155-191	04/06-10/07	≤00:28:00	≤30:00:00
20	00:42:00	36:05:53	T21, T23, T24	96	26-36, 71-78, 140-205, 269-275, 312-321	26/01-05/02, 12/03-19/03, 20/05-24/7, 26/09-02/10, 08/11-17/11	≤00:28:00	≤30:00:00
23	00:32:00	6:02:36	T09	10	106-111, 235-240	16/04-21/04, 23/08-28/08	≤00:28:00	≤30:00:00
24	00:31:00	13:36:56	T06	17	137-144, 202-209	17/05-24/05, 21/07-28/07	≤00:28:00	≤30:00:00
25	00:40:00	35:41:26	T21, T23, T24	99	28-36, 73-77, 136-210, 271-274, 312-319	28/01-05/02, 14/03-18/03, 16/05-29/07, 18/09-01/10, 08/11-15/11	≤00:28:00	≤30:00:00
26	00:37:00	15:09:44	T23, T24	43	66-79, 111-118, 228-235, 268-281	07/03-20/03, 21/04-28/04, 18/08-23/08, 25/09-08/10	≤00:28:00	≤30:00:00
27	00:37:00	20:22:20	T23, T24	48	49-63, 97-106, 241-250, 285-298	18/02-04/03, 07/04-16/04, 29/08-07/09, 12/10-25/10	≤00:28:00	≤30:00:00

Property No.	Max. Daily shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) Producing Shadow Flicker Exceedance	No. of Days 30min/day Threshold is Exceeded	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)	Post-mitigation Maximum Annual Shadow Flicker (hrs:min:sec)
29	00:34:00	26:21:20	T21, T23, T24	61	34-45, 80-88, 161-185, 260-267, 302-313	03/02-14/02, 21/03-29/03, 10/06-04/07, 17/09-24/09, 29/10-09/11	≤00:28:00	≤30:00:00
30	00:37:00	21:09:28	T23, T24	52	41-55, 90-100,247-257, 292-306	10/02-24/02, 31/03-10/04, 04/09-14/09, 19/10-02/11	≤00:28:00	≤30:00:00
31	00:37:00	10:02:32	T18	34	112-128, 218-234	22/04-08/05, 06/08-22/08	≤00:28:00	≤30:00:00
37	00:35:00	13:48:26	T3	38	155-191	04/06-10/07	≤00:28:00	≤30:00:00

Notwithstanding the approach set out above, should shadow flicker associated with the Project be perceived to cause a nuisance at any home, the affected homeowner is invited to engage with the wind farm operator. Should a complaint or query in relation to shadow flicker be received within 12 months of extension of permission of the wind farm, field investigation/monitoring will be carried out by the wind farm operator at the affected property. The homeowner will be asked to log the date, time and duration of shadow flicker events occurring on at least five different days. The provided log will be compared with the predicted occurrence of shadow flicker at the residence, and if necessary, a field investigation will be carried out.

Residual Impact

Following the implementation of the above suite of mitigations measures, the DoEHLG Guidelines limit of 30 mins per day or 30 hours per year will not be exceeded and this will result in a medium-term, imperceptible negative residual effect from shadow flicker on human health.

Shadow flicker could potentially have a medium-term, slight, negative impact. The implementation of the above mitigation measures, where necessary, will ensure that there will be no shadow flicker exceedances of the existing daily and annual shadow flicker limits at properties within 10 rotor diameters from Ballywater Wind Farm, as recommended in the DoEHLG Guidelines. Likewise, the Project can be brought in line with the shadow flicker requirements of the draft 2019 Guidelines should they be adopted during the planning application process for this development.

Significance of Effects

Based on the assessment above and the mitigation measures proposed, there will be **No Significant Effects** related to shadow flicker on third-party properties.

5.10.3.11 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. Full details are provided in Chapter 2: Background and Policy and Chapter 13: Material Assets. Copies of scoping replies received are presented in Appendix 2-1 of the EIAR. The Project will have **No Effect** on telecommunications.

5.10.3.12 Residential Amenity

Potential impacts on residential amenity during the operational phase of the Project could arise primarily due to noise, shadow flicker, changes to visual amenity or interference with telecommunications. Detailed noise and shadow flicker modelling have been carried out as part of this EIAR, which show that the Project will be capable of meeting all required guidelines in relation to noise thresholds and shadow flicker thresholds set out in the 2006 DoEHLG Wind Energy Guidelines and the Draft Revised Wind Energy Development Guidelines 2019.

The visual impact of the Project is addressed comprehensively in Chapter 12 of this EIAR. An assessment of the effects on landscape character was carried out within the 20km LVIA Study Area, with both the methodology and findings of the described in section 12.7.3 of this EIAR. There is a general mix of visibility of the Project, which is largely screened from view due to vegetation and topography surrounding the site. The greatest potential for significant visual effects is upon residential visual amenity, which will occur in relation to a small number of receptors located within 500m of the existing turbines.

All mitigation as outlined under noise and vibration, visual amenity and shadow flicker in this EIAR will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Project.

Proposed Mitigation Measures

As detailed above, the closest turbine, Turbine No. 21 is 324m from the nearest dwelling. All mitigation as outlined under noise and vibration, traffic, visual amenity, telecommunications and shadow flicker in this EIAR will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Proposed Development.

Residual Impact

With the implementation of the mitigation measures outlined in relation to noise and vibration, traffic, shadow flicker, telecommunications and visual amenity, the Project will have an **Imperceptible Effect** on residential amenity.

Significance of Effects

Based on the assessment above there will be **No Significant Direct or Indirect Effects** on residential amenity.

5.10.4 Decommissioning Phase

The Project includes for the extension of lifetime of the existing wind farm and substation for a further 10 years beyond the expiry of the current permission in 2025. It is not proposed to decommission the Underground Grid Connection. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the site may be decommissioned completely. The substation and all associated above-ground site infrastructure will be removed, and the Proposed Development 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 4-4 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 revegetation growth and reduce run-off and sedimentation.

Any impacts and consequential effects that occur during the decommissioning phase will be similar to that which would have typically occurred during the initial construction phase of the existing wind farm, however, to a lesser extent. 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 4-4 Decommissioning Plan will ensure that the potential for impacts on population and human health are minimised or avoided.

5.10.5 Cumulative Effects

The potential for impact between the Project, wind projects, and other relevant non-wind projects (existing, permitted or proposed) has been carried out with the purpose of identifying what influence the Project will have on Population and Human Health as well as the interactions between these factors, when considered cumulatively and in combination with relevant existing, permitted or proposed projects and plans in the vicinity of the Project site, as set out in Chapter 2 of this EIAR. Please see Section 2.9 of Chapter 2 for cumulative assessment methodology. Please refer to Appendix 2-3 for a comprehensive listing of the considered cumulative and in combination with relevant existing, permitted or proposed projects and plans in the vicinity of the Site.

As demonstrated above, there are no significant effects on Population and Human Heath arising from the operation or decommissioning of the Proposed Development. The impacts with the potential to have cumulative effects on human beings are discussed below and in more detail in the relevant chapters: Chapter 12: Landscape and Visual

5.10.5.1 Health and Safety

The Project will have no 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 Project. 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 Effect** from the Project and other developments in the area.

5.10.5.2 Employment and Economic Activity

There are no other wind energy developments within the Population Study Area. Any permitted projects along with the Project will contribute to short term employment during construction stages. All wind farms including the Project, will provide the potential for medium-term employment resulting from maintenance operations. This results in a medium-term, moderate positive impact. Wind farms within 20 kilometres of the Proposed Development which may be proposed, permitted or operational/existing contribute to short term employment during the construction stages and provide the potential for added medium to long-term employment resulting from maintenance operations.

The commercial agricultural activities on the site of the Proposed Development provides employment, either for harvesting or replanting every year. These activities have continued and expanded while the existing wind farm and substation has been under construction and in operation, resulting in a **Long-Term Moderate Positive Cumulative Effect**.

5.10.5.3 Tourism and Amenity

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

It is not considered that the Project together with other projects in the area will cumulatively affect any tourism infrastructure in the wider area. As mentioned previously, the wind farms is an existing feature in the landscape, and has been assimilated into this environment over its current 20 year lifetime. As also noted in Section 5.4 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 Effect** from the Proposed Development and other wind farm developments in the area.

5.10.5.4 Land-use

Existing land-uses of agriculture and public road corridor will continue in conjunction with the Project and all other existing and permitted wind farms (as shown in Figure 2-1 of this EIAR). Therefore, there will be **No Significant Cumulative Impact** on land-use.

5.10.5.5 Property Values

As noted in Section 5.7 above, it can be concluded that there is the potential for a short-term negative not significant impact on property values within 1km of the existing turbines at the Project site. There are no other cumulative turbines located within 2km of the existing turbines and so this area within 1km, where there is potential for impacts on property values, will not overlap with any other cumulative turbines. On that basis it is concluded that there is **No Potential for Cumulative Effects** on property values to arise.

5.10.5.6 Services

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

In addition, the injection of money into local services though the establishment of the proposed community benefit fund is also expected to be a **Medium-Term Positive Cumulative Effect.**

5.10.5.7 Shadow Flicker

As outlined in Section 5.7.5.2, the nearest wind farm development to the Proposed Development is the existing Ballyduff Wind Farm. However, there will be **No Effect from Cumulative Shadow Flicker** as the there are no other existing, permitted or proposed turbines within the Shadow Flicker Study Area.

5.10.5.8 Residential Amenity

Pre-Mitigation Impacts

Cumulative impacts on residential amenity could potentially arise from impacts due to noise, traffic or visual disturbance.

Proposed Mitigation Measures

All mitigation as outlined in this EIAR will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Proposed Development. 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 and turbines is presented in Chapter 2 of this EIAR. The single turbine at Gorey Business Park turbine is located beyond 5km from the Proposed Development with a tip height of less than 50m. Ballyduff Windfarm is the closest existing or permitted wind farm to the Proposed Development, located approximately 19.9km to the west. Chapter 12 Landscape notes that due to factors including distance, turbine dimensions and natural visual screening by the landscape and vegetation, there is so significant cumulative effects likely to arise. Overall, it is deemed that no significant cumulative effects are likely to occur as a result of the continued operation of the Ballywater Wind Farm turbines.

Residual Impact

During the operational phase, noise and shadow flicker from the proposed and permitted projects will be limited to below guideline levels or as committed to by the developer, resulting in a **Medium-Term, Imperceptible Residual Effect** from on residential amenity.

Significance of Effects

Based on the assessment above there will be **No Significant Direct Or Indirect Effects**.

5.10.5.9 Cumulative Effects Summary

Therefore, there will be **No Significant Effects** arising from the continued operation or decommissioning of the Project with any existing, permitted or proposed project/plans listed in Chapter 2. There is no potential for cumulative effects arising from the continued operation or decommissioning of the Project with other existing, permitted or proposed wind farms in the surrounding landscape. Furthermore, the closest wind farm to the Proposed Development site is the Ballyduff Windfarm, located approximately 19.9km to the west of the site.

5.11 Summary

Following consideration of the residual effects (post-mitigation) it is noted that the Project will not result in any significant effects on human beings in the area surrounding the Project. Following appropriate mitigation in accordance with the Guidelines, shadow flicker limits will not be exceeded at any property. It is noted that the Project can be brought in line with the shadow flicker requirements of the 2019 draft Guidelines, should they be adopted while this application is in the planning system, through the implementation alteration of the mitigation measures outlined.

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

6. BIODIVERSITY

6.1 Introduction

Directive 2014/52/EU of the European Parliament and of the Council, which amends Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive), requires that '(an) environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on, *inter alia*, biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC (the Habitats Directive) and Directive 2009/147/EC (the Birds Directive). Blackstaff Ecology Ltd was retained by CGNEE Ireland Ltd to prepare this Environmental Impact Assessment Report (EIAR) on the proposed lifetime extension of the wind farm and associated infrastructure, located between the villages of Kilmuckridge and Ballygarrett, County Wexford, in compliance with this requirement. This EIAR follows guidance provided in Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency 2022).

The existing wind farm at Ballywater commenced operation in 2005, with a permitted operational life of 20 years. It is proposed to extend the operational lifetime of the wind farm by an additional ten years. The wind farm consists of 21 no turbines with a total output of 42MW, a 110kV substation', met mast and associated access tracks and occupies agricultural fields of low conservation interest. It is anticipated that the wind farm will continue to operate with a similar degree of intensity and disturbance for maintenance and repair as at present. Agricultural operations within the wind farm will continue as at present but are independent of the wind farm.

Ornithological surveys (breeding birds) that contributed to the report were carried out by Karl Hamilton, Catriona Porter, Jazmin Creaney and Brian Sutton of Blackstaff Ecology Ltd and wintering birds by MKO Consultants. Carcass searches and additional winter bird surveys were carried out by staff of MKO planning and environmental consultants. Bat surveys were carried out by Cormac Loughran and Philip Leathem.

6.1.1 Statement of Authority

This report was compiled and undertaken by Dr Brian Sutton CEnv MCIEEM PhD BSc and was reviewed by Mr Cormac Loughran CEnv MCIEEM MSc of Blackstaff Ecology Ltd.

Dr Sutton was awarded a PhD in Environmental Science by the University of Ulster. Prior to working at Blackstaff Ecology, he worked as a member of the Habitat Survey Team of the Environment and Heritage Service for 2 years. Following this, he worked as a consultant ecologist for AECOM Ltd for 15 years, carrying out habitat, bird and mammal surveys for a wide range of governmental and private clients. Projects undertaken were at a range of scales, from small private developments to major infrastructure projects. He has been a Principal Ecologist at Blackstaff Ecology for the past eight years. Dr Sutton has carried out breeding and wintering bird surveys over the past 50 years, and has held a British Trust for Ornithology bird ringing licence throughout that period.

Cormac Loughran, a Chartered Environmentalist (CEnv), and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Cormac has worked professionally as a Consultant Ecologist for the past twenty years. He holds an MSc (Distinction) in Environmental Management from the University of Ulster, and has extensive experience in a broad range of flora and fauna surveys. He has undertaken and coordinated the Ecological Impact Assessments for numerous infrastructure developments; including over 20 windfarms across Ireland.

The qualifications and experience of surveyors who carried out the surveys defined in this report are described in the Appendices that refer to those surveys.

6.1.2 Relevant Legislation and Policy

6.1.2.1 National Legislation

The Wildlife Act, (as amended) 1976-2024 , is the principal mechanism for the legislative protection of wildlife in Ireland. The Wildlife Act provides strict protection for species of conservation value. The Act protects species from injury, disturbance and damage to their breeding and resting sites. Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs) are heritage sites that are designated or are under consideration for designation for the protection of flora, fauna, habitats and geological sites. NHAs are designated under the Wildlife (Amendment) Act 2017. Proposed Natural Heritage Areas (pNHAs) currently have no statutory protection but are considered to be of significance for wildlife and habitats as they may form statutory designated sites in the future (NPWS, 2018).

6.1.2.2 National Policy

The National Biodiversity Action Plan 2023-2030 is a framework for the conservation and protection of biodiversity in Ireland. The main objective of the plan is to conserve and restore biodiversity and ecosystem services. Objectives of the National Biodiversity Action Plan identify measures that are relevant to future developments:

- Objective 1 - Adopt a Whole of Government, Whole of Society Approach to Biodiversity
- Objective 2 - Meet Urgent Conservation and Restoration Needs
- Objective 3 - Secure Nature's Contribution to People
- Objective 4 - Enhance the Evidence Base for Action on Biodiversity
- Objective 5 - Strengthen Ireland's Contribution to International Biodiversity Initiatives

Such policies have informed the evaluation of ecological features recorded within the study area and the ecological assessment process. Consultation for a successor Action Plan closed in November 2022. It is likely that the new Action Plan will build on the principles developed for the earlier Plan.

6.1.2.3 European Legislation

The Habitats Directive (together with the Birds Directive) forms the cornerstone of Europe's nature conservation within the EU. It is built around two pillars: the Natura 2000 network of protected sites and a strict system of species protection. The Directive protects over 1,000 animal and plant species and over 200 defined habitat types that are of European importance. The EU Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC), which were transposed into Irish law as S.I. No. 94/1997 European Communities (Birds and Natural Habitats) Regulations 1997, recognise the significance of protecting rare and endangered species of flora and fauna and their habitats. The amended Birds Directive was codified as Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds. The 1997 Regulations and their amendments were subsequently revised and consolidated in S.I. No. 477/2011- European Communities (Birds and Natural Habitats) Regulations 2011. This legislation requires the establishment and conservation of a network of sites of particular conservation value that are to be termed 'European Sites'.

Annex I of the Habitats Directive lists Priority Habitat types the conservation of which requires the designation of Special Areas of Conservation (SAC). Annex II of the Directive lists animal and plant species whose conservation also requires the designation of SACs. Annex IV lists animal and plant species in need of strict protection and Annex V lists animal and plant species whose taking in the wild and exploitation may be subject to management measures. Species can be listed in more than one Annex, as is the case with lesser horseshoe bat which is listed in both Annex II and Annex IV.

Council Directive 2009/147/EC (the Birds Directive) on the conservation of wild birds instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (Article 2). Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (Article 3). Bird species listed in Annex I require special conservation measures in relation to their habitats. These species have been listed on account of *inter alia*: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. Special Protection Areas (SPAs) are to be identified and designated for these Annex I listed species and for regularly occurring migratory species, paying particular attention to the protection of wetlands (Article 4).

6.1.2.4 Relevant Guidance

The assessment methodology is based primarily upon the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019). This EIAR follows the Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022). The assessment is consistent with the National Roads Authority (NRA) Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009); these standard guidelines describe recognised survey methodologies that ensure good practice regardless of the development type.

Evaluation of the potential use of the site by bat species follows the guidance provided by the Bat Conservation Trust (2023) – *Bat Surveys for Professional Ecologists Good Practice Guidelines,* and *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (NatureScot, 2021). The latter considers direct impacts such as collision mortality, but there is reference throughout to the need for a full impact assessment requiring wider consideration of other (indirect) effects. The guidance addresses the key elements of survey, impact assessment and mitigation.

Northern Ireland Environment Agency has published *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland*, which generally follows NatureScot 2021 guidance and provides additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context.

6.2 Methodology

6.2.1 Scope of Assessment

Ballywater Wind Farm has been operational since 2005; an Environmental Impact Statement was produced prior to approval and environmental conditions on the pre-development site and likely effects on conservation receptors were addressed at that time. Effects and impacts arising from the construction and operation of the wind farm have had sufficient time to become long-established and the proposal to extend the operational lifetime of the wind farm is unlikely to have additional effects on many of the conservation receptors that were considered during the pre-construction phase. In particular, habitats on the site are unlikely to be subject to additional impacts from the continuing operation of the wind farm. In summary, the greater part of the site is occupied by agricultural grassland/arable cropland, with fields separated by hedgerows of variable structure and/or by fencelines. There are small pockets of scrub and woodland. Wetlands immediately to the east of the wind farm are within the Cahore Marshes Special Protection Area (SPA) and consist of a mosaic of open water, swamp and wet grassland.

Terrestrial receptors, including badgers, amphibians and invertebrates are also unlikely to experience additional impacts as a result of the continuing operation of the wind farm since habitats that support these taxa will remain unchanged and the current management of the site will be maintained. Impacts, if any, on these receptors have occurred during the past construction and operation of the wind farm and continued operation is unlikely to exert additional effects. Only those receptors that have the potential to be actively affected by the continuing operation of the wind farm are considered therefore. These receptors are restricted to taxa that may use the airspace disturbed by turbine rotors and may therefore interact with the rotors during the proposed extended period of operation of the wind farm. Birds and bats are the only groups of conservation concern that have the potential to be impacted as a result of the Project and assessment of effects is therefore restricted to these taxa.

6.2.2 Desk Study

A desk study was completed to identify potential ecological receptors within the site, and within the wider area of potential influence. The desk study focussed on the following study areas, which vary according to the value of the resource, and the potential for effects on birds and bats:

- Within the site and up to 15km beyond the boundary for designated areas of international and national importance for nature conservation i.e. Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs).
- Within the site and within the relevant hectad (10km square) within which the site is located (S87) for records of protected and notable species.

Sources of relevant data include:

- National Parks and Wildlife Service – for designated sites
- BirdWatch Ireland – for Birds of Conservation Concern Red and Amber lists.
- National Biodiversity Data Centre and associated Biodiversity Maps – for bird and bat records.
- Bat Conservation Ireland – for bat records.

An Appropriate Assessment (Screening) as required by The European Communities (Natural Habitats) Regulations 1997 was carried and is presented in Appendix 6.3.

6.2.3 Field Survey-Birds

The following bird surveys were carried out:

- Vantage Point Surveys - to identify the use made of the site by target and secondary species (SNH 2017):
  - Breeding season (Blackstaff Ecology Ltd);
  - Winter season (Cian Cardiff of CC Ornithology)
- Modified breeding bird survey (Gregory & Baillie 1994)[1] – to identify the location of birds likely to be breeding on the site (Blackstaff Ecology Ltd);
- Winter walkover survey within 500m of the site (Cian Cardiff);
- Winter waterbird distribution and abundance survey within 8km of the site (Cian Cardiff);
- Hen harrier winter roost survey within and adjacent to the site (Cian Cardiff);

[1] Gregory R.D. and Baillie S.R. (1994): Evaluation of sampling strategies for I km squares for inclusion in the Breeding Bird Survey, B.T.O Research Report No. 139. Thetford (BTO).

- Searches within 2km of the site to establish the potential for the presence of protected species within the likely zone of influence of the wind farm (Blackstaff Ecology Ltd); and
- Carcass searches;
    - 03.22-01-01.23 (principally for bat fatalities but incidental bird casualties recorded, Blackstaff Ecology Ltd);
    - 10.23-09.24 (MKO);

Full descriptions of methodologies are provided in Appendix 6.1 (Breeding bird report); Appendix 6.2 (Wintering bird report) and Appendix 6.6. Apparent impacts on bird behaviour were recorded and potential effects on bird populations were assessed.

6.2.4 Field Survey-Bats

The following bat surveys were carried out during 2022:

- Ground level static detector surveys and
- Casualty searches.

Recordings were analysed using various software programmes to represent the recorded calls as sonograms, which were then analysed to determine bat species. Bat activity at each surveyed turbine was classified on a scale of negligible to high activity. Descriptions of methodologies are included in Appendix 6.4 (2022 Bat survey).

The following bat surveys were carried out during 2023:

- A search for bat roosts within 235m of the turbine rotors;
- Dusk emergence surveys at identified Potential Roost Features (PRFs); and
- Driven manual transect surveys;
- Ground level static detector surveys.

All recordings were later analysed using bat call analysis software in order to identify, to a species or genus level, the bats that were present at the Site. Bat activity levels were calculated based on the number of passes recorded, using an accepted (Ecobat) protocol. An assessment of bat collision risk, based on species' behaviour and flight characteristics, in combination with relative abundance, was derived using NatureScot methodology that has been applied to British bat populations. Full descriptions of methodologies of the various bat surveys/carcass searches and the data obtained from these surveys is presented in Appendix 6.5 (2023 Bat survey) and 6.6 Carcass Search Report (Non-Breeding 2023/2024, Breeding 2024).

6.2.5 Assessment

The value of ecological features within the Zone of Influence has been determined within the following geographical frame of reference:

- International – Europe
- National – Ireland
- Regional – Leinster
- County – Wexford
- District/Borough – Cahore
- Local/Neighbourhood –townlands
- Within Zone of Influence of the site – Site + 1km (site value).

The ecological receptors classified as of importance at the District/Borough level and above are considered to be sufficiently valuable for a significant effect upon them to be material in decision making.

6.2.6 Assessing potential effects and identifying mitigation and enhancement measures

The potential impacts of the Project that may arise during operation and decommissioning have been determined. The assessment of impacts has been undertaken in relation to the existing conditions, with reference to aspects of behaviour of each receptor. Impacts can include direct fragmentation and isolation of habitats, restriction of usable airspace and disturbance to species. Each impact has been characterised in consideration of the following parameters:

- Positive or negative;
- Extent (area over which the impact occurs);
- Magnitude (size or amount of an impact);
- Duration (time over which the impact is expected to last prior to recovery or replacement);
- Timing and frequency (particularly in relation to critical life-stages or seasons); and
- Reversibility (whether an impact is permanent i.e. no recovery is possible, or temporary i.e. where spontaneous recovery is possible or where mitigation is possible and enforceable).

6.2.6.1 Assessing the significance of effects

Potential impacts on relevant receptors are assessed and a judgement reached on whether or not the resultant effect on conservation status or structure and function is likely to be significant. This process takes into consideration the characteristics of the impact, the sensitivity of the receptor concerned, and the geographic scale at which the feature is considered important.

CIEEM EcIA Guidelines (2019) state that: *"For the purpose of EcIA a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general ... In broad terms, significant effects encompass impacts on the structure and function of defined application sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)."*

For species, the assessment considers what effect the potential impacts will have on "conservation status", and whether or not the effect is likely to substantively alter the ecological integrity of the species under consideration. Further guidance on how to assess conservation status is provided in the CIEEM Guidelines (2019) as follows:

- For species: "conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area."

In considering effects on conservation status, reference is made to relevant available guidance on the current conservation status of the ecological feature under consideration.

- Not significant (i.e. no ecologically meaningful effect on conservation status); or
- Significant (i.e. an ecologically meaningful effect on conservation status).

6.3 Baseline ecological conditions

For new developments, assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding, with the ecological baseline conditions being "those existing in the absence of proposed activities"

(CIEEM, 2019). However, the present application refers to ecological conditions that have been altered as a result of the construction and operation of the Ballywater wind farm; baseline conditions in the present case refer to these altered conditions, which will continue to be in effect during the period of the Project.

The following sections outline the baseline ecological conditions of the Project.

6.3.1 Desk Study

The Ballywater wind farm is within 15km of four Special Areas of Conservation and two Special Protection Areas; only those protected sites that have designation features that have the potential to be affected by the Proposed Development are considered. SPAs within 15km are listed in Table 6.1. Wexford Harbour and Slobs SPA is also included, since the population of Greenland white-fronted goose for which Cahore Marshes SPA was in part designated was an element of the larger population centred on the Wexford Slobs. No European sites have been designated locally for bat species. There is also a single NHAs or pNHAs within 15km of the site (Cahore Polders and Dunes pNHA).

Table 6.1: Designation features of SPAs with 15km of the Ballywater Wind Farm; together with designation features of Wexford Harbour and Slobs SPA

Special Protection Area (SPA)	Distance from proposed development	Reason for designation
Cahore Marshes	<50mE	Wigeon (*Anas penelope*) [A050] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]
The Raven	12.5km SW	Red-throated Diver (*Gavia stellata*) [A001] Cormorant (*Phalacrocorax carbo*) [A017] Common Scoter (*Melanitta nigra*) [A065] Grey Plover (*Pluvialis squatarola*) [A141] Sanderling (*Calidris alba*) [A144] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]
Wexford Harbour and Slobs	19km S	Little Grebe (*Tachybaptus ruficollis*) [A004] Great Crested Grebe (*Podiceps cristatus*) [A005] Cormorant (*Phalacrocorax carbo*) [A017] Grey Heron (*Ardea cinerea*) [A028] Bewick's Swan (*Cygnus columbianus bewickii*) [A037] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Pintail (*Anas acuta*) [A054] Scaup (*Aythya marila*) [A062] Goldeneye (*Bucephala clangula*) [A067] Red-breasted Merganser (*Mergus serrator*) [A069] Hen Harrier (*Circus cyaneus*) [A082]

Special Protection Area (SPA)	Distance from proposed development	Reason for designation
		Coot (*Fulica atra*) [A125] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Lesser Black-backed Gull (*Larus fuscus*) [A183] Little Tern (*Sterna albifrons*) [A195] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]

The NBDC returned four breeding season bird records from within 1km of the wind farm. These comprised rare visitors (glossy ibis, Montague's harrier, hobby and blue-headed wagtail) and are not relevant to this discussion.

The National Bat Database of Ireland records six of Ireland's nine resident bat species in the hectads in the proximity of the Site. The results of the database search are detailed in Appendix 6.5 Ballywater Wind Farm Bat Survey, 2023.

6.3.2 Field Survey-Birds

6.3.2.1 Breeding season-vantage point survey

Nine species of primary conservation concern were recorded during vantage point watches in the northern section. Of these, four species (kestrel, golden plover, curlew and redshank) are red-listed in BOCCI, while five species (night heron, little egret, marsh harrier, golden plover and common tern) are included in Annex I of the Birds Directive. Great white egret is included as a rare potential breeder that has recently established a breeding population in Britain. Fourteen species of birds of secondary conservation concern were recorded during VP watches. These comprise seven wildfowl species, grey heron, buzzard, four gull species and raven.

Seven species of primary conservation concern were recorded during vantage point watches in the southern section. Of these, three species (kestrel, dunlin and curlew) are red-listed in BOCCI, while three species (little egret, marsh harrier and common tern) are included in Annex I of the Birds Directive. Great white egret is included as a rare potential breeder that has recently established a breeding population in Britain. Seventeen species of birds of secondary conservation concern were recorded during VP watches. These comprise seven wildfowl species, cormorant, grey heron, two raptor species, five gull species and raven.

A limited number of flights occurred of birds entering the windfarm at rotor height. Few birds were seen to approach the turbines. The presence of turbines appeared to deter flocks of 30 greylags on 24.07.23 and five Brent geese on 25.07.23: birds appeared to change direction when approaching turbines and then left the windfarm airspace. Curlew were seen to fly over the marginal wetland and change direction to fly inland between the northern and southern sections of the windfarm on four occasions, thereby avoiding entering the windfarm airspace. Two greylags passed close to T 20 on 24.04.23. and four mallard approached T15 and T16 on 17.05.23. Three little egrets and a great white egret passed through the windfarm on 31.05.23 and a single Brent goose entered the windfarm on 11.07.23. Single buzzards overflew the wind farm on two occasions, an apparent pair of buzzards on a single occasion, and flocks of six (27.06.23) and three (24.07.23) curlew passed through the windfarm.

Observations were generally of birds passing through airspace outside the windfarm, dominantly over wetter habitats between the windfarm and the coast. The recorded species are dominated by wetland birds, which use this peripheral area for foraging and, in some cases, potentially for nesting, while many birds pass over during commuting flights. Commuting little egrets, including a group of three (30.06.23) and single grey herons occasionally passed to the west and east of the windfarm, on occasion approaching turbines to within 100m. Gull species were generally seen passing the site parallel to the coast and rarely approached the vicinity of the turbines.

6.3.2.2 Breeding bird survey

Thirty-seven species were recorded during the BBS, comprising a single re-listed BOCCI species (meadow pipit), ten amber-listed species and 26 green-listed species. The majority of these were recorded as foraging or passing over. Detailed observation and discussion are to be found in Appendix 6.1, Ballywater Wind Farm Breeding Bird Report.

6.3.2.3 Winter-vantage point survey

Twenty-five species of primary conservation concern were recorded during vantage point watches. Of these, thirteen species (kestrel, shoveler, pochard, lapwing, golden plover, curlew, bar-tailed godwit, black-tailed godwit, curlew sandpiper, dunlin, snipe, redshank and kittiwake) are red-listed in BOCCI, while eleven species (little egret, merlin, peregrine, hen harrier, marsh harrier, whooper swan, golden plover, black-tailed godwit, ruff, little gull and Mediterranean gull) are included in Annex I of the Birds Directive. Great white egret is included as a rare potential breeder that has recently established a breeding population in Britain. Greenland white-fronted goose, an amber-listed BOCCI species is included as a primary species of concern because it is a designation species of the immediately adjacent Cahore Marshes SPA. Of these species of primary conservation concern, the three gull species are considered to be incidental visitors to the site and records are of low conservation significance. Fifteen species of birds of secondary conservation concern were recorded during VP watches. These were grey heron, cormorant, mute swan, 2 goose species, 6 duck species, 3 gull species, buzzard and sparrowhawk.

The great majority of records of birds were from outside the turbine field, with a concentration in the vicinity of the wetlands to the east of the wind farm (Appendix 6.2, Table 2.1). Wader movements occurred mainly in this area, but movements of golden plover and lapwing were also frequent within the wind farm, occasionally in substantial numbers (to 460 golden plover, 290 lapwing), consistent with their foraging and roosting in agricultural grassland. Small flocks of curlew and black-tailed godwit also occasionally passed through the wind farm. These wader movements frequently occurred at rotor height. Wildfowl movements were also generally confined to the peripheral marshes, but whooper swan occasionally passed through and over the turbine field, and some flights appeared to deliberately avoid the wind farm as birds flew around the area occupied by the turbines.

Hen harrier occasionally passed through the wind farm, generally below rotor height, but flights were at times at rotor height. Merlin passed through the wind farm on two occasions, both at rotor height.

Flightlines of target and secondary species are shown in Appendix 6.2, Tables 1.1-1.32.

6.3.2.4 Winter-walkover survey

Twenty three bird species were recorded during winter walkover surveys. Significant records were of flocks of between 200 and 530 golden plover foraging within the wind farm, up to 64 whooper swan foraging on, or within 500m of, the wind farm, up to 350 lapwing commuting over or foraging on and adjacent to the wind farm, up to 220 wigeon foraging within the wind farm and three records of single hen harrier.

6.3.2.5 Winter waterbird distribution and abundance survey

The great majority of records of waterfowl were within 500m of the site (Appendix 6.2, Table 4.3). Records of dominantly marine species (red-throated diver, cormorant, common scoter, razorbill and kittiwake) are of low significance since they are unlikely to use the habitats available within the site to a meaningful extent. However, a single scaup was detected on fresh water near the site.

6.3.2.6 Carcass searches

Carcass searches between October 2023 and September2024 provided evidence of 103 likely casualties within the wind farm. Modelling that takes into account removal of casualties by scavengers and detectability of casualties suggests that up to 369 bird fatalities could occur at the Ballywater Wind Farm site, most, if not all, likely to be the result of collision with turbine rotors. This equates to an average of around 17.5 casualties per turbine per year. However, the distribution of detected casualties suggests that there is likely to be wide variability of collision risk between individual turbines. Results of searches are summarised in Table 6.2; details of searches are to be found in Appendix 6.2 Wintering Bird Report.

Table 6.2: Results of carcass searches

Date	Turbine	Species	Distance from Turbine (m)	Date	Turbine	Species	Distance from Turbine (m)
Oct2023	T11	Unknown Bird	45	Jun 2024	T11	Bird spp	5
Nov 2023	T11	Unknown Bird	n/a		T11	Corvid	39
Dec2023	T3	Corvid spp	26		T11	Long-eared owl	52
	T9	Egret	39		T8	Bird spp	16
	T11	Unknown bird	33		T14	Corvid	48
	T11	Unknown bird	29		T13	Pigeon	4
	T15	Gull spp	12		T9	Common pip.	15
	T15	Unknown bird	44		T6	Corvid	88
	T15	Gull spp	48		T6	Corvid	10
	T16	Duck spp	50		T7	Corvid	49
	T17	Black headed gull	40		T5	Corvid	50
	T17	Unknown bird	43		T5	Corvid	34
	T21	Unknown bird	50		T24	Bird spp.	24
Jan 2024	T3	Corvid spp	18	Jul 2024	T22	Unknown bird	44
	T15	Gull spp	17		T22	Swan/goose legs	50
	T16	Gull spp	56		T24	Common pip.	21
	T16	Gull spp	35		T21	Poss swallow	26
	T17	Unknown bird	45		T10	Corvid	50
	T17	Buzzard	35		T12	Pigeon	6

	T18	Swan spp	96			T12	Corvid	10
	T18	Gull spp	48			T12	Corvid	21
	T18	Gull spp	48			T12	Corvid	28
	T20	Unknown bird	26			T12	Pigeon	30
	T24	Unknown bird	25			T12	Corvid	43
	T24	Unknown bird	48			T15	Corvid	2
Feb 2024	T11	Unknown bird	N/A			T5	Corvid	50
	T11	Gull spp	N/A		Aug 2024	T13	Corvid	45
	T17	Kestrel	N/A			T13	Unknown bird	13
	T18	Unknown bird	N/A			T20	Corvid	17
	T16	Gull spp	N/A			T15	Corvid	12
	T16	Gull spp	N/A			T15	Wood pigeon	24
	T13	Corvid spp	N/A			T12	Corvid	27
	T24	Unknown bird	N/A			T12	Corvid	12
	T7	Gull spp	N/A			T11	Corvid	43
	T24	Gull spp	N/A			T10	Corvid	52
Mar 2024	T16	Unknown bird	N/A			T24	Corvid	39
	T10	Unknown bird	N/A			T23	Leisler's bat	37
	T15	Unknown bird	N/A		Sep 2024	T10	Corvid	51
	T24	Gull spp	N/A			T10	Corvid	52
Apr 2024	T15	Common buzzard	N/A			T7	Pip spp.	57
	T15	Wood pigeon	N/A			T8	House martin	17
	T15	Unknown bird	N/A			T9	Sop pip.	30
	T7	Black headed gull	N/A			T18	Sop pip.	17
	T20	Unknown bird	58			T15	Pip spp.	18
	T15	Common buzzard	37			T11	Kestrel	19
	T15	Wood pigeon	5			T12	Corvid	39
	T15	Unknown bird	13			T23	Pip spp.	22
	T7	Black headed gull	27			T23	Sop pip.	21
May 2024	T11	Pigeon spp	24			T22	Rock pipet	27
	T19	Gull spp	49					
	T14	Common pip	25					
	T22	Unknown bird	36					
	T07	Rook	57					
	T23	Unknown bird	7					

27 of the records refer to traces of birds that were not identified to species level. Finds were concentrated towards the eastern part of the site, with particular concentrations immediately to the east of the farm buildings (T10-12, 15-17), with 5-13 casualties recorded at each of these turbines. This cluster of turbines also accounted for all six of the raptors recorded as casualties, with kestrel and long-eared owl found at T11, buzzard (two) at T15 and buzzard and kestrel at T17. Corvids, likely to consist largely of inexperienced, recently-fledged jackdaws, were prominent between June and September, again with largest numbers of casualties at T10 (4 birds) and T12 (7 birds). Gull species

were the next most frequently identified group of casualties, with 17 recorded casualties. The majority of the 20 unidentified casualties are also assumed to be gulls, since they are large birds and residual feathers are likely to be relatively easy to find. Gull casualties were concentrated between December and May, likely reflecting differences in behaviour between wintering and breeding populations. If identified gull and unidentified birds are aggregated, concentrations of casualties occur along the eastern flank of the southern section of the wind farm (T11 – 7 casualties, T15 – 6 casualties and T16 (5 casualties) and the southern flank of the northern section (T24 – 6 casualties). Birds have been observed flying between the two sections of the wind farm and it is possible that this pattern of increased casualties may represent unsuccessful attempts to navigate between the two wind farm sections.

None of the casualties were definitively of designation species of the SPA. Although many of the casualties at Ballywater were unidentified, it does not appear that the designation species of the SPA were a significant proportion of those found at the site. Remains of one (possibly two) swans were found; swan species are mentioned in the site synopsis as being a significant species at the site but are not a designation feature. Remains of a single unidentified duck were found and may therefore have been of a wigeon. In view of the considerable use made of the wind farm grassland by golden plover and lapwing, it is notable that no remains of these species were recorded. A review of 29 studies suggests golden plover will only approach wind turbines to an average distance of 175m in non-breeding season (Hötker et al. 2006)[2]. Golden plover are reported to avoid turbines in the landscape and it is therefore likely that the absence of recorded casualties of this species reflects the actual low collision susceptibility of this species.

Full descriptions of methodologies of the carcass search surveys and the data obtained from these surveys can be found in Appendix 6.6 - Carcass Search Report (Non-Breeding 2023/2024, Breeding 2024)).

6.3.2.7 Field Survey-Bats

2022 bat survey

Details of bat surveys are provided in Appendix 6.4 - Ballywater Wind Farm Bat Survey, 2022.

Seven species of bat were recorded. Levels of bat activity varied between turbines, ranging from Negligible – High. Elevated levels of bat activity were recorded for Leisler's bat, common pipistrelle and soprano pipistrelle - species considered most at-risk from turbine associated mortality. Four turbines (T6, T9, T18, T20) featured elevated levels of bat activity in spring and four turbines (T3, T7, T16, T17) in summer. Activity was not uniform between nights; turbines that experienced high activity levels also recorded lower levels on other nights. Turbines that recorded high activity levels were distributed across the southern section of the wind farm. These spring turbines each received three casualty searches in spring and three in summer; the summer turbines each received three casualty searches in summer and three out of the four turbines received two searches in spring (the fourth receiving three). Casualty search results were negative for all of the turbines with elevated bat activity levels.

2023 bat survey

Details of bat surveys are provided in Appendix 6.5 - Ballywater Wind Farm Bat Survey, 2023.

Manual bat activity surveys took place in the Spring, Summer, and Autumn of 2023. Bat activity was recorded on all surveys, with a total of 292 bat passes. Soprano pipistrelle (n=214) was the species

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[2]Hötker, H, Thomsen, K-M, and Jeromin, H (2006). Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats—facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. NABU 1–65

recorded most frequently, followed by Leisler's bat (n=63), and common pipistrelle (n=51). Brown long-eared bats were recorded infrequently, with only 5 passes recorded across all three surveys. *Myotis* spp. and Nathusius' pipistrelle were also rarely recorded with only two *Myotis* spp. bat passes and one Nathusius' pipistrelle bat pass recorded across all three surveys (n=2). The highest overall bat was recorded in the vicinity of turbine T16, with high bat activity also occurring at turbines T12, T20, T22 and T24. High activity levels tended to be recorded towards the eastern boundary of the site. Estimated site-level collision risk for high collision risk bat species was typically Low, with common pipistrelle and soprano pipistrelle being assigned a medium site level collision risk in Spring. Overall bat activity levels were assessed to be typical of the nature of the site, which is mainly agricultural lands and artificial surfaces, with small patches of broadleaved woodland.

2024 bat survey

Details of further bat carcass search surveys undertaken during the 2024 survey season are presented in Appendix 6.6.

6.4 Assessment of Effects

6.4.1 Do Nothing Scenario

The 'Do-Nothing' alternative with regard to the Proposed Development, is to decommission the existing wind farm and substation in 2025 when the current permissions expire. As part of the decommissioning stage, the existing turbines and substation would be dismantled, and the site reinstated to its original condition; please see Section 4.7 in Chapter 4 of this EIAR for further details regarding decommissioning. The Proposed Development seeks to extend the operational life of the existing wind farm and substation to 2035, at which stage the wind farm and substation would be decommissioned.

Condition no. 17 of the existing planning permission for Ballywater Wind Farm and by consequence, for the existing Ballywater 110kV Substation states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."*

As per the original grants of permission for the existing wind farm and substation, if the 'Do-Nothing' alternative was chosen, decommissioning of the Proposed Development would involve the restoration of the site to its original state prior to development. Decommissioning activities have evolved since the original planning applications were submitted and a Decommissioning Plan has been prepared to account for such updates and is included in Appendix 4-4 of this EIAR. The removal of wind farm and substation infrastructure such as turbine foundations under the 'Do Nothing' alternative is not considered to be the most environmentally prudent option. In order to remove this infrastructure, a significant volume of reinforced concrete, over 180m^3, would have to be removed from the ground. This could result in significant environmental nuisance such as noise, dust and/or vibration, pollution of surface waters and/groundwaters, soils, traffic, and negative impacts on sensitive habitats within the vicinity of the Project. An image of the turbine foundation during construction can be seen in Plate 4-5 of Chapter 4 of this EIAR. In addition, the removal of the access roads has the potential to create significant noise and dust issues as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm infrastructure a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

Should the original Decommissioning Plan be implemented, i.e. removal of the existing turbines, the potential for continued impacts on birds and bats would be eliminated. Therefore, the effect of decommissioning (as per the original Planning Conditions for the wind farm) is considered to have a potentially long-term positive effect on these receptors in the context of the EIAR.

6.4.2 Designated sites

The initial step in the assessment of potential significant effects on European/Nationally designated sites was the determination of the number and nature of the sites within the ZoI of the Proposed Development (see also Appendix 6.3 – Appropriate Assessment Screening Report). Initially, sites within a 15km buffer from the Proposed Development were considered to be within the potential ZoI. Sites outside of the 15km buffer zone (but within 15km of the Project i.e., (including the Underground Grid Connection) were also taken into account and assessed where potential pathways for effects were identified. A standard source-pathway-receptor conceptual model was then used to screen the initial list to determine a preliminary list of "relevant" European/Nationally designated sites (i.e., those which could be potentially affected). This conceptual model is a standard tool in environmental assessment. In order for an effect to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no likelihood for the effect to occur. In the context of the Project, the model comprises:

- Source (s) – potential impacts from the Proposed Development, e.g. the runoff of sediment;
- Pathway (s) – hydrological, physical or ecological connectivity to a European site; and,
- Receptor (s) – qualifying interests and/or special conservation interests of the European/Nationally designated sites.

The assessment process considered potential significant effects which may arise during the construction, operational and decommissioning phases of the Project.

It has been determined during the assessment process, following the examination, analysis and evaluation of the relevant information, and in applying the precautionary principle that there is no potential for significant impacts on the following European/Nationally designated sites;

- *Blackwater Bank SAC*
- *Screen Hills SAC*
- *Seas off Wexford SPA*
- *Slaney River Valley SAC*
- *Ardamine Woods pNHA*
- *Ballyconnigar Upper pNHA*
- *Ballycongir Sand Pits pNHA*
- *Ballymoney Strand pNHA*
- *Ballynabarney Wood pNHA*
- *Ballyroe Fen and Lake pNHA*
- *Ballyteige Marsh pNHA*
- *Cahore Polders and Dunes pNHA*
- *Cahore Point North Sandhills pNHA*
- *Clone Fox Covery pNHA*
- *Courtdown Dunes and Glen pNHA*
- *Donaghmore Sandhills pNHA*
- *Killoughrum Forest pNHA*
- *Kilmuckridge-Tinnaberna Sandhills pNHA*
- *Leskinfere Church, Clogh pNHA*

- *Screen Hills pNHA*
- *Slaney River Valley pNHA*
- *Wexford Slobs and harbour pNHA*

Upon examination of the relevant information including, in particular the nature of the Proposed Development, the proximity of European sites, the application of the precautionary principle, that the following sites should be considered in more detail;

- *Cahore Polders & Dunes SAC*
- *Kilmuckridge-Tinnaberna Sandhills SAC*
- *Cahore Marshes SPA*
- *The Raven SPA*
- *Wexford Harbour and Slobs SPA*

There are no likely effects on the designation features of the two SACs listed above (Cahore Polders & Dunes SAC and Kilmuckridge-Tinnaberna Sandhills SAC) arising from the Proposed Development (i.e. the 10-year extended operation of the existing wind farm) or the Project (i.e., including the Underground Grid Connection). As there are no likely pathways for effects on site hydrology or physical effects on any of the SAC designation features. The nature and scale of the proposal, and lack of hydrological connectivity, indicate that there are also no likely pathways for effects on Natura 2000 sites at greater distances.

The designation feature species of The Raven are dominated by littoral and marine species, which are unlikely to be affected by the onshore Ballywater wind farm. The Greenland white-fronted designation feature is part of the wider Wexford Harbour and Slobs population; the site is used as a night roost for a significant part of this population. As part of the complex of sites used by the species, it is likely that the sub-population that historically used the Cahore Marshes SPA will have had links with The Raven SPA. Impacts on Greenland whitefronts that are a designation feature of the Cahore Marshes SPA are discussed below.

Existing turbines approach the Cahore Marshes SPA boundary locally at around 40m; it is likely that any effects on designation species distribution and behaviour have been long-established and an extension of the wind farm operational lifetime is unlikely to exert additional pressures on these populations compared to the current situation. The populations of three (out of four) of the designation species have declined during the current operational period of the wind farm. Wigeon have increased during the period of wind farm operation, contrary to the national trend of decline, while lapwing and golden plover have declined, generally in line with national trends. The conservation objective of maintaining or restoring designation populations are largely dependent on conditions elsewhere, principally in their distant breeding areas, that have effects on their breeding success, together with superimposed effects arising from climate change. The fact that declining populations of these species at Ballywater conform to national trends indicates that the presence of the wind farm is unlikely to be a major contributor to the decline of lapwing and golden plover at this site. During this period, the maximum Greenland whitefront count of 120 birds was in 2005/06, which marks a considerable decline in use of the SPA since the average counts of 634 birds for the period 1994/95 to 1998/99 (the period which provided the quantitative validation for the designation of the site). The Wexford wintering flock, of which birds using Cahore Marshes SPA are a part, has declined in numbers from around 10,000 birds in the 1990s to a maximum spring count in 2021 of 6262 birds. The Cahore population was itself of international importance and the subsequent near extinction - the most recent available IWeBS maximum winter count for the site was of 18 birds (2021/22) - is therefore significant at the population level. Population decline generally is the result of low reproductive success in Greenland, together with apparently low reproductive capability. (Stroud *et al* 2012)[3].

Displacement effects resulting from the construction and operation of the Ballywater wind farm may be superimposed on this pattern of general population decline. The population trend for Greenland whitefronts at Cahore Marshes shows a trend that is significantly steeper than that for the totality of the Wexford flock. Greenland whitefronts are intensely site-faithful and the loss of the species from a particular site therefore suggests that the loss is due either to death/low recruitment of the individual birds or their adoption of an alternative wintering site due to factors operating at the site level. A review of studies of effects of wind farms on wintering birds indicates that displacement distances of feeding geese at wintering sites ranged from 100–600 m, but evidence also suggests that large-scale displacement occurs, with fewer swans and geese returning to areas after wind farms were installed (Rees 2012).[4] The close proximity of the Cahore Marshes SPA to the Ballywater wind farm therefore suggests that the decline in the local wintering sub-population may in part be ascribed to the presence of the wind farm. These potential effects are now well-established and the extension of the proposed operational period is unlikely to have a significant effect on the current distribution or numbers of the species at this site.

It therefore is likely that the construction and operation of the Ballywater wind farm has had a significant past effect at an international level on Greenland white-fronted goose at this location. There is considerable evidence that the decline of this species is driven by low breeding success. It is likely that the formerly occurring whitefronts from Cahore Marches have been displaced to the core Wexford Harbour site, where there has in any case been decreased foraging pressure, and it is unlikely that the presence of the Ballywater wind farm has contributed to the overall decline of the species. In a possible future absence of the wind farm following decommissioning and removal of all wind farm structures any recovery of the species at the Cahore Marshes site would be largely conjectural. There is evidence that the stability of the Wexford Harbour flock, relative to the greater decline of the total population, has been fuelled by immigration from sub-populations that formerly existed elsewhere[5]. This pattern of local extinction suggests that once a sub-population is lost the site remains unused. The loss of the Cahore Marshes sub-population, when viewed from this perspective, may therefore be permanent, whether or not the Ballywater wind farm remains operational. This effect is reinforced by the likely mortality of most, if not all, of the pre-operational individuals that comprised the Cahore Marshes sub-population (average life span of white-fronted goose is around 6 years, oldest from BTO ringing scheme is 18.75 years). For the site to be permanently re-populated, a "new tradition" would need to be developed by individuals that would presumably be sourced from the Wexford Harbour flock, against the current trend for immigration of birds from elsewhere. In a study of the decline of Greenland whitefront, Fox *et al* concluded that there is limited potential for recolonisation of deserted sites because of the species' high degree of site fidelity[6]. Similarly, Warren *et al* found that only 2.8% of the population moved between sites within winters, virtually all of those involved en route to

[3] Stroud, D.A., Fox, A.D., Urquhart, C. and Francis, I.S. (compilers). (2012). International Single Species Action Plan for the Conservation of the Greenland White-fronted Goose *Anser albifrons flavirostris*, 20122022. AEWA Technical Series No. XX. Bonn, Germany.

[4] Rees, E.C., (2012): Impacts of wind farms on swans and geese: a review. *Wildfowl* (2012) 62: 37–72

[5] Weegman, M.D., Bearhop, S., Fox, A.D., Hilton, G.M., Walsh, A.J., McDonald, J.L. and Hodgson, D.J. (2015): Integrated population modelling reveals a perceived source to be a cryptic sink. *Journal of Animal Ecology* Volume 85, Issue 2, 467-475.

[6] Fox, A.D., Stroud, D., Walsh, A., Wilson, J., Norriss, D. and Francis, I. (2006); The rise and fall of the Greenland white-fronted goose: a case study in international conservation, *British Birds,* 99, May 2006, 242-261

wintering sites within Britain and Ireland[7]. These factors suggest that the former Greenland white-fronted goose population of Cahore Marshes is unlikely to be restored under current population constraints.

The presence of the wind farm has had a neutral effect on the wigeon, lapwing and golden plover designation species. Effects on avian designation species are likely to be well-established, and the proposed extension of the operating period is unlikely to have an additional effect on the SPA or its conservation objectives. It is considered that, since there will be no change to any parameters affecting the relationship between the wind farm site and designated conservation sites, there will be **no significant residual effects** on designated sites or their conservation objectives.

A more detailed review of the likely effects of the Project is to be found in Appendix 6.3 Ballywater Wind Farm: Appropriate Assessment (Screening), Cahore Marshes SPA.

6.4.3 Breeding birds

The wind farm habitats continue to support passerine species that are typical of the habitats found in the local wider countryside. The presence of the wind farm does not appear to have had a significant impact on this breeding bird community. Larger birds (particularly corvid species) which may be at greater risk from collision with turbine rotors were recorded within the wind farm during BBS and appear to routinely pass through the wind farm. This suggests a degree of habituation, with birds generally avoiding turbines. Two bird corpses (jackdaw and herring gull) found within the wind farm may have been the result of collisions, but, from numerous searches, the incidence of collisions during the breeding season appears to be very low. This likely reflects the smaller numbers of birds available for collision during the summer months. Corpses found during both winter and summer were generally of larger species and hence readily visible. However, it is noted that the discrepancy between summer and winter searches may in part be the result of different search (human searchers in summer, dogs in winter) and possible differences in scavenger activity between seasons.Both primary and secondary species recorded during VP watches were dominated by wetland bird species which in the main used the airspace above the wetland habitats to the east of the wind farm. These species rarely entered the wind farm airspace, which likely reflects the absence of significant wetland habitats within the wind farm. It is likely that the majority of these birds were of local provenance and there was thus also an element of habituation in their behaviour with regard to the turbines. Observations of bird behaviour, determination of the breeding bird community and absence of evidence of significant collision risk to birds suggest that the wind farm currently does not have a significant effect on the breeding bird population of the site. An extension to the operating period for the wind farm is unlikely to have a significant effect on the distribution, diversity or abundance of the current breeding bird community.

Casualties were apparently more frequent during the winter recording season, perhaps reflecting the use of dogs as a search strategy, but also likely to reflect the greater number of non-territorial birds available for collision;these may also include locally breeding birds These casualties are likely to include birds from widely dispersed populations and the continued operation of the wind farm is unlikely to provide a significant risk to any particular population. It is considered that, since there will be no change to any parameters affecting the relationship between the wind farm site and breeding bird populations, and casualties arising from wind farm operation are unlikely to be of significance at population levels, there will be **no significant residual effects** on breeding birds

A more detailed review of the likely effects of the Project is to be found in Appendix 6.1 Ballywater Wind Farm Breeding Bird Report.

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[7] Warren, S.M., Walsh, a.j., Merne, O.J., Wilson, H.J. and Fox A.D. (1992): Wintering site interchange amongst Greenland white-fronted geese *Anser albifrons flavirostris* captured at Wexford Slobs, Ireland. *Bird Study*, 39:3, 186-194.

6.4.4 Wintering birds

The wind farm is immediately adjacent to the Cahore Marshes SPA, designated for populations of wintering bird species. The assessment of effects on designated sites discussed above likely applies to the populations of non-designation species that use, or have used, the wind farm for foraging and/or commuting. Effects on wintering birds generally are likely to be well-established.

Significant numbers of some species, particularly golden plover and lapwing, use the agricultural fields within the turbine field for foraging, resting and, potentially, roosting, and were frequently observed using the air space within the wind farm at rotor height. Despite using dogs as a search strategy, no casualties of these species were found during carcass searches. Removal of dead birds by scavengers is likely, perhaps more readily in the case of birds in this smaller size range, but the lack of evidence of casualties and the readiness of birds to use the ground between turbines suggests that collision events are infrequent. It is likely that birds using wind farm sites become habituated to turbine operation and are generally able to avoid operating turbines.

Any effects on numbers and distribution of wintering birds that have become established are likely to continue during the period of the Project. In particular, birds are likely to actively avoid turbines, which for some species may mean that foraging or roost sites will continue to be unavailable within the wind farm. The Project will not have additional impacts on wintering birds compared to the current situation.

Intensive searches for collision casualties suggest that there is a relatively high bird mortality arising from the present operation of the wind farm. Further, a limited predator removal trial indicated that some casualties are likely to be removed by scavengers (fox, hooded crow) within the timescale of intervals between searches. Feather spots that are a high percentage of the casualty records likely refer to these scavenger events. It is likely that much of this mortality arises from the proximity of the wind farm to the coast and adjacent wetlands, with consequent exposure to the movement of significant numbers of larger species that frequently use the air space equivalent to rotor height. Gull species comprise the most abundant group providing evidence of collision mortality. Casualties in the survey period included three buzzard, which has a dispersed distribution, two red-listed kestrel and a single little egret, a Birds Directive Annex 1 species that has a limited breeding population in Ireland.

It is likely that mortality rates will continue at similar levels during the Project. For the species recorded as casualties at Ballywater, it is unlikely that there will be a significant effect at the population level, whether locally or at larger scales, and there will be **no significant residual effects** on wintering birds

6.4.5 Bats

No changes to the habitats available on or near the wind farm will be made as a result of the Project. Any potential bat roost sites will be retained, as will hedgerows that may function as flightlines. There will be no change in the foraging potential of the site. The habitats on the site will remain suitable for bats and no displacement of individuals or populations is anticipated as a result of the continued operation.

A total of ten bat casualties were found during 2024 search season, with the last search date on 05.09.24. These comprised single Leisler's bat, two common pipistrelle, three soprano pipistrelle and three pipistrelles unidentified to species level. Although casualty numbers were small, there appears to be a cluster of records at turbines surrounding the farm buildings, while T23 in the northern section of the wind farm accounted for four of the ten casualties. The results from the bat casualty survey indicate that Ballywater Wind Farm is currently causing significant bat fatalities and its continued operation (without mitigation) has the potential to cause a significant impact upon the local bat population (The model estimates with 90% confidence that between 17 and 47 bat fatalities occurred over the study period at the wind farm). Overall risk levels for high collision risk bat species ranged from Low to Medium. This risk level is reflective of the nature of the site, which is mainly agricultural grasslands and arable crops, with areas of buildings and artificial surfaces, marshes, sand dunes, scrub, woodland, and treelines, with low to moderate levels of bat activity recorded during the walked and driven transects undertaken.

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

Following consideration of the residual effects (post-mitigation) it is considered that the Proposed Development will not result in any significant effects on bats. Provided that the Proposed Development is maintained and operated in accordance with the design, best practice and mitigation that is described within this report (and associated appendices), significant effects on bats are not anticipated at any geographic scale.

The operational phase of the Project is therefore considered passive, and there will be **no significant residual effects** on bat species.

6.4.6 110KV Substation and Underground Grid Connection

There is not considered to be any impact on biodiversity from the continued operation of the Ballywater 110KV Substation for a further 10-years as well as the continued (indefinite) operation of the Underground Grid Connection.

6.5 Cumulative Effects

The Proposed Development was considered in the context of other plans, existing and approved projects and planning applications, in the surrounding area that could result in cumulative impacts on the birds and bats. The Ballywater wind farm is within 15km of four Special Areas of Conservation and two Special Protection Areas. Although there is no formal requirement for this 15km radius zone, it is recommended for plans and projects in guidance for planning authorities provided by NPWS in 2010 (DEHLG, 2010), and has become the norm across other land use sectors in Ireland. The plans and projects considered are listed in Chapter 2 of the EIAR: Background of the Project.

In consideration of the fact that no changes will be made to wind farm site characteristics, and in the absence of schemes that are likely to have significant effects on bird or bat distributions or populations, it is concluded that the Project will not result in any residual adverse effects on birds or bats. There is no potential for the proposal to contribute to any cumulative adverse effects on any bird or bat populations when considered in-combination with other plans and projects and there will be **no significant residual cumulative effects** on birds or bats.

6.6 Mitigation

What are generally called mitigation measures encompass three different possible types of action. Adverse effects can be "mitigated" entirely by avoiding actions that will have adverse effects on ecological receptors, for example by changing the location or timing of potentially damaging activities. Effects may be addressed by reducing the potential impact of activities, for example by reducing the time during which an activity takes place. Finally, mitigation may take the form of remediating and/or improving habitats so that there is a gain in the area or number of ecological receptors as a result of the works.

In the case of the Ballywater Wind Farm application, opportunities for mitigation are limited by the fact that the wind farm is in operation and mitigation measures were built into the approvals for construction of the wind farm. Effects arising from the operation of the wind farm are well-established and remediation of any adverse impacts that have arisen may not be possible. In particular, restoration of the former internationally important population of Greenland white-fronted goose would likely require the removal of the wind farm; in such a hypothetical situation there would be no guarantee that the birds would return since the population of concern has clearly dispersed, presumably to other parts of the Wexford coast, and the site is no longer a traditional wintering site.

6.6.1 Mitigation for Birds

With regard to birds, management of the wind farm shall continue to maintain the current habitats that support breeding and wintering birds.

- In recognition of the relatively high mortality associated with T11, 15, 16 and 24 it is proposed that these turbines will be stopped for an hour at dawn and dusk, periods of high flight activity when many birds are actively commuting from and to roost in low light conditions and when turbines are consequently likely to be least visible.

- Dog-based fatality monitoring will be carried out on a monthly basis between 15 April and 15 October each year of the LTE. Annual reports will be prepared and submitted for the attention of the local authority and NPWS.

6.6.2 Mitigation for Bats

With regard to bats, a precautionary approach suggests the implementation of an adaptive monitoring and mitigation strategy (NatureScot 2021). Elements of this strategy include:

- Automatic 'feathering' of idling blades will be implemented (through SCADA) to reduce rotation speed of blades to below 2 RPM while idling. Feathering blades has been shown to be effective in reducing fatality rates of bats by up to 50% and does not result in a significant loss of energy output (NatureScot 2021).
- Bat activity will be monitored for 3 years (by deployment of passive detectors) after the implementation of the 'feathering' of turbine blades.
- Dog-based fatality monitoring will be carried out on a monthly basis between 15 April and 15 October each year of the LTE. Annual reports will be prepared and submitted for the attention of the local authority and NPWS.
    - Systematic searches will be conducted within a 125m x 125m grid centred on the turbine.
    - A minimum of 5 turbines will be searched at random during each visit.
    - Search effort will follow NatureScot 2021 and is outlined in Table 6.3 below

Table 6.3 - Proposed survey effort to maximise the duration of monitoring during each season

Days 1-10	Days 11-20	Days 21-30	Days 31-40	Days 41-50	Days 51-60
Initial 'sweep' then survey alternate days (d2, d4, d6, d8, d10)	No Survey	Initial 'sweep' then survey alternate days	No Survey	Initial 'sweep' then survey alternate days	No Survey

- In the event that a bat collision is recorded, curtailment will be immediately implemented at the particular turbine (15 April to 15 October annually).
    - Following NatureScot guidance (where 90% of all bat activity can occur on sites when temperature exceeded 11.5°C and windspeed was below 5m/s; and where bat activity

    was generally recorded 30 minutes after sunset and 40 minutes prior to sunrise. These conditions are largely consistent with the high seasonal activity peaks recorded at the proposed development site. Therefore these parameters will be used at the windfarm during the LTE when designing the curtailment programme.
  - Searcher efficiency trials will also be be conducted alongside Scavenger Removal Rates.
- The Bat Monitoring & Mitigation Strategy is designed to be iterative and should be amended as conditions or results dictate. These will be outlined in the annual monitoring reports to The Council.
- All mitigation and environmental controls outlined in the OEMP will be fully implemented.

The proposed mitigation methodology is treated in greater detail in Appendix 6.5 - Ballywater Wind Farm Bat Survey, 2023.

6.6.3 Decommissioning

Regarding Ornithology and Avian Populations, the decommissioning plan will include industry best practice measures to mitigation the impact of works on a bird, which may include the following:

- No removal of woody vegetation or scrub will be carried out within the bird breeding season (March 1st to August 31st)
- Vantage Point surveys will be carried out for the season before and during the decommissioning process.
- All edible wastes will be stored in covered segregated containers and disposed of at licensed facilities.
- All measures to mitigate the risks of contamination of watercourses as highlighted in Chapters 7 (Geology) & 10 (Noise) will be fully implemented.
- The areas within 50m of the hard-stand and turbine foundations will be subject to a pre-works ornithology walkover to highlight any constraints that may be present (e.g. breeding or resting places of protected species). If any significant constraints are identified, appropriate controls will be developed and integrated into the live decommissioning plan ahead of the commencement of the work.
- Speed limits will be enforced on internal roads.
- A detailed traffic management plan will be incorporated into the decommissioning plan which will ensure that areas of marsh & fen (i.e., the habitats within the SPA) are unaffected by traffic or storage of plant and materials.

Regarding Biodiversity at the site, the decommissioning phase will involve the following mitigation measures:

- All measures to mitigate the risks of contamination of watercourses as highlighted in Chapters 7 & 10 will be fully implemented.
- The areas within 50m of the hard-stand and turbine foundations will be subject to a pre-works terrestrial ecology walkover to highlight any constraints that may be present (e.g. breeding or resting places of protected species, presence of Invasive Plant Species). If any significant constraints are identified appropriate controls will be developed and integrated into the live decommissioning plan ahead of the commencement of the work.
- If any Third Schedule Invasive species are present in or adjacent to the works footprint, an Invasive Species Management Plan (ISMP) will be developed, and all recommendations implemented in accordance with the contemporary best practice measures.
- Speed limits will be enforced on internal roads.
- A detailed traffic management plan will be incorporated into the decommissioning plan which will ensure that areas of intact blanket bog are unaffected by traffic or storage of plant and materials.

- All edible wastes will be stored in covered segregated containers and disposed of at licensed facilities.

Any import of soil or fill necessary in the decommissioning process shall be from approved sources and appropriately tested or inspected to minimise the risk of import of invasive species. Only soil appropriate to the site (pH, soil type) will be used. The re-seeding or natural revegetation of reinstated areas will proceed on the advice of a suitably qualified ecologist. Any seed mix used will be on the approval of the ecologist

6.7 Conclusions

6.7.1 Breeding birds

The wind farm habitats continue to support passerine species of a diversity and apparent abundance that are similar to those characteristic of the local wider countryside. The presence of the wind farm does not appear to have had a significant impact on this breeding bird community. The incidence of collisions with rotors appears to be very low during the breeding season. Active avoidance of turbines was observed. Both primary and secondary species recorded during VP watches were dominated by wetland bird species which in the main used the airspace above the wetland habitats to the east of the wind farm. Observations of bird behaviour, determination of the breeding bird community and absence of evidence of significant collision risk to birds suggest that the wind farm currently does not have a significant effect on the breeding bird population of the site and an extension of the operational lifetime is unlikely to have any additional effect.

6.7.2 Wintering birds

Relatively high casualty rates, presumably arising from collisions with turbines, were evident, particularly during mid-winter (for gulls) and late summer (corvids). Mitigatory switch-offs of turbines that have been shown to have particularly high collision rates will reduce collision risk arising from low light conditions. However, it is likely that mortality rates will continue at relatively high levels because of the coastal location of the wind farm, which is likely to define the orientation of birds moving between foraging sites, and between foraging and roost sites. Effects on wintering birds have developed over the operational lifetime of the wind farm and for the species recorded as casualties at Ballywater, it is unlikely that there will be significant effects at the population level.

6.7.3 Bats

In the absence of changes to the habitats available on or near the wind farm they will remain suitable for bats and no displacement of individuals or populations is anticipated as a result of the continued operation. Any potential risks to the local bat populations that may be identified during post-permission monitoring may be further reduced by the adoption of mitigation measures outlined in Appendix 6.5.

7. LAND, SOILS AND GEOLOGY

7.1 Introduction

7.1.1 Background and Objectives

MKO, on behalf of Ballywater Windfarm Ltd. (the Applicant), has carried out an assessment of the Proposed Lifetime Extension of the existing Ballywater Wind Farm and existing 110kV Substation (the Proposed Development), together with the existing Underground Grid Connection (the Project) on the land, soils and geology of the receiving environment. The townlands within which the Project is located are listed in Section 1.1.2 of Chapter 1 of this EIAR.

The Applicant plans to continue to utilise the site as an operational 21 no. turbine wind farm and onsite 110kV substation to generate renewable energy for export to the National Grid for a further 10 years. No new construction or project alterations are proposed beyond routine operation and maintenance activities.

A full description of the Project, which includes the Proposed Development, is provided in Chapter 4: Description of Project.

This Environmental Impact Assessment Report (EIAR) chapter provides a baseline assessment of the environmental setting of the existing Ballywater Wind Farm, Ballywater 110kV Substation, and the Underground Grid Connection from the onsite substation to the Crane 110kV Substation (i.e. the Project) in terms of land, soils and geology, and discusses the potential likely significant effects of the extension of operational life. This chapter also discusses any mitigation measures required to be put in place to limit any identified potentially significant effects to land, soils and geology and provides an assessment of residual impacts and significance of effects. Hydrogeology and groundwater are not discussed in this chapter as they are discussed in detail in Chapter 8: Hydrology and Hydrogeology of this EIAR.

7.1.2 Statement of Authority

This section of the EIAR has been prepared by Keelin Bourke and Robert Kennedy and reviewed by Sean Creedon.

Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin. Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects. Robert also played a role in developing MKO's new service offering around Biodiversity Net Gain and other nature-positive mechanisms.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

7.1.3 Relevant Legislation

The EIAR complies with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. The requirements of the following legislation are complied with:

- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001 – 2018;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) regulations and subsequent amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999; S.I. No. 450 of 2000; S.I No. 538 of 2001); S.I. No. 30 of 2000 the Planning and Development Act, 2000; and S.I 600 of 2001 Planning and Development Regulations and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law; and,
- The Heritage Act 1995, as amended

7.1.4 Relevant Guidance

The land, soils and geology chapter of this EIAR was prepared having regard, where relevant, to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2015): Draft – Revised Guidelines on the Information to be contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the information to be contained in Environmental Impact Statements);
- European Commission (2017) Guidance on Screening;
- European Commission (2017) Guidance on Scoping;

- European Commission (2017) Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements; and,
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

7.2 Methodology

7.2.1 Desk study

A desk study of the Project site and the surrounding study area (i.e., lands within the immediate vicinity of the existing wind farm and substation) was completed in September 2023 and January 2024. The desk study involved collecting all the relevant geological data for the wind farm site and study area. This included inspection and/or consultation with the following:

- Environmental Protection Agency (EPA) database (www.epa.ie);
- Tailte Éireann GeoHive Geospatial Data Hub (www.geohive.ie);
- Geological Survey of Ireland (GSI) – 1:100,000 Bedrock Aquifer Map;
- GSI – Groundwater Database (www.gsi.ie);
- Groundwater Vulnerability Map (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 19 (Geology of Carlow-Wexford). (GSI, 1994);
- GSI – 1:25,000 Field Mapping Sheets, and,
- General Soil Map of Ireland 2nd Edition (www.epa.ie)

7.2.2 Walkover Survey

A visual inspection of the Proposed Development and surrounding areas was undertaken by MKO on 26th September 2023. The purpose of the site inspection was to assess the site for any surface indications of residual impacts to land, soils and geology resulting from the historic construction and operation of the wind farm and substation. Particular attention was paid to identifying the potential areas of soil erosion that may have resulted from the incorrect backfilling of excavations, or that may have arisen from the operation of machinery and vehicles on the site. No evidence of any residual effects to land, soils and geology, such as any geotechnical movements, was observed.

7.2.3 Scoping and Consultation

The scope of this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.8 of Chapter 2 of this EIAR.

With respect to land, soils and geology, the Geological Survey Ireland (GSI) responded to this scoping consultation and requested that MKO utilise their publicly available datasets when compiling this chapter. This has been undertaken, as set out in Section 7.2.1 above. No other scoping responses were received relating to land, soils and geology.

7.2.4 Impact Assessment Methodology

Using information from the desk study and site walkover visual assessment, an estimation of the importance of the land, soil and geological environment within the study area is assessed using the criteria set out in Table 7-1 (NRA, 2009[1]).

Table 7-1 Estimation of Importance of Soil and Geology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource.
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes. Geological feature of high value on a local scale (County Geological Site). Well drained and/or high fertility soils. Moderately sized existing quarry or pit. Marginally economic extractable mineral resource.

[1] *National Roads Authority (2009). Guidelines for Assessment of Ecological Impacts of National Roads Schemes. Available at: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf*

Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

The criteria (EPA, 2022[2]) for the assessment of effects require that likely impacts are described with respect to their extent, magnitude, type (i.e., negative, positive, or neutral) probability, duration, frequency, reversibility, and trans frontier nature (if applicable). The descriptors used in this environmental impact assessment are those set out in EPA (2022) Glossary of Impacts as outlined in Chapter 1 of this EIAR. In addition, the two effect characteristics, proximity and probability, are described for each impact and these are defined in Table 7-2.

Table 7-2 Additional Effect Characteristics.

Effect Characteristic	Degree/ Nature	Description
Proximity	Direct	An effect which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An effect which is caused by the interaction of effects, or by off-site developments.
Probability	Low	A low likelihood of occurrence of the effect.
	Medium	A medium likelihood of occurrence of the effect.
	High	A high likelihood of occurrence of the effect.

[2] *Environmental Protection Agency (May 2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports. EPA, Wexford. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf*

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential impacts on the geology and morphology of the existing environment, as listed in Table 7-3.

Table 7-3 Impact descriptors related to the receiving environment

Effect Characteristics		Potential Geological/Hydrological Effects
Quality	Significance	
Negative only	**Profound**	**Widespread permanent impact on:** • **The extent or morphology of a designated site** • **Regionally important aquifers.** • **Extents of floodplains.** • **Loss of a geologically sensitive site.** **Mitigation measures are unlikely to remove such effects.**
Positive or Negative	Very Significant/ Significant	Local or widespread time dependent effects on: • The extent or morphology of a cSAC / ecologically important area. • A regionally important geological feature (or widespread effects to minor geological features). • Extent of floodplains. • Widespread permanent effects on the extent or morphology of a NHA/ecologically important area, Mitigation measures (to design) will reduce but not completely remove the effect – residual impacts will occur.
Positive or Negative	**Moderate**	**Local time dependent effects on:** • **The extent or morphology of a cSAC / NHA / ecologically important area.** • **A minor geological feature.** • **Extent of floodplains.** **Mitigation measures can mitigate the effect OR residual impacts occur, but these are consistent with existing or emerging trends**
Positive, Negative or Neutral	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Positive, Negative or Neutral	**Not Significant**	**An effect which causes noticeable changes in the character of the environment but without significant consequences.**
Neutral	Imperceptible	No effects, or effects which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

7.3 Receiving Environment

7.3.1 Site Description and Topography

The existing Ballywater Wind Farm and Ballywater 110kV Substation are situated on a relatively flat, lowland coastal area of agricultural land, approximately 4km northeast of Kilmuckridge village, Co. Wexford. The grid connection cabling route runs underground, mostly in the public road network, with small portions also running through third-party land. The existing wind farm and substation are located within the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, Templederry. The Underground Grid Connection is located within the townlands of Ballywater Lower, Killannaduff, Raheenlusk, Ballinvunnia, Barnaree, Coolatrindle, Corbally, Boira North, Craan, Greenhall, Ballinvally, Kilpatrick, Ballyrea, Ballyedmond, Ballyshane, Ballynamire, Ballymurragh, Clone West, Raheendarrig, Tomnaboley Lower, Tomnaboley Upper, Tobergal, Knocknaskeagh, Myaugh, Ballydonigan, Tinnacross, Oulartard, and Crane.

The Project consists of a proposed lifetime extension to the existing Ballywater Wind Farm and Ballywater 110kV Substation for an additional 10 years, as well as the continued operation of the Underground Grid Connection. Ballywater Wind Farm consists of 21 no. turbines located to the northeast of Kilmuckridge village. The turbines are grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines, and the larger southern cluster comprises of 17 no. turbines.

The Environmental Impact Assessment Report (EIAR) Study Area for the Project is approximately 472 hectares (ha), while the total development footprint of the Proposed Development (i.e., the existing wind farm, hardstandings, site roads, and substation footprint) is approximately 7.52ha. The vast majority of the EIAR study area is under agricultural use, split between agricultural grassland and tillage throughout the site. Surrounding land uses along the Underground Grid Connection include agriculture, low density housing, recreational amenity, and the wider road network

The topography across the site of the Proposed Development is relatively flat and slopes downwards in and easterly direction towards the coast. The Proposed Development site ranges slightly in elevation, measuring approximately between 5 and 30 metres above Ordanance Datum (mAOD). The area surrounding the existing Ballywater Wind Farm is comprised of pastureland with scattered one-off housing and small developments, and inland marshes and beaches to the east. The route of the Underground Grid Connection ranges from approximately 20 to 90 metres above mOAD.

The Proposed Development contains approximately 5.8km of site roads, constructed of consolidated gravel with a running width of approximately 4m. Access to the southern site cluster for maintenance and landowner traffic, such as maintenance vehicles, is via the current existing entrance at the R742 Regional Road, which runs along the western side of the site boundary. Access to the northern cluster of the site is via the Cahore Local Road, which runs along the northern side of the site boundary, off the R742 Regional Road. The Underground Grid Connection runs for approximately 21.4km through the local road network. A shorter section, approximately 1.2km runs through third-party land.

The location of the Project is shown on Figure 4-1. The location and layout of the Proposed Development is shown on Figure 4-2.

7.3.2 Soils and Subsoils

According to GSI Mapping (www.gsi.ie) the site of the Proposed Development is dominated by poorly drained Carboniferous Limestone till of Irish Sea Basin origin (IrSTLs). Two other soil types also occur in smaller pockets of the site: Marine or Estuarine sediments comprised mainly of silts or clays (Mesc) and undifferentiated gravelly Alluvium (A). To the east of the site towards the coast, a band of windblown sands in dunes (Wsd) also occurs. Between the onsite substation and Crane 110kV substation along the Underground Grid Connection, the soil type is dominated by Shale till (TLPS) and poorly drained Carboniferous Limestone till of Irish Sea Basin origin (IrSTLs). The cabling also runs through smaller areas of Alluvium undifferentiated (A) and Bedrock at surface (Rck).

GSI mapping for the Proposed Development indicates that the site and surrounding area is underlain by thickbedded grey-green greywackes and slates of the Cambrian period.

The Teagasc soils map[3] identifies the predominant soil associated with the site of the Proposed Development as being poorly drained fine loamy over clayey calcareous Irish sea till (700a) to a depth of greater than 0.8m. This soil is poorly drained and not well suited to intensive agricultural practices, unless accompanied with the use fertilizers regularly, with land use defined as improved grassland. Previous investigation of the site provided in the original EIS prepared for Ballywater Wind Farm noted that soil as a generally sandy clay with few fieldstones or boulders, of a homogenous nature, possibly due to heavy cultivation. The local subsoils map is shown on Figure 7-1.

It was noted during the site walkover that the majority of the site is under intensive agricultural use for pasture and arable activities. Low levels of soil erosion are likely due to farm machinery action.

7.3.2.1 Bedrock Geology

Based on the GSI bedrock map of the region, the majority of the site of the Proposed Development is underlain by the Newtown Formation (CANEWT) consisting of a succession of grey-green greywackes and associated green and purple shales and slates, and the Cahore Point Formation (CACAPT) consisting of pale coloured quartzites and interbedded slaty mudstones. Both the Newtown Formation and the Cahore Point are defined as Cambrian Metasediments formed during the Cambrian Period. Both formations are classified as Poor Aquifers (Pl) which are generally unproductive except for local zones.

A bedrock geology map of the area is included as Figure 7-2.

7.3.2.2 Geological Heritage and Designated Sites

There is one Geological Heritage Site within the Project EIAR Site Boundary, the Cahore Polders and Dunes (WX009), which is located to the east of Ballywater Wind Farm, with a section of this site within the EIAR Site Boundary. This Geological Heritage Site consists of a ridge comprising individual sand dunes at varying depositional stages extending for over 4km along the east coast, which grade westward into polder grassland and wetland. This is a countywide important natural geological structure due to its representative features of a dynamic coastal depositional environment. The Cahore Point Geological Heritage Site (WX008) is located approximately 1.5km to the north of Ballywater Wind Farm. This site consists of approximately 1km of coastal Continuous Cambrian-Silurian rock exposure representative of Cambrian rocks of the Cahore group. The Cahore House Formation of thick bedded grey-green to purple greywackes interbedded with slates, are faulted against the massive grey-green quartzites of the Cahore Point formation, producing an olistostrome consisting of a jumbled mix of quartzite blocks in a slate matrix. This is a countywide important natural geological structure due to its unique formation and representation of the wider Cahore Group. The location of these Geological Heritage Sites in relation to the Project is provided on Figure 7-3.

There are a number of designated sites (both national and EU Natura 2000 sites) located within proximity of the Project, as shown in Figure 7-3 below. The Cahore Marshes Special Protection Area (SPA)[4] is located within and to the north-northeast of Ballywater Wind Farm. The recently designated

[3] http://gis.teagasc.ie/soils/map.php
[4] *NPWS (2022) Conservation objectives for Cahore Marshes SPA [004143]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage. Available at:* https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004143.pdf

Seas off Wexford Marine SPA[5] is located within the sea to the east of the Project, running over 85km along the majority of the Wexford coastline, covering an area of approximately 3,054km^2. The Cahore Polders and Dunes Special Area Conservation (SAC)[6] and Cahore Polders and Dunes proposed National Heritage Area (pNHA) are similarly located within and to the east and northeast of the Ballywater Wind Farm site boundary. The Kilmuckridge-Tinnaberna Sandhills SAC[7] is located approximately 3.2km south of the site, while the Blackwater Bank Marine SAC[8] is located approximately 4.5 off the coast of Ballywater Wind Farm. The Slaney River Valley SAC[9], located north of Crane 110kV substation, is located approximately 435m from the EIAR site boundary at its closest point. Further assessment of potential impacts to designated sites are included in Chapter 6: Biodiversity and the Appropriate Assessment Screening Report (AASR) of this EIAR.

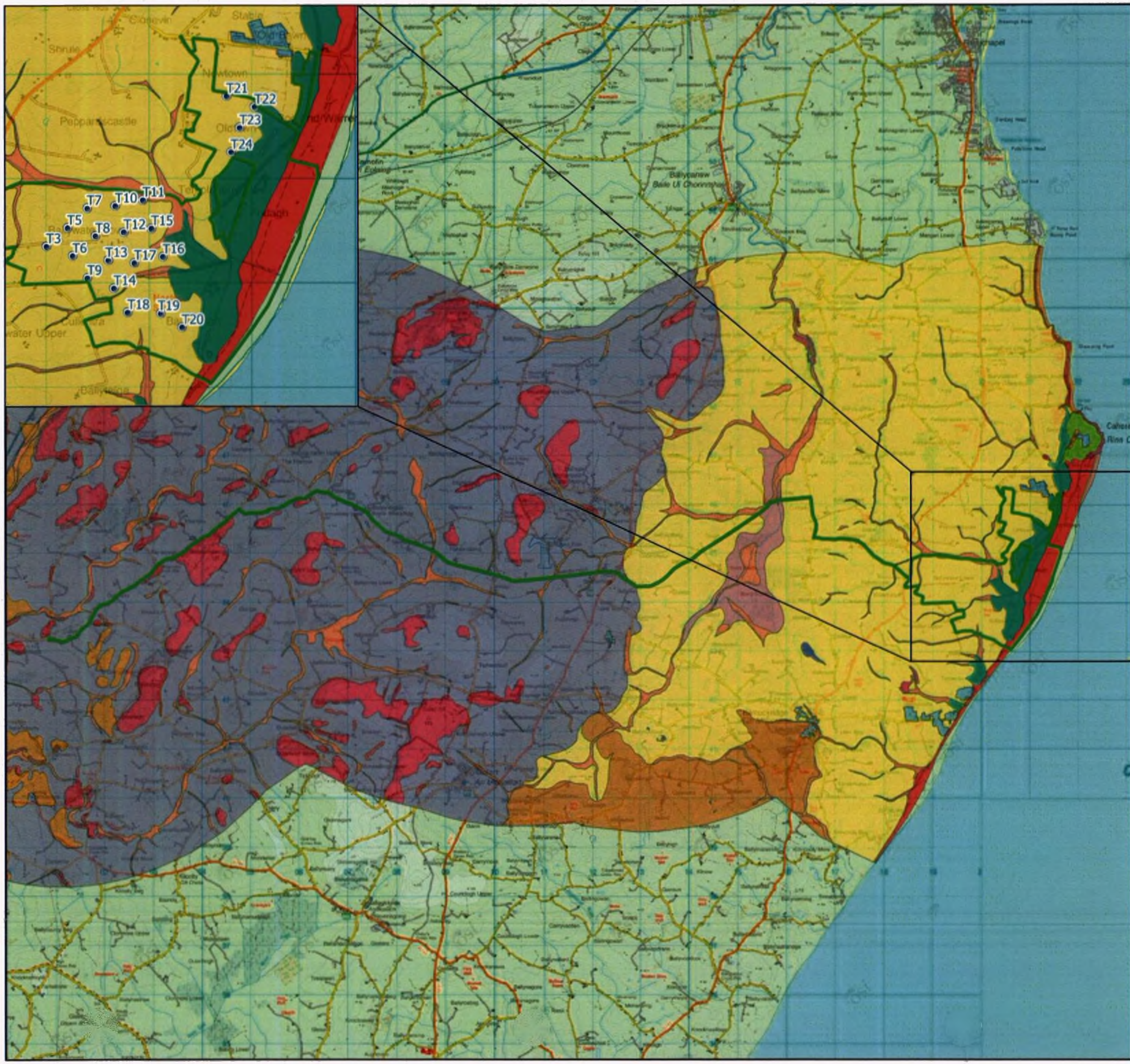
7.3.2.3 Soil Contamination

According to the EPA online mapping (https://gis.epa.ie/EPAMaps), there are no licenced waste facilities on or within the immediate environs of the Project.

There are no historic mines in the immediate vicinity of the site that could potentially have contaminated tailings, or historical quarries on Cassini 6inch Maps in the wider vicinity of the Project, and thus no evidence of soil contamination in the site and the surrounding area of the existing wind farm and substation, or along the Underground Grid Connection.

The site walkover survey did not identify any evidence of potential soil contamination at or adjacent to the Proposed Development and there is no record from the existing wind farm's operational phase of any environmental incidents with the potential to cause soil contamination.

[5] NPWS (2024). Conservation Objectives: Seas off Wexford SPA 004237. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage. Available at: https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004237.pdf
[6] NPWS (2016). Conservation Objectives: Cahore Polders and Dunes SAC 000700. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Available at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000700.pdf
[7] NPWS (201x). Conservation Objectives: Kilmuckridge-Tinnaberna Sandhills SAC 001741. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Available at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001741.pdf
[8] NPWS (2023). Conservation Objectives: Blackwater Bank SAC 002953. Version 2. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage. Available at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002953.pdf
[9] NPWS (2011). Conservation Objectives: Slaney River Valley SAC 000781. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Available at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000781.pdf



Map Legend

- EIAR Site Boundary
- Existing Turbines

Subsoils

- A, Alluvium
- GCSsS, Sandstone, shale sands and gravels (Cambrian/Precambrian)
- GLPSsS, Sandstone, shale sands and gravels (Lower Palaeozoic)
- IrSTLs, Limestone till (Carboniferous) with matrix of Irish Sea Baisn origin
- L, Lake sediments undifferentiated
- Made, Made ground
- Mbs, Beach Sand
- Mesc, Estuarine Sediments (Slits/clays)
- Rck, Bedrock at surface
- TCSsS, Sandstone and shale till (Cambrian/Precambrian)
- TLPS, Shale till
- Wsd, Blown sand in dunes

N

Drawing Title: Local Subsoils Map	
Project Title: Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By: CF	Checked By: RK
Project No.: 230417	Drawing No.: Figure 7-1
Scale: 1:75,000	Date: 2024-09-19

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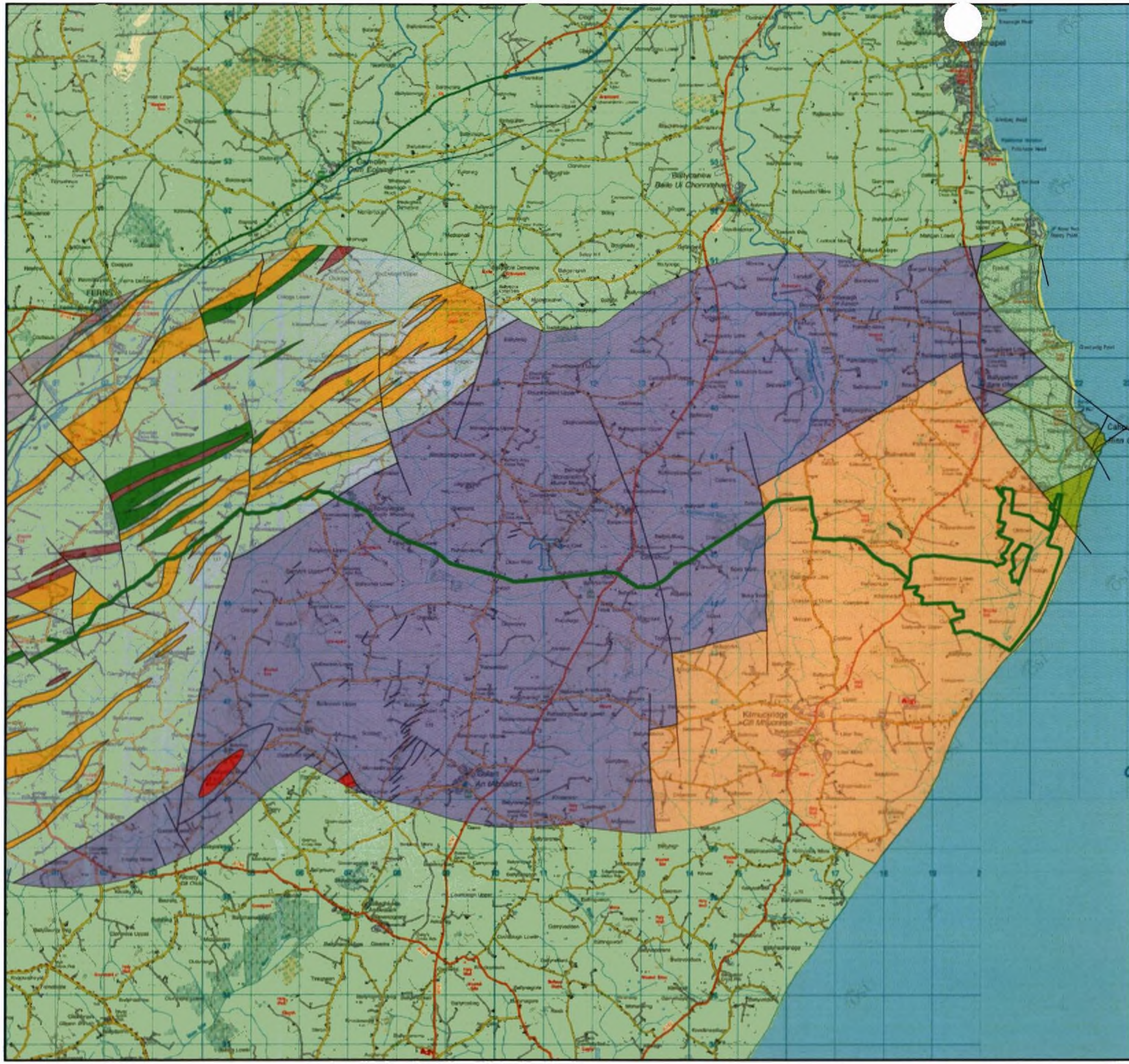

Map Legend

- EIAR Site Boundary

Bedrock
- Cahore House Formation
- Cahore Point Formation
- Glascarrig Formation
- Newtown Formation
- Roney Formation
- Ballynamuddagh Granite
- Dolerite
- Oaklands Formation
- Campile Formation
- in Campile Formation
- in Campile Formation
- Askingarran Formation
- Ballyhoge Formation
- Geological Linework

N

Drawing Title: Bedrock Geology Map	
Project Title: Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By: CF	Checked By: RK
Project No.: 230417	Drawing No.: Figure 7-2
Scale: 1:75,000	Date: 2024-09-19

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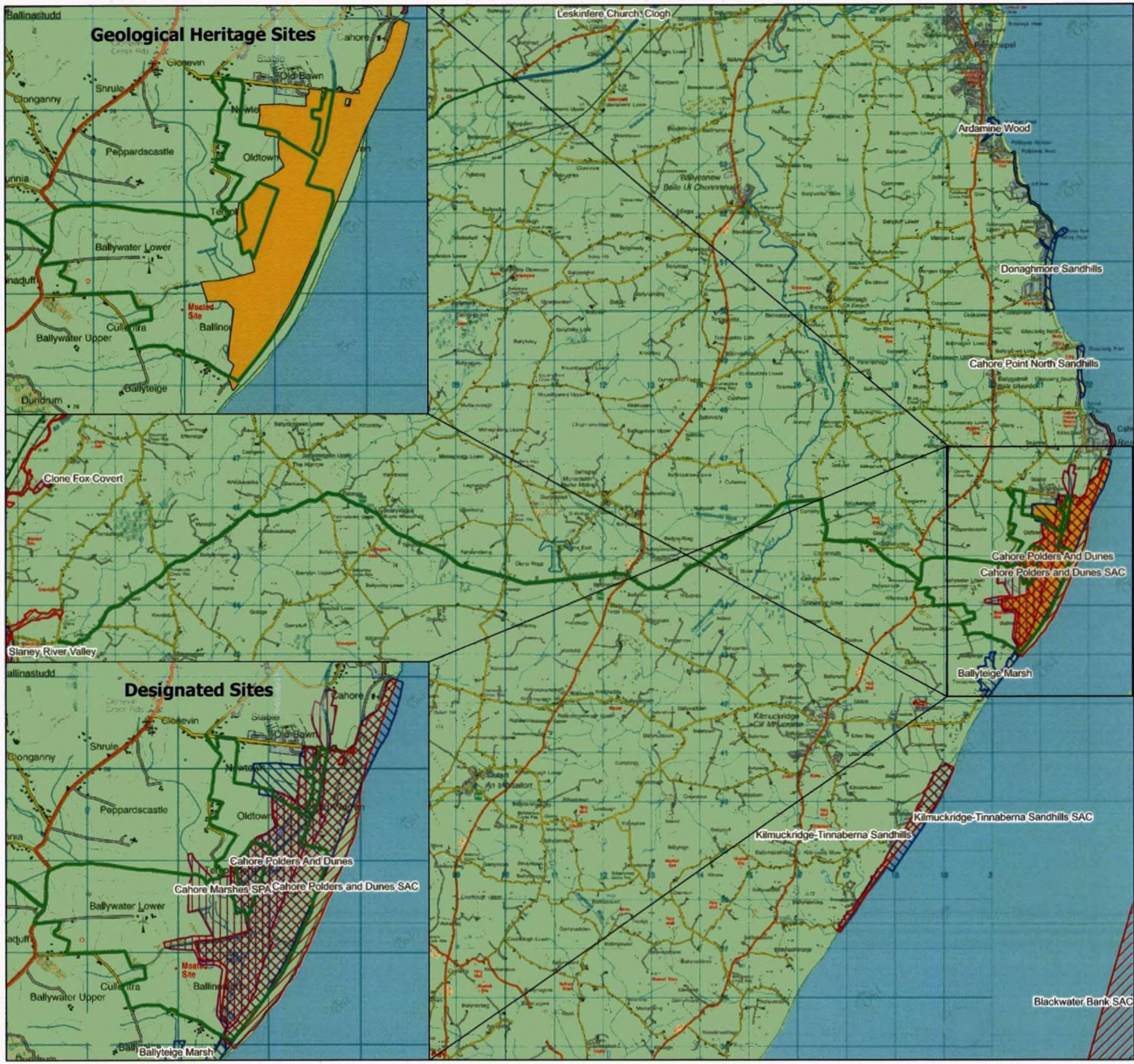

Map Legend

- EIAR Site Boundary

Designated Sites
- pNHA
- SAC
- SPA

Geological Heritage Sites
- Cahore Point
- Cahore Polders and Dunes
- Pollshone Head - Roney Point

N

Drawing Title	
Geological Heritage and Desinated Sites	
Project Title	
Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By	**Checked By**
CF	RK
Project No.	**Drawing No.**
230417	Figure 7-3
Scale	**Date**
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7.4 Characteristics of the Project

The Project consists of a 21 no. turbine wind energy development and onsite 110kV substation, and an underground grid connection cabling route, which have been in operation since 2005. The 21 no. turbines are all Enercon E70 models with a combined maximum total capacity of 42 MW. The turbines have a hub height of 64m, a rotor diameter of 70m and an overall tip height of 99m.

The existing operational wind farm includes a control building, site roads, and associated underground internal cabling. Ballywater Wind Farm is connected to the National Grid via an onsite 110kV substation and 110kV underground cable to the Crane 110kV Substation (approximately 18km west of the Proposed Development).

The original construction of the Project between 2003 and 2005 required the excavation of soil and subsoil to facilitate turbine foundation construction, burial of the internal cabling, and trenching along the Underground Grid Connection to bury the cable ducts. Significant excavations within the Proposed Development site were not required, and as confirmed during the site walkover in September 2023, all disturbed areas appear to have been returned to their pre-construction grades.

7.5 Likely, Significant Impacts and Mitigation Measures Implemented

7.5.1 Do-Nothing Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm and substation once the current planning permissions expires in 2025 and restoration of the site to its original use as agricultural lands for pasture and crops.

Condition 17 of the original Planning Application to Wexford County Council (WCCRef: PL 2001/0458) states the following in relation to the decommissioning of the wind farm:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus including foundations and all access roads shall be dismantled. All decommission structures shall be removed within three months of decommissioning and the entire side shall be restored to its original state within six months"*

Similarly, condition no. 13 of the current planning permission states:

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"* (WCC Pl. Ref. 2001/0458)"

Should the Decommissioning Plan as set out in the Planning Conditions for the existing Ballywater Wind Farm be implemented, it may lead to environmental effects on geology and soils due to the potentially extensive ground works required to remove existing access tracks and the turbine foundations. Local subsoils are not expected to be significantly affected during these potential decommissioning works, however a more environmentally sensitive approach is outlined for the end of the proposed extended operational period (i.e., in 10 years), as set out below. The effect of decommissioning is considered to have a **Long-term, Slight Negative Effect** in the context of this EIAR.

7.5.2 Construction Phase Effects

As the Project consists of an extension of life to an existing wind farm and substation, and the continued operation of an existing Underground Grid Connection, no construction related excavations, groundworks or other intrusive works are planned. Therefore, **No Significant Effects** to the subsurface environment (land, soils or geology) will occur.

7.5.3 Operational Phase Effects

No effects on soils and geology have occurred, or are anticipated, during the operational phase of the Project. The operational phase will not involve any disturbance to topsoil, subsoils or the geology of the area. Routine operational and maintenance works are expected to be required throughout the lifespan of the Project. These works are likely to include minor upgrades or replacements of turbine components, and mechanical/electrical components related to the control building. There is potential for limited use of plant and machinery as part of this maintenance work. There will be **No Significant Effects** on land, soils and geology associated with any future maintenance works.

Similarly, routine operational and maintenance works are anticipated to be required for the Underground Grid Connection. These works are anticipated to be infrequent and highly localised and isolated in nature. There is potential for limited use of plant and machinery as part of this maintenance work. There will be **No Significant Effects** on soils and geology associated with any future grid connection maintenance work.

For the reasons outlined above, there will be **No Significant Effects** associated with the operational phase of the Project.

7.5.3.1 Contamination of Soil by Leakages and Spillages

During routine maintenance works, oils and lubricants may be used, plant and machinery may require refueling onsite, meaning hydrocarbons may be present. Also, the transformers in each turbine and in the onsite substation are oil-filled transformers. Managed incorrectly, there is the risk of spills and leaks associated with these operations impacting on land and soils.

Pathway: Topsoil, subsoil and bedrock pore space.

Receptor: Topsoil, subsoil and bedrock.

Potential Impact: Negative, direct, slight, short term, medium probability impact on topsoil, subsoils and bedrock.

Mitigation Measures

Oil used in transformers (at each turbine and at the substation) and any storage of oils or hydrocarbons within the control building compound could potentially leak during the operational phase and impact on soils and subsoils. During maintenance and service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Wind Farm Site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised facility. Turbine transformers are located within the basement of each turbine (i.e. within the turbine hardstands), with dedicated concrete foundations. Oils for the purposes of cooling the turbine transformers are stored in bunded tanks within the turbine foundations, within a bund able to contain at least 110% of the volume stored. Any leaks would be contained within the turbine transformer units, and hydrocarbons would not be able to permeate to ground. Each transformer is also housed within bunds to prevent any unintended leaks or spillages. In addition:

- All plant and machinery to be serviced before being mobilised to site;
- Road-going vehicles will be refuelled off site wherever possible;
- Onsite refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required. Irrespective of the buffer distance and location of refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water;
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; and
- Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur.

Residual Impact

The implementation of the above mitigation measures will result in a residual **Imperceptible, Negative Direct, Short term, Unlikely effect** to land, topsoil, subsoils or bedrock. There was no recorded or observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

Based on the assessment above, **No Significant Effects** on land, topsoil, subsoils or bedrock as a result of leakages or spillages due to future maintenance works are expected.

7.5.3.1.2 *Significance of Effects*

No Significant Effects on land, soils and geology environment are envisaged during the operational stage of the Project.

7.5.4 Decommissioning Phase Effects

The potential effects associated with future decommissioning (which only applies to the existing wind farm and substation) of the Project in approximately 10 years will be similar to those associated with a typical wind farm and substation construction but of reduced magnitude, due to the proposed environmentally sensitive Decommissioning Plan included in Appendix 4-4 of this EIAR.

During decommissioning, it will be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the existing wind farm and substation by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by covering these areas with local topsoil and reseeding with a local native mix to encourage vegetation growth and reduce run-off and sedimentation. Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude.

Condition 17 of the original planning permission (WCC 2001/0458) outlines the conditions for decommissioning, as set out in Section 7.5.1 above. It is considered that this Condition is not appropriate in the current context, from an environmental perspective, for the Project. Upon decommissioning of the Project, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling. The disassembly and removal of the turbines will not have an impact on the subsurface environment (land, soils and geology) at the site.

It is proposed to leave turbine foundations in place underground, and to cover with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisances such as noise, vibration and dust.

It is proposed to leave underground cables in place where they are unlikely to be impacted by typical agricultural works. It is proposed that the site roadways will be left in-situ, as appropriate, to facilitate ongoing access for agricultural lands. A decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Project.

The decommissioning of the onsite 110kV substation will take place using conventional demolition methods. Further details on the decommissioning of the substation are outlined in Appendix 4-4: Decommissioning Plan of this EIAR.

As it forms part of the Project, the existing 110kV Underground Grid Connection cabling has also been assessed for potential effects upon land, soils and geology. The grid connection is composed of approximately 21.4km of buried 110kV transmission line from the existing Ballywater 110kV substation 110kV substation, located approximately 18km to the west of the Proposed Development. The Underground Grid Connection is existing linear underground infrastructure and there are no associated potential impact pathways which could lead to negative effects alone or in combination with the Proposed Development. It is proposed to leave the Underground Grid Connection cabling in place where it is unlikely to be impacted by current use along the local road network and small sections of third-party land. Leaving the grid connection cabling in-situ is considered a more environmentally prudent option, as to remove approximately 21.4km of buried cabling could result in significant environmental nuisances such as noise, vibration and dust, and traffic.

However, as noted in the Scottish National Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013[10]), reinstatement proposals for a wind farm are made far in advance, so within the 10-year extended lifespan of the Proposed Development, technological advances and preferred approaches for reinstatement might change. According to the SNH guidance, it is, therefore:

> *'Best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'.*

The 'Decommissioning of Onshore Wind Turbines' document as published by Wind Europe[11] provides guidance in relation to the protection of soil and prevention of contamination while decommissioning turbines. Relevant guidance set out in this document will be adhered to during the decommissioning phase of the Ballywater Wind Farm.

The mitigation measures as detailed in Section 7 of the Decommissioning Plan in Appendix 4-4 of this EIAR will be implemented during the decommissioning phase of the Project.

7.5.4.1.1 Significance of Effects

No Significant Effects on the land, soils and geological environment will occur during the decommissioning phase of the Project.

[10] *Scottish Natural Heritage (SNH) (2013). Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms. Report No.591. Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202013%20-%20SNH%20Commissioned%20Report%20591%20-%20Research%20and%20guidance%20on%20restoration%20and%20decommissioning%20of%20onshore%20wind%20farms.pdf*
[11] *Wind Europe (2020). Decommissioning of Onshore Wind Farms. Available at: https://windeurope.org/intelligence-platform/product/decommissioning-of-onshore-wind-turbines/*

7.5.5 Potential Cumulative Impacts

Potential cumulative effects on land, soils and geology between the Project and other developments in the vicinity, including those listed in Section 2.9 of this EIAR were also considered as part of this assessment. The nearest wind energy development to the Existing Ballywater Wind Farm is the existing 2 no. turbine Ballyduff Wind Farm, located approximately 19.9km northwest of the Proposed Development site. A single wind turbine also exists in Gorey Business Park, approximately 14.1km north of the Proposed Development site. As all of these wind turbines are operational and no groundworks are proposed at any site, there is no potential for cumulative impacts in relation to land, soils or geology that will occur.

Due to the limited scale of other developments in the vicinity, there is little potential for significant impacts to land, soil, and geology resulting from those developments. There will be no construction or excavation works associated with the Project, and there is no potential for significant impacts to land, soil, and geology. Therefore, **No Significant Cumulative Effects** on land, soils and geological environment are anticipated during the continued operational and decommissioning phases of the Project.

7.5.6 Summary

The Project (lifetime extension of the existing Ballywater Wind Farm and existing Ballywater 110kV Substation and ongoing operation of the existing Underground Grid Connection) does not involve any construction works, including excavations or otherwise, that may have the potential to impact local soils or underlying geology. Historically, groundworks, including excavations for turbine and control room foundations, and trenching for laying of cables, formed part of the construction of the wind farm between 2003 and 2005.

During the site walkover on the 26th of September 2023, no evidence of any geotechnical incidents or residual impacts to the land, soils and geology of the site was observed.

Storage and handling of small quantities of hydrocarbons/chemicals may be required during the operational and decommissioning phases, however **No Significant Effects** are likely.

No Significant Effects to the land, soil and geology at the site have occurred, or are anticipated, as a result of the proposed extension the Project, including the continued operational and decommissioning phases of the existing wind farm and substation.

8. HYDROLOGY & HYDROGEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

On behalf of Ballywater Windfarm Ltd. (the Applicant), MKO has carried out an assessment to extend the operational period of the existing Ballywater Wind Farm and Ballywater 110kV Substation (the 'Proposed Development'), and ongoing operation of the Underground Grid Connection (the 'Project') in the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown and Templederry, Killannaduff, Raheenlusk, Ballinvunnia, Barnaree, Coolatrindle, Corbally, Boira North, Craan, Greenhall, Ballinvally, Kilpatrick, Ballyrea, Ballyedmond, Ballyshane, Ballynamire, Ballymurragh, Clone West, Raheendarrig, Tomnaboley Lower, Tomnaboley Upper, Tobergal, Knocknaskeagh, Myaugh, Ballydonigan, Tinnacross, Oulartard, Crane, Co. Wexford, on Water (Hydrology and Hydrogeology) of the receiving environment.

A full description of the Project, which includes the Proposed Development, is included in Chapter 4: Description of the Project.

The Applicant plans to continue to utilise the existing site as an operational 21 no. turbine wind farm and 110kV substation to generate renewable energy for export to the National Grid, for a period of a further 10 years. No new construction or significant project alterations are proposed beyond routine operation and maintenance activities.

This Environmental Impact Assessment Report (EIAR) chapter provides a baseline assessment of the environmental setting of the Project in terms of hydrology, and hydrogeology and discusses the potential likely significant effects of extending the operational life of the existing wind farm and substation. The objectives of this assessment area to:

- Produce a baseline study of the existing water environment (surface and groundwater) in the area of the Project;
- Identify likely positive and negative effects of the development on surface and groundwater during construction, operational and decommissioning phases of the development;
- Identify mitigation measures implemented to avoid, reduce, or offset significant negative effects;
- Assess significant residual impacts and effects;
- Assess cumulative effects of the Project along with other local infrastructure developments.

8.1.2 Statement of Authority

This section of the EIAR has been prepared by Emily Lynch and Keelin Bourke and reviewed by Robert Kennedy, Michael Watson and Colin Fitzgerald, all of MKO.

Emily is an Environmental Scientist with almost 2 years' experience in private consultancy. Emily graduated from the National University of Ireland, Galway with a B.Sc. in Environmental Science. Since beginning working with MKO, Emily has been involved in preparing and managing Environmental Impact Assessments for large-scale onshore wind energy developments. Emily has experience in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports.

Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin. Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Michael Watson is Environmental Director at MKO, overseeing a team which comprises over 50 highly skilled environmental professionals. Michael has over 20 years' experience in the environmental sector. Following the completion of his Master's Degree in Environmental Resource Management, Geography, from National University of Ireland, Maynooth he worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael's professional experience includes managing Environmental Impact Assessments, EPA License applications, hydrogeological assessments, environmental due diligence and general environmental assessment on behalf of clients in the renewables, waste management, public sector, commercial and industrial sectors nationally. Michaels key strengths include project strategy advice for a wide range and scale of projects, project management and liaising with the relevant local authorities, Environmental Protection Agency (EPA) and statutory consultees as well as coordinating the project teams. Michael is a key member of the MKO senior management team and as head of the Environment Team has responsibilities to mentor various grades of team members, foster a positive and promote continuous professional development for employees. Michael also has a Bachelor of Arts Degree in Geography and Economics from NUI Maynooth, is a Member of IEMA, a Chartered Environmentalist (CEnv) and Professional Geologist (PGeo).

Colin Fitzgerald is a Senior Environmental Geologist at MKO with over 12 years of experience in geological and environmental consulting. This experience can be categorised into the disciplines of contaminated land, hydrology, and mineral resources. Colin completed his undergraduate degree (B.Sc. Hons.) in geology from University College Cork and completed a P.G. (Dip.) in environmental engineering from Trinity College Dublin. He is also a Professional Geologist with the Institute of Geologists Ireland. Prior to his current position with MKO, Colin worked as a geologist in gold exploration, heavy minerals mining, and lead mining in Western Australia before joining AECOM in Dublin as an environmental geologist. Colin then joined CDM Smith as a senior geologist before MKO acquired CDM Smith Ireland in 2024. Colin has worked on small and large-scale projects on greenfield and brownfield development sites, providing project management, environmental assessment, and mitigation/remediation design. His key skills include data analysis, site investigation, risk assessment, report writing and communication. Colin has led and managed large project teams since the start of his career and aims to deliver the highest standard of work in a positive and effective project environment.

8.1.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility, and other interested parties. This consultation process is outlined in Chapter 2, Section 2.7 of this EIAR. Issues and concerns highlighted with respect to local water sources are summarised in Table 8-1 below.

Table 8-1 Summary of Water Environment related Scoping Responses

Consultee	Description	Addressed in Section
Geological Survey of Ireland (GSI)	Recommended the use of their Groundwater Data, Geological Heritage Data and Geological Mapping Viewer in the compilation of the EIAR Chapter	8.3.4 – 8.4.6
Health Service Executive (HSE)	Included reference to a number of other EIAR chapters. With regards to Water, requested that any drinking water from surface or groundwater sources be identified alongside any Public and Group water schemes or any other private water supplies such as wells, and to ensure protection of all sources in relation to the Proposed Development. Any potential effects to drinking water sources, along with hydrological characteristics or the site and surrounding area were requested to be identified and assessed within the EIAR.	8.3.1
Inland Fisheries Ireland (IFI)	No response received at the time of report issue.	n/a
Uisce Éireann	Provided general guidance on aspects of water services to be considered in the scope of an EIA.	8.3.1 & 8.3.3.2
Waterways Ireland	This is not within any Zone of Influence of their waterways so they will not be commenting.	n/a
Wexford County Council, Water Services	No response received at the time of report issue.	n/a

8.1.4 Relevant Legislation

This EIAR complies with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

Regard has also been taken of the requirements of the following legislation (where relevant) as it pertains to the water environment:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and Development Act 2000 (as amended), and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;

- S.I. No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD"). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the "Drinking Water Directive") and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016).

8.1.5 Relevant Guidance

The hydrology and hydrogeology section of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) where relevant;
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be Contained in Environmental Impact Statements where relevant;
- European Commission (2017) Guidance on Screening;
- European Commission (2017) Guidance on Scoping;
- European Commission (2017) Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);

- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

8.2 Methodology

8.2.1 Desk Study & Preliminary Hydrological Assessment

A desk study and preliminary hydrological assessment of the site of the Proposed Development and the surrounding study area (i.e., lands within the immediate vicinity of the wind farm) were completed in advance of the site walkover. This involved collection of all relevant geological, hydrological, hydrogeological, and meteorological data for the area. This included review of the following sources:

- Environmental Protection Agency (EPA) Maps application (https://gis.epa.ie/EPAMaps/);
- Tailte Éireann GeoHive Geospatial Data Hub (www.geohive.ie);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- GSI – Groundwater Wells and Springs database (https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx#Wells)
- GSI – 1:100,000 scale bedrock geology map of Ireland (https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx)
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive Map Viewer (www.catchments.ie);
- OPW Flood Hazard Mapping (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

8.2.2 Site Investigations

A visual inspection of the existing Ballywater Wind Farm and Ballywater 110kV Substation and surrounding area, including drainage mapping, was undertaken by MKO on 26th September 2023. On the day of the site walkover, the weather was clear, dry and sunny. Particular attention was paid to existing site drainage, drainage patterns, watercourses, water flow directions and any other notable hydrological features within the site of the Proposed Development. The purpose of the site inspection was to investigate the site for any indications of residual impacts to the water environment resulting from the historic construction and operation of the wind farm.

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological, and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. Hydro Environmental Services undertook a walkover survey of the site and existing turbine locations on 13th February 2024. The weather on the day of the site visit was breezy with light showers. The days preceding had similar weather.

During the site walkover survey, particular attention was paid to the presence of hydrological/drainage features, local ground conditions, and potential surface water drainage flow paths between the existing infrastructure and adjacent SAC/SPA downstream to the east. The main observations identified were communicated to MKO and have been integrated into the chapter. Limited relevant historic site data was also available from the Environmental Impact Statement (EIS) for Ballywater Wind Farm, prepared by Ted Walsh and Associates on behalf of Ryland Construction Ltd. (Ted Walsh and Associates, 2001).

8.2.3 Impact Assessment Methodology

The guideline criteria (EPA, May 2022) require that the baseline environment is described in terms of the context, character, significance and sensitivity of the existing environment. The description of the baseline environment is Step 5 of the information which must be included in an EIAR as per the guideline criteria (2022).

The assessment of effects follows the description of the baseline environment and is Step 6 of the information which must be included in an EIAR. The guideline criteria for the assessment of effects states that the purpose of an EIAR is to identify, describe and present an assessment of the likely significant effects. The likely effects are described with respect to their quality (positive, neutral or negative), significance (imperceptible to profound), extent (i.e. size of area or number of sites effected), context (is the effect unique of being increasingly experienced), probability (likely or unlikely), duration (momentary to permanent), frequency and reversibility. The descriptors used in this chapter are those set out in the EPA (2022) Glossary of effects, as shown in Chapter 1 of this EIAR.

In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of importance, which are defined in Table 8-2 for hydrology and Table 8-3 for hydrogeology, are used to assess the potential effects that the Proposed Project may have on them.

Table 8-2: Estimation of Importance of Hydrology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for a wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.

Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 8-3: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes.

8.3 Receiving Environment

8.3.1 Site Description, Land and Topography

The Proposed Development is situated on a relatively flat area of agricultural land on the southeast coastline, approximately 1.6km from Cahore Point and 4km from Kilmuckridge village to the southwest. The Proposed Development is located in the townlands Ballinouart, Ballywater Lower, Cullentra, Newtown, Oldtown and Templederry.

The Proposed Development consists of a lifetime extension of the existing Ballywater Wind Farm for an additional 10 years. The existing Ballywater Wind Farm consists of 21 no. turbines located to the northeast of Kilmuckridge Village, with access to the southern cluster via the R742, and access to the northern cluster via a Local Road, Oldtown Rd. The Proposed Development is located on low lying agricultural land situated on the southeast coastline. The Cahore Marshes and the hedgerows along field margins provide the wind farm site with natural boundaries.

The Environmental Impact Assessment Report (EIAR) Study Area for the Project is approximately 472 hectares (ha) while the total development footprint of the Proposed Development (i.e., the existing Ballywater Wind Farm and Ballywater 110kV Substation) is approximately 7.52ha. The vast majority of the EIAR study area is under agricultural use, split between arable and pastoral land throughout the wind farm site and public road corridor.

While the Proposed Development is located in a low-lying coastal area, the topography across the site is undulating with gentle to moderate slopes that descend in a general easterly direction towards the Cahore Polders and Dunes SAC, Cahore Marshes SPA and the Cahore polders and dunes pNHA. In addition, the topography slopes locally towards the two main watercourses that drain easterly through the site. The site has a maximum elevation of approximately 20 metres Ordnance Datum (mOD) in the west of the site, at T05 and a minimum elevation of approximately 2 metres Ordnance Datum (mOD) in the east of the site near the Cahore Polders and Dunes SAC. There is no infrastructure situated near the minimum elevation of the study area. Carrigroe Hill is located approximately 10.8km from closest turbine (T03) at a maximum elevation of 231m (mOD). The Blackstairs Mountains run from northwest to southwest, approximately 34.8km from the wind farm site at its closest point. Mount Leinster and Black Rock Mountain are approximately 35km west of the existing wind farm and substation, with peak elevations of 796 mAOD and 599.6 mAOD respectively. The predominant land use in the areas surrounding Ballywater Wind Farm and Ballywater 110kV Substation is agricultural land and small patches of commercial forestry to the west, with scattered one-off housing and small developments also present.

The Underground Grid Connection, which forms part of the Project, runs predominantly through the public road network, with smaller sections of the cable travelling through private farm access roads and third-party lands. The topography of the Underground Grid Connection is relatively undulating. The elevation of the Project site increases slowly over a long distance, from approximately 20 metres Ordnance Datum (mOD) in the east, at the existing wind farm and substation site, to a maximum of approximately 100m Ordnance Datum (mOD) further inland, approximately 3.5km from the Crane 110kV Substation.

The Proposed Development contains approximately 5.8km of site roads, constructed of consolidated gravel with a running width of approximately 4m. Access to the southern section of the site for general traffic such as maintenance vehicles is via the current existing entrance to the southwestern section of the wind farm site from the regional road R742 which runs in a north-south direction. The northern access point is via the horse stables on the local Cahore Road, adjoining to the regional road R742 northwest of the site at Clonevin Cross Roads. The location of the Project is shown in Figure 1-1, while the location of the Proposed Development is shown in Figure 1-2 of Chapter 1: Introduction.

Due to the specific nature of the Project, there is infrequent requirement for staff welfare facilities. There are no staff welfare facilities in the electrical substation control building, and thus no wastewater arising from the Proposed Development. In place of this, the wind farm developer has an agreement with the participating landowners who has provided ongoing access to staff working on site at the existing wind farm and substation to staff welfare facilities. These facilities are available as part of the active agricultural farm that operates within the site boundary, and this agreement will remain in place during the proposed lifetime extension of the Project.

8.3.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann. The annual average rainfall (AAR) and potential evapotranspiration (PE) data was sourced from the Met Eireann weather station at Johnstown Castle, Co. Wexford. This weather station is located approximately 33km southwest of Ballywater Wind Farm.

The AAR and PE daily data was derived from June 2011 to July 2024 at Johnstown Castle. The AAE over this period was 1074.9 mm/yr. The annual average PE over the same period was 542.7 mm/yr.

These values are used as a best estimate for the site. Actual evaporation (AE) at the site is estimated as 515.6 mm/yr (which is 0.95 x PE)[1]. The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

Effective rainfall (ER) = AAR – AE = 1074.9 mm/yr – 515.6 mm/yr = 559.3 mm/yr.

Based on recharge coefficient estimates from the GSI (www.gsi.ie), 7.5% recharge is reported for majority of the Proposed Development site. The Proposed Development slopes in a general easterly direction towards the Cahore Polders and Dunes SAC and Cahore Marshes SPA. The downhill easterly boundary of the Proposed Development acquires a recharge co-efficient of 85%. This is due to the presence of high permeability subsoils such as sands and gravels overlain by well-drained soil. This indicates that 7.5% or 85% of the effective rainfall in each respective area infiltrates into the ground and becomes groundwater, the remaining 92.5% or 15% of the effective rainfall will become runoff into surface waters and the sea.

Based on the recharge coefficients, for the Proposed Development (i.e., the existing wind farm and subtation), the site is estimated to have an annual average recharge of 42.0 mm/yr or 475.4 mm/yr, and annual average runoff rates of 517.4 mm/yr or 83.9 mm/yr respectively.

8.3.3 Surface Water

8.3.3.1 Regional and Local Hydrology

The entire site of the Project lies within the Southeastern River Basin District (RBD). With respect to regional hydrology, under the Water Framework Directive (WFD) the Proposed Development is located entirely within the Owenavorragh surface water catchment, while the wider Project also lies within the Slaney & Wexford Harbour surface water catchment. The Proposed Development site is located within the Cahore (SC010) regional surface water sub-catchment while the wider Project also lies within Owenavorragh (SC010) and the Slaney (SC080) surface water sub-catchments. A regional hydrology map is shown as Figure 9-1.

8.3.3.2 Local and Site Drainage

Within the wider EIAR Site Boundary there are a number of watercourses which are encountered along the Underground Grid Connection. The grid connection crosses the Clonganny stream approximately 715m northwest of the Ballywater 110kV Substation, which downstream, closer to the Proposed Development, meets the Cahore Canal. Approximately 4km further northwest, the Underground Grid Connection crosses the Owenavorragh River, which continues to flow north towards Courtown where it enters the sea, approximately 13km north of the Project. Approximately 9km along the Underground Grid Connection, the public road (within which the cable is located) crosses over the Ballyedmond River, a tributary of the Owenavorragh River. Further along the Underground Grid Connection, which runs along the public road network, crosses a number of tributaries of the Ballyedmond River, the Tomnaboley Lower Stream and the Corbally stream, approximately 1.4km and 2.6km west, respectively. Before entering Crane 110kV Substation, the Underground Grid Connection, within the public road system, crosses two more watercourses, which are tributaries of the Tinnacross Stream, which further downstream enters the River Slaney, approximately 1km from Crane 110kV Substation.

There are two watercourses located within the Proposed Development site boundary, the Cahore River and the Bog and Warren River. The rivers are sourced in a region of low-lying undulating hills northwest and west of the Proposed Development, respectively. The Cahore River is located approximately 0.8km from the nearest turbine (T11) and flows in a southeast direction until the

[1] *European Commission (2015). Available at: https://data.europa.eu/doi/10.2779/352735*

waterbody traverses Ballywater Wind Farm. The Cahore River is redirected in a northeasterly direction due to the Cahore Canal situated approximately 0.64km from the nearest turbine (T14). This canal provides drainage for the Cahore River and the Bog and Warren River, avoiding the Cahore Polders and Dunes SAC, the Cahore Marshes SPA and the Cahore Polders and Dunes pNHA by discharging into the Irish Sea at Cahore Point. The Bog and Warren watercourse origins are south of the western entrance in the townland Cullentra, approximately 0.51km from the nearest turbine (T09). The watercourse flows in a northeasterly direction, adjoining with the Cahore River and subsequently discharging into the Irish Sea at Cahore Point. The soils and subsoils within the Proposed Development Site appear to be reasonably well-drained with an overall absence of manmade field drainage. There are no constructed drainage outfalls associated with the wind farm infrastructure, with runoff instead flowing off hardstands and onto the adjacent ground in an "over the edge" drainage approach across most of the site. Generally, no drains have been identified for the collection of runoffs. Most of the wind farm infrastructure is surrounded by well-established grassland that comes right up to the edge of the hardstand areas in a well-kept and graded manner.

There are additional watercourses adjacent to Ballywater Wind Farm, hydraulically connected to the Cahore River and the Bog and Warren River. Cooperstown River is situated northeast approximately 1.3km from the closest turbine, T21. It adjoins with the Cahore River roughly 1.1km prior to discharging at Cahore Point. The Ballywater Upper River runs in a south easterly direction south of the EIAR study boundary. It drains into the Irish Sea, south of Ballinoulart Beach and the closest turbine (T20) is approximately 0.46km from the Ballywater Upper River.

Surface water runoff on the Proposed Development site typically drains in an easterly direction due to the sloping topography along the coastline, east of the site. A local hydrology map is presented as Figure 8-2, while the EIAR Study Area is defined in Chapter 1 of this EIAR.

As mentioned previously, there is an infrequent requirement for staff welfare facilities and there are no staff welfare facilities in the electrical substation control building, and thus no wastewater arising from the Proposed Development. Instead, the Applicant has an agreement with the participating landowners which grants access to staff working on site at the Proposed Development to staff welfare facilities which are available as part of the active agricultural farm within the site.

8.3.3.3 Flood Risk Identification

OPW's indicative river and coastal flood map (www.floodinfo.ie), CFRAM Preliminary Flood Risk Assessment (PFRA) maps which can be accessed at the Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie), and historical mapping (i.e. 6" & 25" maps) were consulted to identify areas within the EIAR as being at risk of flooding.

The OPW installed a drainage scheme in the existing Ballywater Wind Farm and Ballywater 110kV Substation site as part of the larger flood risk management plan for Owenavorragh River Basin (UOM11).[2] This provides local drainage to a low-lying coastal area near Cahore Point. The Cahore Canal diverts surface runoff from flowing into the Cahore Marshes and Polders SAC, Cahore Marshes and Polders pNHA, and the Cahore Marshes SPA. Local Authorities have a statutory duty to maintain the drainage schemes and the plan does not amend these responsibilities to provide additional flood relief.

According to the indicative river and coastal flood maps produced by the OPW, there are two recurring flood incidents recorded in the village of Kilmuckridge approximately 4km southwest of the Project[3]. Recurring flooding also occurred immediately east of Ballywater Wind Farm near T21-T24 in

[2] *OPW (2018). Available at: https://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_11.pdf*
[3] *OPW (2024). Available at: https://www.floodinfo.ie/map/floodmaps/pf_report/?X=6893454.286408281&Y=699521.1075880843*

the northern cluster in proximity to Cahore Point[4]. In Cahore, two flooding events took place in 2005 and 2011, respectively. Note that not all local flooding issues are recorded on the OPW database. Along the Underground Grid Connection, only one flood event has been recorded, in November 2000 along the Owenavorragh Corbally Bridge[5], prior to the construction of the Project.

The Department of Environment, Community and Local Government online mapping viewer (www.myplan.ie) identifies areas in Courtown approximately 7.8km north of Ballywater Wind Farm, which are classified as liable to flood under a 1-in-10 year scenario within the costal flood and the river flood extents. There are no fluvial or pluvial flood zones identified on the PFRA mapping within the vicinity of the Project site. National Indicative Fluvial Mapping (NIFM), which shows the modelled extent of land which may be affected by fluvial flooding, predicted that lands located within the Proposed Development, east of the existing wind farm and substation, are liable to flood under and Annual Exceedance Probability (AEP) of 1%, or a 1-in-100-year flood. Under the 0.1% AEP, or 1-in-1000-year flood, the modelled flooding scenario is slightly higher, but the Proposed Development infrastructure is similarly unaffected. This flood area is associated with land that was drained as part of the Drainage Districts carried out prior to The Arterial Drainage Act, 1945.

Historical 6" and 25" maps for the Project were consulted to identify areas that are "prone to flooding". The Cahore Canal is liable to flood, and sluices were installed for flood control along the Cahore Canal flowing from south to north towards Cahore Point, immediately west of Ballywater Wind Farm. None of the existing infrastructure within the Proposed Development is in proximity to regions where flooding is likely.

Based on the above information, encompassing indicative river and coastal flood map, CFRAMs, PFRAMs assessments and historical mapping there is medium potential flood risk probability of flooding at the Proposed Development site.

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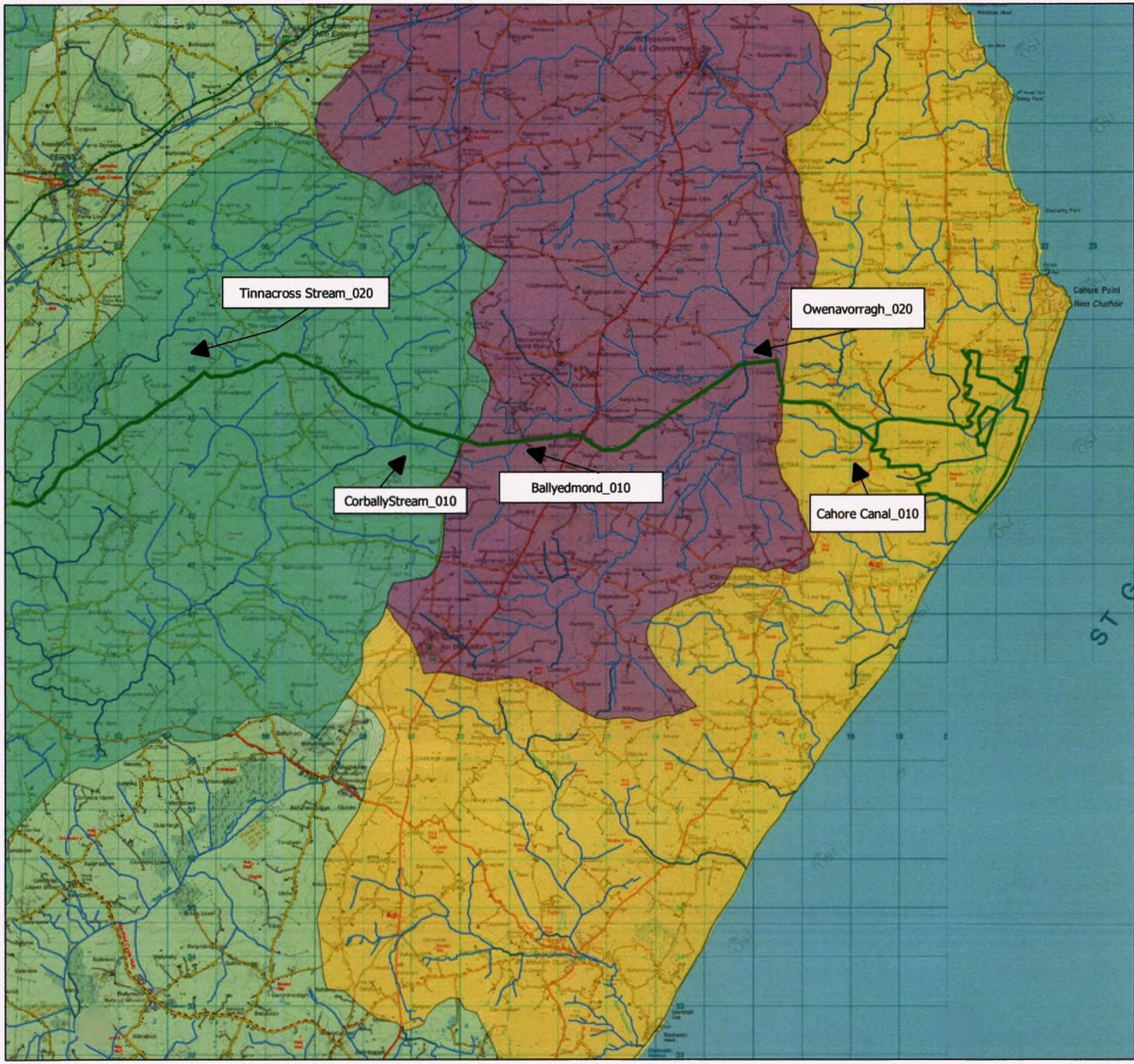
[4] *OPW (2024). Available at: https://www.floodinfo.ie/map/floodmaps/pf_report/?X=6900822.816284874&Y=690684.9871183181*
[5] *OPW (2000). Available at: https://static-floodinfo.s3-eu-west-1.amazonaws.com/media/reports/F310%20Data%20Collection/005%20OPW%20Trim/002%20Reports/opt_re_if_0000002906.pdf*



Map Legend

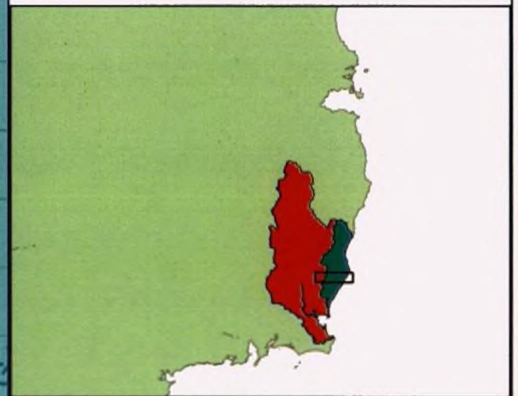
EIAR Site Boundary
Watercourses

Water SubCatchments

- Cahore_SC_010
- Owenavorragh_SC_010
- Slaney_SC_080

Water Catchments

- Owenavorragh
- Slaney & Wexford Harbour



N

Drawing Title Project Site Hydrology Map	
Project Title Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By CF	Checked By RK
Project No. 230417	Drawing No. Figure 8-1
Scale 1:75,000	Date 2024-09-19

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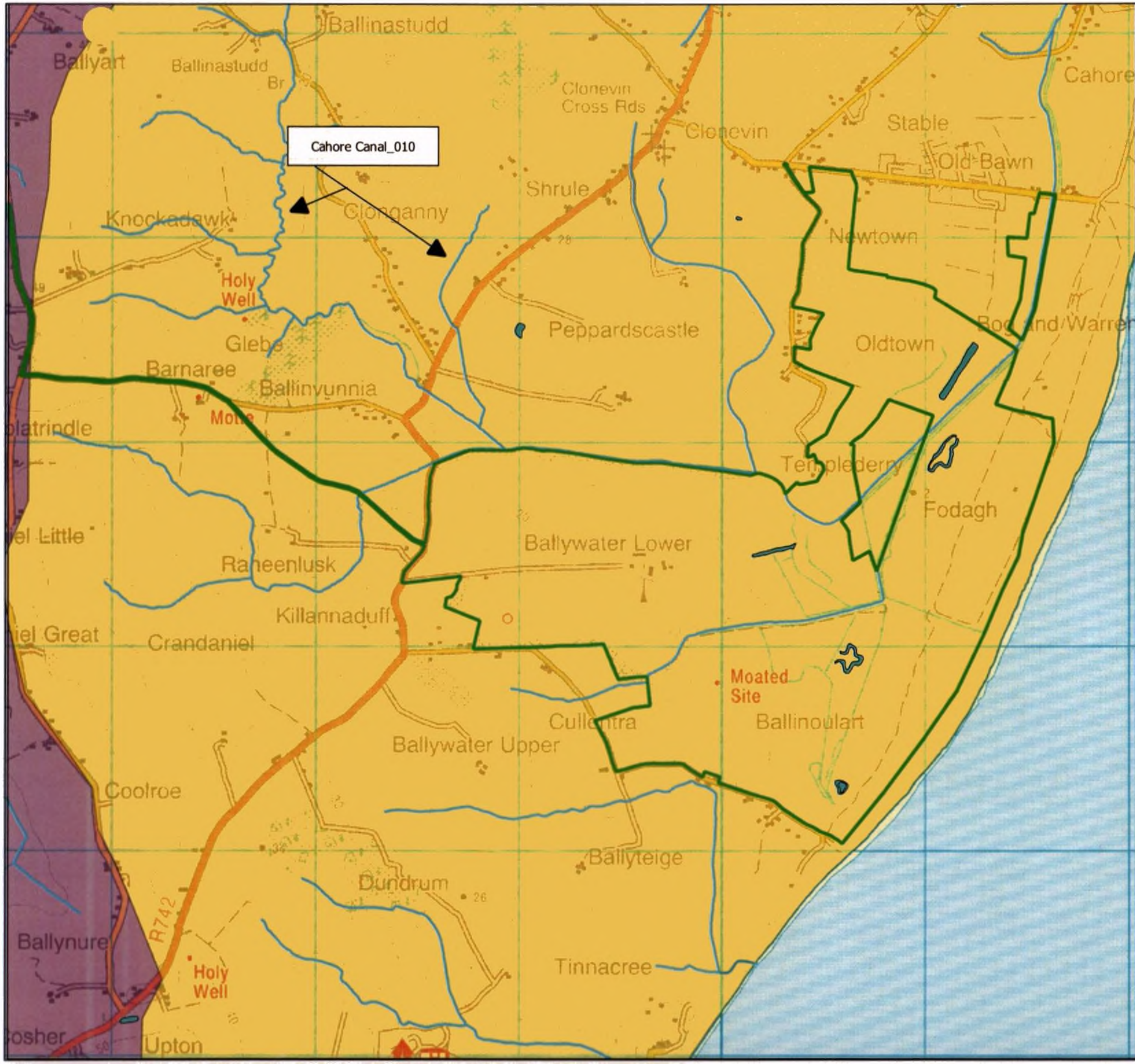


Map Legend

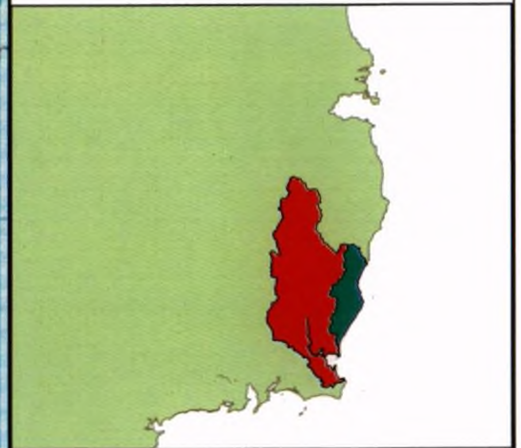
- EIAR Site Boundary
- Watercourses
- Lakes

Water SubCatchments

- Cahore_SC_010
- Owenavorragh_SC_010

Water Catchments

- Owenavorragh
- Slaney & Wexford Harbour



N

Drawing Title Propsoed Development Site Hydrology Map	
Project Title Proposed Lifetime Extension of Ballywater Wind Farm	
Drawn By CF	Checked By RK
Project No. 230417	Drawing No. Figure 8-2
Scale 1:18,000	Date 2024-09-19

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8.3.3.4 Surface Water Hydrochemistry

The Environmental Protection Agency's (EPA) Quality Rating System (Q-Rating) is a biotic index used to rate the ecological quality of streams and rivers. The rating system assigns streams a Q-Value of between 1 and 5, with 1 indicating bad ecological quality and 5 indicating the highest ecological quality. None of the monitoring points are hydrologically connected to the Cahore River or the Bog and Warren River. Therefore, the criteria for choosing an appropriate EPA monitoring point were based on proximity, pertaining the same sub catchment and land use. The closest monitoring point to the Ballywater Wind Farm is on the Blackwater River, a watercourse located southwest of the River Cahore, approximately 10km south of the Project site boundary at its nearest point. The River Blackwater Station is located on a local road bridge over the River Blackwater, approximately 12km southeast of the nearest turbine (T18). The latest Q-Value from 2022 shows a score of 4 (Good Water Quality) for the River Blackwater.

The Ballynamona Stream Station is located approximately 2.3km upstream of the Blackwater River monitoring point. The Ballynamona stream station is located approximately 13km southwest of the nearest turbine (T18) on a local road bridge. The latest Q-Value from 2022 shows a score of 2 (Poor Water Quality) for the Ballynamona Stream. Along the Underground Grid Connection, there is a number of historical monitoring points which exist, with the most recent measurements between 1987 and 2001. The most up to date is that of the Corbally Stream at Kilcormick Bridge, approximately 1.7km south of the Project at its closest point. As of 2022, this uppermost station along the Corbally Stream was in poor ecological condition, with a Q-Value of 2, while Good ecological conditions, with Q-Values of 4, persisted at all other 4 no. sites within the Corbally Stream. These watercourses are not expected to be affected by the continued operation of the Project due to the fact that the existing wind farm and substation, and Underground Grid Connection have been in operation since 2005, and there are no additional groundworks proposed.

8.3.4 Groundwater

8.3.4.1 Hydrogeology

Based on the GSI bedrock map of the region, the Proposed Development is underlain by the Newtown Formation, consisting of grey-green greywackes and slates, and the Cahore Point Formation consisting of pale-coloured quartzites and slates interbedded with slaty mudstones. These two bedrock formations are Cambrian era formations; the Proposed Development is predominantly underlain by the Newtown Formation. The Cahore Point Formation is exclusively underlying a small section in the northeast, in the Bog and Warren townland. The wider Project along the Underground Grid Connection is underlain by the Ballyhoge Formation, which consists of dark grey slates with siltstone laminae. As the route moves further southwest towards Crane 110kV Substation, it is underlain by the Campile Formation which consists of rhyolitic volcanics and brown and grey slates with fissures of intermediate volcanics from the Ordovician Period.

The bedrock aquifer within the Proposed Development is categorised as poor (PI) and generally unproductive except for local zones. A bedrock aquifer map is shown as Figure 9-3.

The Proposed Development is underlain by the poorly productive (PP) Cahore Point Ground Water Body (GWB) as delineated by the GSI. The Cahore Point GWB is a GWB in the Southeastern RBD and is characterised by the topography extending north from the most northeasterly tip of Wexford Harbour to Courtown. The highest point within the GWB is 231m (mOD), defining the eastern boundary of the groundwater body. Transmissivities have been estimated to be in the range of 5 to 20 m^2/d in local zones, but generally less than $5m^2/d$. The effective thickness of the GWB is typically 30m and the porosity fraction of the GWB is approximately 0.01.[6]

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[6] *GSI (n.d.). Available at: https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/CahorePointOCM.pdf*

Within the wider Project EIAR Site Boundary, the Underground Grid Connection is underlain by the northern section of the poorly productive (PP) Castlebridge North GWB, and moving further west towards Crane 110kV Substation, it is underlain by the productive fissured bedrock (Fl) within the Enniscorthy GWB.

The Castlebridge North is characterised by a variable topography, encompassing north and south of Wexford Harbour. The southeastern section of the GWB is heavily influenced by the topography of the Screen Hills with an erratic drainage pattern, and the isolated catchment of the River Sow which discharges into the north of Wexford Harbour. In the northern section of the GWB, which the grid connection is underlain by, the GWB is heavily influenced by the River Slaney catchment. The highest elevation with the GWB is in the southwestern region, south of Wexford Harbour, where Forth Mountain has a peak of 237m (mOD). There is little information on the hydrogeological properties of the GWB, but transmissivities are considered to be in the range between 1-10m^2/d The effective Thickness of the GWB is estimated to be about 15-30m[7]. The Enniscorthy GWB is defined by the topography of Carrigroe Hill in the northeastern section of the GWB, with an elevation of 230m (mOD), and in the southwest by the topography of the Clonroche area, at 166m (mOD). The majority of the area is free draining with patches of poorer drainage where the permeability of the subsoil is reduced. The GWB is defined as a regionally important Fractured Aquifer, with smaller portions which are classified as Poor aquifers, which are generally unproductive except in local zones. The effective thickness of the GWB is estimated to be quite large, with open fractures measured at depths of 50m. Transmissivities are estimated to be in the range of 20-300m^2/d in the northern sections, and an average of 100m^2/d in the southern sections[8].

The depth to which groundwater varies below ground level (bgl) was not noted as part of the original EIS prepared for the Ballywater Wind Farm. Based on the topography of the Proposed Development site, and the Initial Characterisation Report, the groundwater flow paths of the Cahore Point GWB is inferred to be generally west to east, with the majority of discharge to surface waterbodies rather than directly to the sea. Within the wider EIAR Site boundary, the Castlebridge North Initial Characterisation Report details a generally uncertain groundwater flow path, due to its poor aquifer capabilities, with the general flow direction to the south of the GWB. The Initial Characterisation Report for the Enniscorthy describes the lack of intergranular permeability of the bedrock, with groundwater flow occurring in the fractures present in the bedrock. Generally, the groundwater flow path is estimated to from the east and west to the main discharge areas in the centre of the waterbody along the Slaney River.

A regional groundwater body map is provided as Figure 9-4.

8.3.4.2 Groundwater Vulnerability

Groundwater vulnerability is generally mapped as varying between low and high across the EIAR Site Boundary. As the Underground Grid Connection exits the Proposed Development site, it runs along public road corridor towards Crane 110kV Substation. This route passes through smaller areas which are classified as Moderate and High groundwater vulnerability, with smaller sections of the route running adjacent to areas classified as X – Rock or Karst at or near Surface. High groundwater vulnerability is classified along the eastern boundary of the Proposed Development due to the presence of the marshes and polders. The majority of the Proposed Development falls under the category of low groundwater vulnerability.

[7] *GSI (n.d.). Available at: https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/CastlebridgeAGWB.pdf*
[8] *GSI (n.d.). Available at: https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/EnniscorthyGWB.pdf*

Map Legend

- EIAR Site Boundary
- Aquifer Geological Lines

Bedrock Aquaifers

- Rf - Regionally Important Aquifer - Fissured bedrock
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

N

Drawing Title

Bedrock Aquifers Map

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm

Drawn By	Checked By
CF	RK
Project No. 230417	Drawing No. Figure 8-3
Scale 1:75,000	Date 2024-09-20

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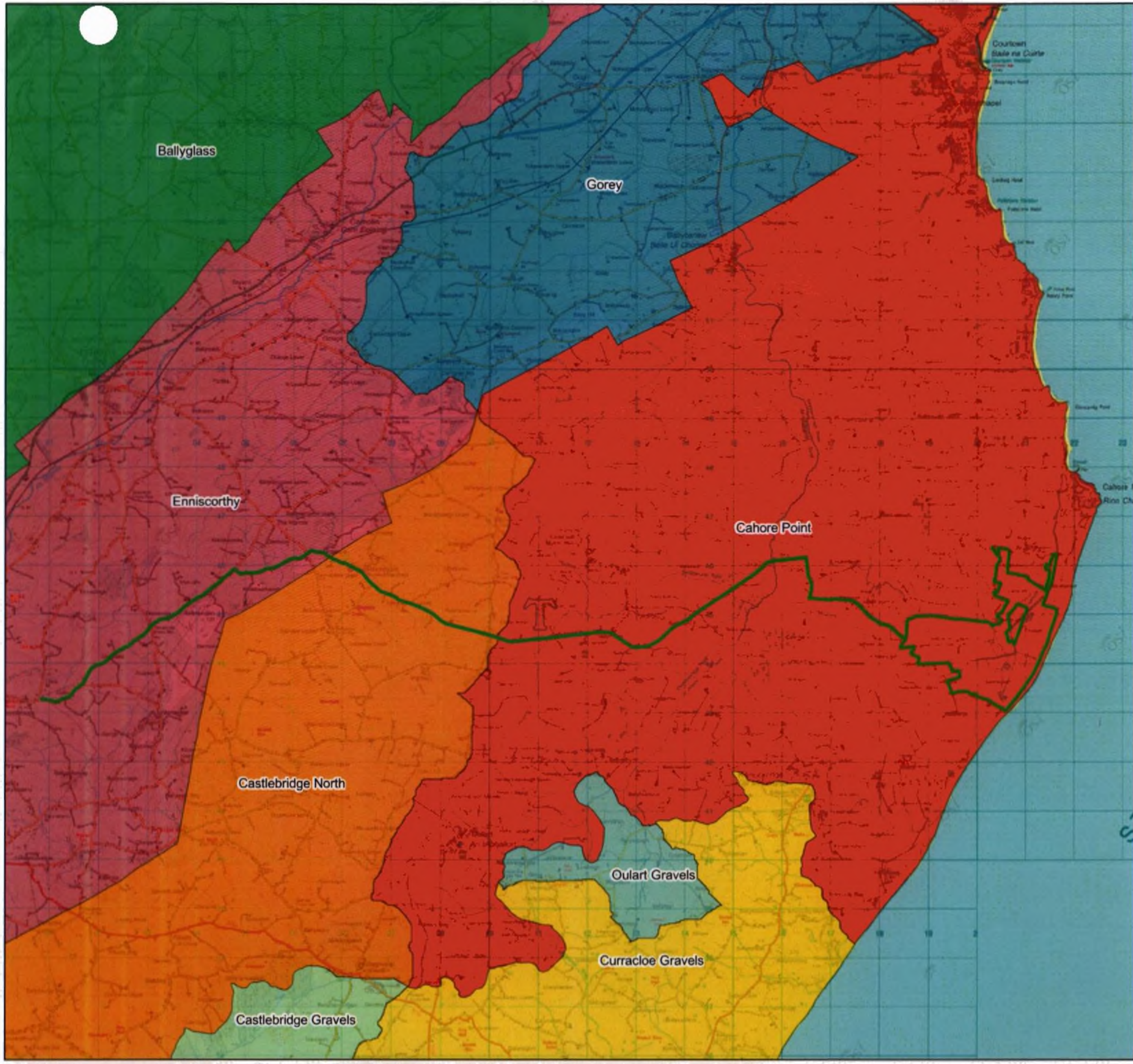

Map Legend

EIAR Site Boundary

Water Framework Directive Groundwater Bodies

- Ballyglass GWB
- Cahore Point GWB
- Castlebridge Gravels GWB
- Castlebridge North GWB
- Curracloe Gravels GWB
- Enniscorthy GWB
- Gorey GWB
- Oulart Gravels GWB

N

Drawing Title
Regional Groundwater Bodies Map

Project Title
Proposed Lifetime Extension of Ballywater Wind Farm

Drawn By	Checked By
CF	RK
Project No. 230417	Drawing No. Figure 8-4
Scale 1:75,000	Date 2024-09-17

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8.3.4.3 Groundwater Hydrochemistry

As this is an existing development and no groundworks are proposed, groundwater sampling has not been undertaken. As there is no excavation or construction activity associated with the Project, discharges to ground or groundwater quality impacts are not anticipated.

The Initial Characterisation Report on the Cahore GWB contains hydrochemical data detailing the hydrochemical signature of the GWB. The bedrock strata of the aquifer are Siliceous, and the water is mostly moderately hard with a few soft occurrences. Saltwater intrusion is limited in the Cahore Point GWB due to low transmissivity of the bedrock.

The Initial Characterisation Report on the Castlebridge North GWB describes the hydrochemical signature of the GWB. Similar to the Cahore GWB, the bedrock strata are Siliceous, but with moderately soft waters and low electrical conductivity of approximately 270 µs/cm. There is an indication of ion exchange, and the water has a magnesium bicarbonate signature, implying that the water is not freshly recharging and that this is a confined aquifer beneath the almost impermeable marl.

The Enniscorthy GWB Initial Characterisation Report details the hydrochemical signature of the GWB. This Ordovician siliceous aquifer has slightly hard water, with average Calcium Carbonate concentrations of 135 mg/l, and electrical conductivity values of 384 µs/cm. The main discharges from the GWB are with associate waterbodies, and the Slaney River, which is the main discharge area.

8.3.5 Water Framework Directive Water Body Status & Objectives

The Water Framework Directive (WFD) establishes a framework for the protection of ground and surface waters and their dependent habitats and wildlife. Under the directive, the EPA is working to classify all waterbodies in the State and to assign a risk status to each of them. The overall objective of the WFD is for all waterbodies to achieve a minimum of 'Good' water quality status.

Local Groundwater Body and Surface Water Body status and risk result are available from (www.catchments.ie).

8.3.5.1 Groundwater Body Status

Groundwater Body (GWB) status information is available from (www.catchments.ie). Please refer to Figure 9-4 for the location and extent of associated groundwater bodies.

In terms of WFD status the Cahore Point GWB (IE_SE_G_025) which underlies the Proposed Development site is defined as 'At Risk'. This classification represents the risk of Cahore Point GWB failing to meet the Water Framework Directive objectives by 2027. While classed as at risk, it is not classed as a 'High Status Objective'. The WFD catchment assessment report for the Owenavorragh catchment identifies the significant impacts at Cahore Point GWB as anthropogenic pressure.[9] Monitoring data available for the GWB shows a 'Good' value for each assessment.

The Castlebridge North GWB (IE_SE_G_031) underlying the Underground Grid Connection holds an overall WFD groundwater status of 'Good'. This shows the WFD environmental objectives of the Castlebridge GWB are currently being achieved. This GWB underlies both the Owenavorragh catchment described above, and the Slaney and Wexford Harbour catchment. 85% of the GWBs in the Slaney and Wexford Catchment were at 'Good' status, with significant pressures on the remaining 3

[9] *EPA (2019). Available at: https://catchments.ie/wp-content/files/subcatchmentassessments/11_1%20Cahore_SC_010%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf*

GWBs anthropogenic pressures associated with agricultural activities[10]. The Enniscorthy GWB (IE_SE_G_061), also within the Slaney and Wexford Harbour Catchment, has a WFD groundwater status of 'Good', but is classed as 'At Risk' of meeting its 2027 WFD environmental objectives due to pressures from nutrients loading associated most significantly with agriculture.

8.3.5.2 Surface Water Body Status

Local surface water body status and risk results are available from (www.catchments.ie). The Proposed Development site is located within the Cahore (SC010) regional surface water sub-catchment. Bordering sub-catchments include the Owenavorragh (SC010) and Litter More (SC010) surface water sub-catchments, and the River Cahore Canal (SC010), which is located approximately 138m west at its closest point (T15). Within the wider EIAR Boundary, as the Underground Grid Connection exits the Proposed Development, it passes through the River Owenavorragh (Owenavorragh_020, Owenacorragh_30) and the Litter More River (Litter_More_010) sub-basins within the Cahore, Owenavorragh and Littermore sub-catchments. All three surface waterbodies (the Cahore Canal, the Litter More River, and the Owenavorragh River) are not hydrologically connected. As the Underground Grid Connection moves further west towards Crane 110kV Substation, it passes through the Ballyedmond River (Ballyedmond_010) and Corbally Stream (Corbally_Stream_010) sub-basins, located in the Slaney Sub-catchment (Slaney_SC_010), which both discharge downstream into the River Owenavorragh. Finally, before entering Crane 110kV Substation, the Underground Grid Connection passes through the Tinnacross Stream (Tinnacross_Stream_020) sub-basin, which discharges into the River Slaney, near Enniscorthy, Co. Wicklow.

The River Cahore Canal is classed as 'At Risk', with no 'High Status Objective'. The River Owenavorragh, Ballyedmond River and Corbally Stream are classed as 'Poor' status and 'At Risk' for achieving the WFD objectives by 2027. The Cahore Canal is classed as 'Good' but 'At Risk' for achievement of the WFD objectives for 2027, alongside both the River Litter More and Tinnacross Stream. Neither WFD surface waterbody is classified as a 'High Status Objective'. Significant issues identified for the majority of the surface water bodies include excess nutrients, and organic matter the associated pressures of agriculture and domestic wastewater treatment. The Corbally Stream was assessed with the significant pressure determined to be affecting it being morphological, due to hydromorphological pressures, along with excess nutrients associated with agriculture.

The WFD sub-catchment assessment report for the Cahore Canal_SC_010 (EPA, 2019) identifies the waterbody as facing environmental pressures from domestic wastewater discharges and agriculture (both point and diffuse sources), in particular due to pasture farming. Phosphate and ammonia concentrations are elevated at Cahore Canal_010 as a result of the significant pressures. Litter_More_010 is also referenced in the WFD sub-catchment assessment report detailing the waterbody's significant pressures as domestic wastewater, urban wastewater, and agriculture.

The WFD sub-catchment assessment report (EPA, 2018)[11] for the River Owenavorragh_010 classified the waterbody as 'Not at Risk' due to good biological status. In the upper reaches of the Owenavorragh (Owenavorragh_020 Owenavorragh_030 and Owenavorragh_040), the significant issue is elevated phosphate, resulting in less than good biological status. The significant pressures are diffuse agriculture and septic tanks.

[10] *EPA (2024). Available at:* https://catchments.ie/wp-content/files/catchmentassessments/12%20Slaney%20&%20Wexford%20Harbour%20Catchment%20Summary%20WFD%20Cycle%203.pdf

[11] *EPA (2019). Available at:* https://catchments.ie/wp-content/files/subcatchmentassessments/11_2%20Owenavorragh_SC_010%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf

The WFD sub-catchment assessment report (EPA, 2019)[12] for the Sub-catchment Slaney_080 classified the waterbody as 'At Risk' with High Ecological Status. For the overall catchment area, agriculture has been assessed as the most significant pressure on the ecological status of the sub-catchment, along with impacts from urban wastewater treatment and hydromorphological issues associated with historical dredging.

The operation of the Project to date has not had any long-term impact on the water quality of these sub-catchments. As the Project does not involve any excavation or construction activity, no impact is anticipated for surface waterbodies in the area.

8.3.6 Designated Sites & Habitats

Designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs) Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). There are 19 designated sites within 15km of the Project, which are:

- Cahore Polders and Dunes SAC
- Kilmuckridge-Tinnaberna Sandhills SAC
- Blackwater Bank SAC
- Slaney River Valley SAC
- Screen Hills SAC Cahore Marshes SPA
- Seas off Wexford SPA The Raven SPA
- Wexford Harbour and Slobs SPA
- Cahore Polders and Dunes pNHA
- Ballyteige Marsh pNHA
- Cahore Point North Sandhills pNHA
- Donaghmore Sandhills pNHA
- Ardamine Woods pNHA
- Courtdown Dunes and Glen pNHA
- Ballymoney Strand pNHA
- Leskinfere Church, Clogh pNHA
- Kilmuckridge-Tinnaberna Sandhills pNHA
- Ballyconnigar Upper pNHA
- Ballycongir Sand Pits pNHA
- Ballynabarney Wood pNHA
- Clone Fox Covery pNHA
- Killoughrum Forest pNHA
- Screen Hills pNHA
- Slaney River Valley pNHA
- Wexford Slobs and harbour pNHA
- Ballyroe Fen and Lake pNHA

The existing wind farm and substation infrastructure is not located within any designated site or habitat. It is located approximately 0.2km away from the Cahore Polders and Dunes SAC, pNHA and SPA at its closest point (T22). The the newly designated Seas off Wexford SPA is located within the sea to the east of Ballywater Find Farm, running over 85km along the majority of the Wexford coastline, covering an area of approximately 3,054km^2. However, as there are no groundworks or construction works proposed as part of the Project, it is not expected that there will be any negative effects associated with the proximity to the Cahore Polders and Dunes SAC, pNHA and SPA. The Proposed Development has been operational as a wind farm and 110kV substation since 2005, and no negative effects have been observed in relation to the Cahore Polders and Dunes SAC, pNHA, SPA.

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[12] ***EPA (2019). Available at:*** *https://catchments.ie/wp-content/files/subcatchmentassessments/12_4%20Slaney_SC_080%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf*

Special Protection Areas (SPAs) are sites of European importance for the protection and conservation of birds designated under the EU Birds Directive (2009/147/EC), and their management is provided for by this legislation and planning policy. The closest SPA to the Project is the Cahore Marshes SPA, located approximately 0.2km away from the nearest turbine at Ballywater Wind Farm at its closest point (T22).

Natural Heritage Areas (NHAs) are sites of national importance for nature conservation designated under the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. A review of the National Parks and Wildlife Service (NPWS) website indicates that there are 13 pNHAs located within 15km of the site.

Designated sites in proximity to the Proposed Development are detailed further in Chapter 6: Biodiversity of this EIAR, and in the accompanying Appropriate Assessment Screening Report (AASR).

8.3.7 Water Resources

A search of the Geological Survey of Ireland (GSI) well database (www.gse.ie) indicates that there are 7 no. wells mapped in the vicinity of Ballywater Wind Farm, and 5 no. within the vicinity of the wider Project EIAR Site Boundary. These mapped wells are boreholes that were drilled for agricultural and domestic purposes, public supply, and agricultural only purposes. They are all located southeast of Ballywater Wind Farm on the periphery of Kilmuckridge village, each approximately 4.3km, 4.6km, 4.7km, 4.8km, 5km, 5.3km and 5.3km away from the EIAR site boundary. Along the Underground Grid Connection, there are 3 no. wells located to the south of the Project, near Boleyvougue, approximately 620m, 850m and 2km south of the Project EIAR site boundary. There is one well located within this area approximately 675m north of the site boundary, while one well exists, to the accuracy of 1km, within the vicinity of the Underground Grid Connection, in the area of Tinnacross, approximately 2.7km before the Project enters Crane 110kV Substation.

The GSI Database is not exhaustive, and it is most likely that other private wells exist within the vicinity. Due to the local aquifer characteristics, topography and inferred groundwater flow direction, it is not likely that groundwater from the Project site flows towards these wells. Based on the absence of construction activity and limited maintenance work proposed during the operational phase of the proposed lifetime extension of Ballywater Wind Farm, impacts to groundwater quality and the groundwater environment are not likely.

8.3.8 Receptor Sensitivity

Due to the existing nature of the Project (extension of life to the existing Ballywater Wind Farm and Ballywater 110kV Substation, and ongoing operation of the Underground Grid Connection), the potential for impacts to surface water and groundwater are not likely. No new construction works, excavations, groundworks or significant alterations to the existing wind farm and substation are proposed. The primary risk to groundwater at the site would be from cementitious materials, hydrocarbon spillage and leakages. The decommissioning phase of the Project has the potential to cause significant impacts, but this would be at a reduced magnitude in contrast to the full implementation of the construction phase. There is limited potential for these risks to occur during the extension of the operational phase of a wind farm and substation as significant quantities of potentially hazardous materials are not stored onsite. All potential contamination sources are carefully managed at the site during the operational phase and will be carefully managed during the decommissioning phase of the Project, and mitigation measures have been put in place to deal with these potential minor impacts.

Groundwater within the majority of the vicinity of the Project is identified as low vulnerability to pollution, and the bedrock aquifers underlying the majority of Project is classed as Poor Aquifer - bedrock which is generally unproductive except in local zones, with no private-use wells present on the site. In smaller sections along the Underground Grid Connection, areas which are classified as high vulnerability to pollution are present, although the bedrock aquifers present in the area are still classed as Poor Aquifers. No significant interactions with the hydrogeological regime are expected to occur during the operational phase and the decommissioning phase of the Project.

There are two surface water features within the Proposed Development, namely the Cahore River and the Bog and Warren River, approximately 0.51km southeast of T09 and the Cahore River is approximately 0.51km south of T09. Within the Project EIAR Site Boundary, there are 6 no. surface water features which are encountered along the Underground Grid Connection. The Owenavorragh River, the Ballyedmond River, the two Corbally Stream tributaries and two Tinnacross Stream tributaries. These surface waters are known to face other environmental pressures, in particular from agriculture. These surface waters also form part of designated sites and are important natural habitats. As such, these surface waters are considered to be very sensitive to potential contamination.

Mitigation measures currently in place at the existing wind farm and substation to ensure the protection of all downstream receiving waters will be continued should the application for extension of life be granted.

Implementation of these mitigation measures will ensure that surface runoff is of a high quality and will not impact on the quality of downstream surface water bodies. No additional drainage works are proposed as part of the Project, thereby avoiding changes to flow volumes leaving the site.

8.4 Likely, Significant Impacts and Mitigation Measures Implemented

8.4.1 Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess potential impacts on downstream environmental receptors (see below, bottom as an example) as a result of the Project.

Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022); and,
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below, we have firstly presented a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process (refer to Table 8-4). The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all operation activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 8-4 Impact Assessment Steps

Step 1	Identification and Description of Potential Effect Source: This section presents and describes the activity that brings about the potential effect or the potential source of pollution. The significance of effects is briefly described.	
Step 2	Pathway / Mechanism:	The route by which a potential source of effect can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential effect can only arise as a result of a source and pathway being present
Step 4	Pre-mitigation Effect:	Effect descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential effect before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse effects. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post Mitigation Residual Impact:	Effect descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential effects after mitigation is put in place.
Step 7	Significance of Effects:	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

8.4.2 Do-Nothing Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing Ballywater Wind Farm and Ballywater 110kV substation once the current planning permissions expire in 2025 and restoration of the site to its original use as agricultural lands for pasture.

Condition 17 of the original planning permission to Wexford County Council (Ref: PL WCC 2001/0458) states the following in relation to the decommissioning of the wind farm:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."*

Planning condition no. 2 of the existing planning permission (WCC Pl. Ref: 2004/2901) for the existing substation states:

> *"This planning permission is for construction of a 110kV Substation, perimeter fence, storeroom and incidental site works (to service Ballywater windfarm) only. The proposed development shall be carried out strictly in accordance with the plans and particulars lodged with this planning application, and the terms and conditions of the original planning permission for the windfarm, granted under planning registration number 2001 0458"*

It is therefore assumed that the substation was granted planning permission under the same conditions as the Ballywater Wind Farm, and planning permission for the onsite substation therefore expires at the same time as the wind fam, i.e. in June 2025.

Should the Decommissioning Plan as set out in the Planning Conditions for the existing Ballywater Wind Farm and 110kV Substation be implemented, it may lead to environmental effects on hydrology due to the potentially extensive ground works required to remove existing access tracks and the turbine foundations. Surface water drainage and groundwater flow patterns are not expected to be significantly affected during these potential decommissioning works however a more environmentally sensitive approach is outlined for the end of the proposed extended operational period, as set out below and in Appendix 4-4 of this EIAR. The effect of decommissioning (as per the original Planning Conditions for the wind farm) is considered to have a **Short-Term, Slight Negative Effect** in the context of the EIAR.

8.4.3 Construction Phase

No construction activities or significant alterations to the existing Ballywater Wind Farm and 110kV Substation are proposed as part of the Project therefore **No Effects** to the water environment will occur.

8.4.4 Operational Phase

There will be no soil disturbance or use of machinery during the operational phase. Furthermore, since there was no deep excavation associated with the Project, there is no potential for impacts on groundwater flow during the operational phase. Therefore, **No Effects** are envisaged during the operational phase.

The existing wind farm and substation do not require onsite storage of significant quantities of materials or liquids likely to cause a pollution incident, however small quantities of hydrocarbons may be required in order to operate/maintain machinery. There will be no ground disturbing works associated with the operational phase, no natural drainage features will be altered, and there will be no direct or indirect discharges to watercourses during the continued operation of the Project.

The Cahore Polders and Marshes SAC is of international value for nature conservation and would have a high sensitivity to changes in water quality. However, given the measures in place to protect water quality detailed above, in the unlikely event that a pollution event did occur, it would be localised, small-scale, short-term, with a negligible magnitude of change. There are no wind farm drainage outfalls that preferentially channel runoff towards the Cahore Polders and Marshes SAC, with runoff instead flowing off the wind farm hardstands and onto the adjacent soils, which are reasonably well-drained. This potential impact has therefore been assessed as not significant.

The ecological receptors were assessed as being of international (higher) value and would have a high sensitivity to changes in water quality. However, they are of low significance since they are unlikely to use the habitats available within the Proposed Development site to a meaningful extent. Given the measures in place to protect water quality detailed above, in the unlikely event that a pollution incident occurred, it would be localised, small-scale, short-term, with a negligible magnitude of change. This potential impact has therefore been assessed as not significant.

8.4.4.1 Potential Release of Hydrocarbons During Operation and Storage

During routine maintenance works, plant and machinery may require refueling onsite and so hydrocarbons may be present. Additionally, the transformers in each turbine are a mix of oil cooled and dry type cast resin transformer. Managed incorrectly, there is the potential for spills or leaks of oils from this equipment which could result in contamination of surface and groundwater. The existing onsite 110kV substation transformer comprises a core and coils immersed in oil in a steel tank. The closest surface water feature to the existing onsite substation is the River Cahore (EPA 11C0). This watercourse is located approximately 558m to the south/ southeast of the existing substation.

Pathway: Groundwater in subsoils and bedrock, surface water.

Receptor: Groundwater, surface water, sea.

Potential Impact: Negative, direct, slight, short term, medium probability impact on surface waters and groundwater.

Mitigation Measures

Oil used in transformers (at the substation and at each turbine) and any storage of oils or hydrocarbons within the control building compound could potentially leak during the operational phase and impact on groundwater or surface water quality. During maintenance and service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Wind Farm Site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised facility. The substation transformer is in a concrete bund capable of holding 110% of the stored oil volume, and all oil on site is stored in suitable bunds capable of holding 110% of the stored oil volume. Turbine transformers are located within the turbine hardstands, with dedicated concrete foundations, so any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to surface or groundwater bodies. In addition:

- All plant and machinery to be serviced before being mobilised to site;
- Road-going vehicles will be refuelled off site wherever possible;
- Onsite refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required. Irrespective of the buffer distance and location of refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water;
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; and

Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur. These mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils, and to groundwater and surface water quality.

Residual Impacts

The implementation of the above mitigation measures will result in a residual **Neutral, Imperceptible, Direct, Short-Term, Unlikely Effect** on surface water and groundwater. There was no recorded or observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

No Significant Effects on the water environment are envisaged during the operational stage of the Project.

8.4.5 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential impacts associated with decommissioning of the Project in 2035 will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.7 of this report, and the environmentally sensitive Decommissioning Plan included in Appendix 4-4.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the wind farm by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by allowing these areas to naturally regenerate and revegetate naturally.

It is considered that the planning conditions as outlined in Section 8.4.2 above are not appropriate in the current context, from an environmental perspective, for the Project. Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above- ground turbine components will be separated and removed off-site for reuse or recycling. The disassembly and removal of the turbines will not have an impact on the hydrological environment at the site. As stated in the *Decommissioning of Onshore Wind Turbines* (Wind Europe Intelligence Platform, 2020) the EU Waste Framework Directive (2008/98/EC) states that the waste oils must be collected separately (where this is technically feasible) and treated in accordance with the waste hierarchy and without any harm to human health and the environment.[13] This guidance will be adhered to upon decommissioning of the existing Ballywater Wind Farm.

It is proposed to leave turbine foundations in place underground and to cover with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisances such as noise, vibration and dust.

As the cables connecting the wind turbines to the onsite substation were installed without ducting, the cables will be cut at both ends and remain in-situ to avoid unnecessary excavation and soil disturbance, and avoid adverse environmental effects such as noise, vibration and dust. It is proposed that site roadways will be left in situ, as appropriate, to facilitate agricultural and amenity uses by the local community. A decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Project.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain, but will be of reduced magnitude. Mitigation measures to avoid these potential impacts will be implemented.

However, as noted in the Scottish Natural Heritage report (SNH) *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013) reinstatement proposals for a wind farm are made far in advance, so within the proposed 10-year extension to the lifespan of the Proposed Development, technological advances and preferred approaches to reinstatement may change. According to the SNH guidance, it is, therefore:

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[13] *WindEurope (2020). Available at: https://windeurope.org/intelligence-platform/product/decommissioning-of-onshore-wind-turbines/*

> *'Best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'.*

No Significant Effects on the hydrological and hydrogeological environment are envisaged during the decommissioning stage of the Project.

8.4.5.1 Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

Decommissioning phase activities that require earthworks resulting in removal of vegetation cover/ road pavement material and excavation of mineral subsoil (where present) are detailed in Chapter 4: Description. Potential sources of sediment laden water include stockpiled excavated onsite material providing a point source of recently spread material sediment.

This activity has the potential to result in the release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies. However, given the relatively small, localised scale of the works, the volume of runoff from decommissioning works is expected to be minimal in relation to the overall runoff to local waterbodies.

Pathways: Drainage and surface water discharge routes.

Receptors: Downgradient watercourses and dependant ecosystems.

Pre-Mitigation Potential Impact: Indirect, negative, significant, temporary, likely impact.

Implemented Mitigation Measures

The key mitigation measure during the decommissioning phase is the avoidance of sensitive aquatic areas. The River Cahore runs approximately 0.8km from the nearest turbine (T11) and flows in a southeast direction until the waterbody intersects the Ballywater Wind Farm. The Bog and Warren River is sourced approximately 0.51km from the nearest turbine (T09). The Bog and Warren River is a tributary of the River Cahore. The Cahore Canal is situated approximately 0.16km from the nearest turbine (T17) and provides drainage which redirects the Cahore River from the designated sites located along the eastern periphery of Ballywater Wind Farm. Because of this proximity to surface waters, mitigation measures were put in place during the original construction phase. No in-stream works would be required during the decommissioning phase of the existing wind farm. Small amounts of clean granular material may be imported to maintain the surfaces of access tracks and hardstanding areas. During decommissioning works, application of temporary drainage control measures (i.e. silt fencing) and protection measures with regard to oils/fuel usage will be sufficient to prevent any significant hydrological effects in the nearby SAC/SPAs. Best construction practices will be adhered to throughout the decommissioning phase of the development as indicated in Chapter 4, Section 4.7.

No earthworks are proposed, no effect on groundwater is anticipated, therefore no further mitigation measures are proposed.

Residual Impact

The implementation of the mitigation measures discussed above will prevent the release of any significant quantity of suspended solids to surface watercourses. Therefore, there is likely to be **No Residual Impact** on downstream waters, from earthworks during the decommissioning phase.

Significance of Effects

Based on the analysis above there would be **No Significant Effects** on surface water quality resulting from earthworks during the decommissioning phase of the Project.

8.4.5.2 Potential Impacts on Groundwater Levels and Local Well Supplies During Excavations

Dewatering of deep excavations have the potential to impact on local groundwater levels. No significant dewatering works are likely and therefore, no groundwater level impacts are likely to occur from the decommissioning of the wind farm infrastructure.

Pathway: Hydraulic groundwater level fluctuations.

Receptor: Groundwater environment and groundwater wells.

Pre-mitigation Potential Impact: None.

Implemented Mitigation Measures

No effect on groundwater is anticipated, therefore no further mitigation measures are proposed.

Residual Impact

No effects on groundwater levels or local well supplies are likely to occur during the decommissioning phase of the Project.

Significance of Effects

Decommissioning of the project will have **No Significant Effects** on groundwater.

8.4.5.3 Potential Release of Hydrocarbons during Decommissioning and Storage

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water, associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxic to humans, and all flora and fauna, including fish, and do not readily degrade in the environment. It is also a

Pathway: Groundwater and grid route/road drainage network.

Receptor: Groundwater, surface water and the sea.

Pre-Mitigation Potential Impact:

Indirect, negative, slight, short term, likely impact to local groundwater quality.

Mitigation Measures

Oil used in transformers (within each turbine transformer and the 110kV on site substation) and any storage of oils or hydrocarbons within the Proposed Development site could potentially leak during the decommissioning phase and impact on groundwater or surface water quality. Turbine transformers are located within the turbine hardstands, with dedicated concrete foundations, so any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to the ground, or to surface and groundwater bodies. In addition:

- All plant and machinery to be serviced before being mobilised to site;
- Road-going vehicles will be refuelled off site wherever possible;
- Onsite refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required. Irrespective of the buffer distance and location of refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water;
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; and

Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occurThese mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils, and to groundwater and surface water quality.

Residual Impacts

The implementation of the above mitigation measures will result in a residual **Neutral, Imperceptible, Direct, Short-Term, Unlikely Impact** to surface water and groundwater. There was no recorded or observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

No Significant Effects on the water environment are envisaged during the decommissioning stage of the Proposed Development.

8.4.6 Potential Hydrological Impacts on Designated Sites

The existing wind farm is located on the periphery of the Cahore Marshes and Polders SAC, the Cahore Marshes SPA, and the Cahore Marshes and Polders pNHA which are comprised of a sand dune system that extends along the coast for over 4km, backed by areas of polder grassland, wetland, and drainage channels with a number of qualifying interests. The Seas off Wexford SPA is also located within the sea just east of the Proposed Development and Cahore Polders and Dunes protected area. Extending over 85km along the majority of the Wexford coastline, covering an area of approximately 3,054km^2, this newly designated SPA waters constitute a valuable feeding resource for seabirds which return yearly to a number of County Wexford's coastal and island colonies. The site of the Proposed Development also lies approximately 3.1km northwest of the Kilmuckridge-Tinnaberna Sandhills SAC and pNHA. Within the wider Project EIAR Site Boundary, the grid connection enters Crane 110kV Substation approximately 550m from the Slaney River Valley SAC and Slaney River Valley pNHA at its closest point. These designated sites are in particular proximity to the Project, but there are a number of others within 15km, as mentioned in Section 8.3.6.

The Ballyteige Marsh pNHA is located approximately 0.3km south of the Proposed Development. The Cahore Point North Sandhills pNHA is also located nearby the Proposed Development at 2.0km northeast. The Blackwater Bank SAC is located in St George's Channel within the Irish Sea situated approximately 3.8km from the Proposed Development. The Raven SPA and the Wexford Slobs and Harbour pNHA are both located along the Wexford coastline roughly 12.5km from the Proposed Development. The Ballycongir Upper pNHA and the Ballycongir Sand Pits pNHA are both situated southwest of the Existing Wind Farm Site, approximately 10.4km and 11.6km respectively at the closest point. The Donaghmore Sandhills pNHA and the Cahore Point North Sandhills pNHA are located approximately 3.7km and 2.2km northeast respectively of the Proposed Development. The Ardamine Wood pNHA is located approximately 7.2km northwest, with the Courtdown Dunes and Glen pNHA and the Ballymoney Strand pNHA located in proximity approximately 10.5km and 12.9km from the Proposed Development, respectively. The Slaney River Valley SAC is located approximately 14km northwest of the site, with the nearby Leskinfere Church, Clogh pNHA being located approximately 11.6km northwest of the Proposed Development.

There are no likely pathways for hydrological effects on these Designated Sites due to the lack of hydrological connectivity between the Project and the Designated Sites. Potential for impacts to these designated sites will be prevented by adhering to the mitigation detailed for the protection of the SACs, SPAs, and pNHAs. Potential for impacts in the form of surface water deterioration will be prevented by adhering to the mitigation described below:

Pathway: Groundwater and surface water.

Receptor: Downgradient water quality and designated sites.

Pre-Mitigation Potential Impact: Indirect, negative, slight, short term, likely impact.

Impact Assessment and Implemented Mitigation Measures:

Mitigation measures which are already operational on the Proposed Development site will be maintained. Further mitigation measures may need to be put in place during the decommissioning phase, as surface waters from sections of the Proposed Development site will potentially drain to these areas.

Mitigation measures as outlined in Section 9.4.5.1 to Section 9.4.5.3 above will be implemented to provide the necessary protection to these hydrologically sensitive areas.

These mitigation measures, which include drainage control measures (e.g. silt fencing), sediment control measures, and mitigation measures related to spills/chemical releases will ensure that the quality of runoff from the site during decommissioning remains good. Therefore, there is no potential for significant direct or indirect impacts on designated sites.

The hydrological regime locally will not be affected by the decommissioning works and so the regime of the designated sites will not be affected.

Residual Impact

The implementation of the mitigation measures discussed above will block the pathways for impacts to downstream designated sites. Observations during the site walkover revealed no evidence of any impacts to surface waters or designated sites. It is likely there will be **No Residual Impacts** on designated sites.

Significance of Effects

Based on the analysis above there are **No Significant Effects** on designated sites likely as a result of the decommissioning phase

8.5 Cumulative Impacts

The hydrological impact assessment undertaken in this chapter finds that significant effects are unlikely due to the limited nature of the works associated with the extension of life of the Existing Ballywater Wind Farm. Potential cumulative effects on local hydrology or hydrogeology between the Proposed

Development and other developments in the vicinity, including those listed in Section 2.9 of this EIAR, were also considered as part of this assessment. The nearest wind energy development to the existing Ballywater Wind Farm is an existing single turbine at Gorey Business Park, approximately 14.1km from T21, its closest point, and the existing two turbine Ballyduff Wind Farm, which is approximately 19.9km from T03, its closest point. No existing, permitted or proposed wind farm developments were identified within the cumulative assessment study area, a combination of surface water and groundwater bodies which show potential connectivity to the Project site. Therefore, no significant impact to surface waters, groundwaters or coastal waters would occur due to the cumulative effects of wind farm developments.

Due to the limited scale of other developments in the vicinity, there is little potential for significant impacts to surface waters, groundwaters or coastal waters resulting from those developments. Therefore, **No Significant Cumulative Effects** on local hydrology or hydrogeology are anticipated during the continued operation of the Project.

9. AIR AND CLIMATE

9.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the operation and decommissioning of the Project. As detailed in section 1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: the 'Proposed Development' which encompasses the continued operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation, while the 'Project' relates to the Proposed Development and the existing Underground Grid Connection.

The existing Ballywater Wind Farm and Ballywater 110kV Substation are located on the coast of Co. Wexford, approximately 4km northeast of Kilmuckridge village.

The Proposed Development consists of 21 no. Enercon E70 2 megawatts (MW) turbines with a blade tip of 99m and an onsite 110kV Substation and control building. The existing Ballywater Wind Farm, which became operational in 2005, was granted under the provisions of ABP Pl. Ref. 2001/0458. Planning permission is also sought for the continued operation of the existing onsite Ballywater 110kV Substation, which was permitted under the provisions of WCC Pl. Ref. 2004/2901, and which also became operational in 2005. As previously stated, an extension to the operation of all 21 no. turbines that make up the existing wind farm, and the existing onsite 110kV substation which services the wind farm, is being applied for as part of this EIAR and Planning Application. The Proposed Development has a total rated capacity of c.42 MW.

All 21 no. of the permitted turbines and the 110kV substation were constructed in 2005 and remain in place. An Environmental Impact Statement (EIS) was prepared and submitted as part of the initial planning application to WCC. The connection to the national grid is via the via underground cable from the onsite Ballywater 110kV substation to the existing Crane 110kV Substation, Co. Wexford. The Proposed Development has been in commercial operation since 2010.

Land use at the site consists of commercial agricultural activities, split between pastural and arable land.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power stations. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Emissions from the operation and decommissioning phases of the Proposed Development are addressed in Section 9.3.

9.1.1.1 Statement of Authority

This section of the EIAR has been prepared by Keelin Bourke and Catherine Johnson, and reviewed by Robert Kennedy and Sean Creedon, all of MKO.

Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin.Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping. Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Catherine is an Environmental Scientist and Climate Practitioner with MKO with two years of private consultancy experience and expertise in climate and sustainability matters. Catherine holds a BSc in Earth and Ocean Science and a LLM in Global Environment and Climate Change Law. Prior to taking up her position with MKO in October 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise regarding international climate law and policy, earth processes, ocean science, and sustainability/ESG. Since joining MKO Catherine has been involved in a myriad of environmental service offerings at MKO including EIA Screenings and Reports, climate and sustainability related work and renewable energy infrastructure projects. Within MKO Catherine plays a large role in company sustainability and a more focused climate service offering and holds a graduate membership for the Charted Institution of Water and Environmental Management.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

9.2 Air Quality

This section identifies describes and assesses the potential effects of the continued operation of Ballywater Wind Farm and Ballywater 110kV Substation, and decommissioning, on air quality.

It was deemed to be unnecessary to undertake air quality sampling for this EIAR. This is due to the non-industrial nature of the existing wind farm and substation, and the fact that it is already operational and does not require a construction phase, as well as the general character of the surrounding environment. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g., heavy industry) in close proximity to the site.

9.2.1 Relevant Guidance

The air quality section of this EIAR is carried out in accordance with the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU and having regard, where relevant, to guidance listed below.

- Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022);
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – June 2022' (EPA, 2022);
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report' (EC, 2017);
- Air Quality in Ireland Report 2023 (Environmental Protection Agency, 2024)

- Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects Environmental Protection Agency (2021);
- European Environment Agency (2022) Air Quality in Europe 2022;
- Guidance on the Assessment of Dust from Demolition and Construction V2.2 (IAQM 2020);
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII 2011);
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (TII 2009);
- UK Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM.TG (16) (DEFRA 2018);
- Clean Air Strategy for Ireland (Rialtas na hÉireann, April 2023);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (UKHA 2019);
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide Global Update 2005 (WHO 2005).

9.2.2 Relevant Legislation

In order to reduce human health risk resulting from poor air quality, national and European statutory bodies set limit values in ambient air for a range of pollutants. The applicable legal standards in Ireland are described below.

In 1996, the Air Quality Framework Directive (96/62/EC) (on ambient air quality assessment and management) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 33 of 1999). The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive (2004/107/EC), published in 2004, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016).

The Air Quality Framework Directive and the first three Daughter Directives were replaced by the Clean Air for Europe (CAFÉ) Directive (Directive 2008/50/EC on ambient air quality and cleaner air for Europe) (as amended by Directive EU 2015/1480) which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure concentration reduction target.

- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 9-1 below sets out the limit values of the CAFÉ Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (μg/m³) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFÉ Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). The 2011 Regulations superseded the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999). The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) was revoked on 31 December 2022 and has been replaced by the Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022).

9.2.3 Air Quality Standards

The recently implemented Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022) remains aligned to the CAFÉ Directive and diverts to the CAFÉ Directive for the Limit values outlined in Table 9-1, the Assessment Thresholds in Table 9-2, the Ozone limits and Assessment Thresholds in in Table 9-3 and Table 9-4 respectively.

Table 9-1 Limit values of the CAFÉ Directive 2008/50.EC, (Source: https://www.epa.ie/air/quality/standards/)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m³)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in	1st Jan 2010

					a calendar year	
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of vegetation	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1st Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1st Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1st Jan 2010

Table 9-2 Assessment Thresholds from CAFÉ Directive 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu g/m^3$)	Basis of Application of Limit Value
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of human health	24 hours	75	Not to be exceeded more than 3 times in a calendar year
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	Not to be exceeded more than 3 times in a calendar year
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	Not to be exceeded more than 18 times in a calendar year

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu g/m^3$)	Basis of Application of Limit Value
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	Not to be exceeded more than 18 times in a calendar year
Particulate matter 10 (PM_{10})	Upper assessment threshold	24 hours	35	Not to be exceeded more than 35 times in a calendar year
Particulate matter 10 (PM_{10})	Lower assessment threshold	24 hours	25	Not to be exceeded more than 35 times in a calendar year
Lead (Pb)	Upper assessment threshold	Calendar Year	0.35	-
Lead (Pb)	Lower assessment threshold	Calendar Year	0.25	-
Carbon Monoxide (CO)	Upper assessment threshold	8 hours	7000	-
Carbon Monoxide (CO)	Lower assessment threshold	8 hours	5000	-
Benzene (C_6H_6)	Upper assessment threshold	Calendar Year	3.5	-
Benzene (C_6H_6)	Lower assessment threshold	Calendar Year	2	-

Ozone is set out differently in the CAFÉ Directive in that it sets target values and long-term objectives for ozone rather than limit values. Table 9-3 presents the target values and long-term target values for ozone and Table 9-4 details the threshold values for Ozone.

Table 9-3 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Long-term Target Value for 2020
Protection of human health	Maximum daily 8-hour mean	120 $\mu g/m^3$ not to be exceeded more than 25 days per calendar year averaged over 3 years	120 $\mu g/m^3$
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 $\mu g/m^3.h$ averaged over 5 years	6,000 $\mu g/m^3.h$

*AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m3 and is expressed as g/m3 hours.

Table 9-4 Threshold for Ozone Defined in Directive 2008/50/EC (source: https://airquality.ie/information/air-quality-standards and Directive 2008/50/EC)

Pollutant	Averaging Period	Threshold
Information Threshold	**1-hour average**	**180 µg/m^3**
Alert Threshold	**1-hour average**	**240 µg/m^3**

On the 26th of October 2022 the EU Commission announced a proposed review of Air Quality Standards[1]. The proposed revision will set interim 2030 EU air quality standards, seeking to align more closely with WHO recommendations, while putting the EU on a trajectory to achieve zero pollution for air at the latest by 2050, in synergy with climate-neutrality efforts. To this end, regular reviews of the air quality standards are proposed to reassess them in line with latest scientific evidence as well as societal and technological developments. The first review is proposed to take place by the end of 2028, with the objective of ensuring full alignment with WHO recommendations.

The Ambient Air Quality Standards Regulation (2022) made the provisions necessary for the implementation of Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (as amended), establishes the limit values and alert thresholds for concentrations of certain pollutants in ambient air, provides for the assessment of concentrations of certain pollutants in ambient air, provides for the maintenance of ambient air quality, and ensures that adequate information on concentrations of pollutants are made available to the public.

9.2.3.1 Air Quality and Health

In September 2024, the EPA published 'Air Quality in Ireland 2023'[2] which reports that although Ireland met the current EU legal air quality limits in 2023, monitoring results were higher than the more stringent health-based World Health Organization air quality guidelines for a number of pollutants including: particulate matter (PM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3). The main sources of these pollutants are the burning of solid fuel in our towns and villages and traffic in our cities. People's health and the health of our environment is impacted by these pollutants. Ireland's ambition in the 'Clean Air Strategy for Ireland' (discussed below) is to move towards alignment with the World Health Organisation (WHO) Air Quality guidelines, this will be challenging but will have a significantly positive impact on health. Despite comparing favourably with many of our European neighbours, Ireland's 2023 monitoring results would exceed the soon approaching 2026 WHO targets,

The European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2022 Report*' highlights the negative effects of air pollution on human health across the EU. The report assessed that poor air quality accounted for premature deaths of approximately 238,000 people in the 27 EU Member States in 2021 and in 2020 in the European Union, 96% of the urban population was exposed to levels of fine particulate matter above the health-based guideline level set by the World Health Organization. Furthermore, in 2020, damaging levels of nitrogen deposition to ecosystems were exceeded in 75% of the total ecosystem area in the EU-27. This represents a fall of 12% since 2005.

The Office of Energy Efficiency and Renewable Energy in the United States published an article on August 24, 2023 entitled 'How Wind Can help Us Breathe Easier.'[3] This article details the CO_2 emissions from different energy sources over the entire lifespan of the technology. It was found that

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[1] European Commission (October 2022) Revision of the Ambient Air Quality Directives. <https://environment.ec.europa.eu/topics/air/air-quality/revision-ambient-air-quality-directives_en>

[2] *Environmental Protection Agency: Air Quality in Ireland 2023. Available at:* https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2023.php#:~:text=Summary%3A%20Air%20quality%20in%20Ireland,based%20WHO%20guidelines%20in%202023.

[3] *Office of Energy Efficiency and Renewable Energy (2023) How Wind Can Help Us Breathe Easier*

wind energy Wind energy produces around 11 grams of CO_2 per kilowatt-hour (g CO_2/kWh) of electricity generated, compared with about 980 g CO_2/kWh for coal and roughly 465 g CO_2/kWh for natural gas. That makes coal's carbon footprint almost 90 times larger than that of wind energy, and the footprint of natural gas more than 40 times larger. During combustion of high-emitting energy sources, other air pollutants, i.e., nitrogen oxides (NO_x) and sulphur dioxide (SO_2), are also released into the atmosphere. This results in the emission of pollutants that can cause adverse health effects, including asthma, bronchitis, lower and upper respiratory symptoms, and heart attacks. As stated above, air pollution is responsible for a large number of premature deaths relating to these illnesses.

The EEA published a briefing on Europe's air quality status in April 2024[4]. This briefing presented the status of concentrations of pollution in ambient air in 2022 and 2023 for regulated pollutants in relation to both EU air quality standards and the 2021 WHO guideline levels. The assessment shows that, in spite of constant improvements, exceedances of air quality standards are common across the EU, with concentrations well above the latest WHO recommendations. These emissions, along with others including sulphur oxides (SO_x) are produced during fossil fuel-based electricity generation in various amounts, depending on the fuel and technology used, emissions from industry and power plants, vehicles emissions and transport fuels.

A 2024 EPA report *'Ireland's State of the Environment Report'*[5] states that the pollutants of most concern are Fine Particulate matter ($PM_{2.5}$.), Nitrogen Dioxide (NO_2) and Ammonia (NH_3). The EPA 2024 report goes on to state that:

> *"The planned transition to more renewable energy sources, and away from combustion-sourced heating systems to electrification, is a shift that could see greenhouse gas emissions from industry significantly decrease.*
>
> *As a consequence of meeting these growing demands primarily with oil, natural gas, coal and peat, our energy system is highly dependent on fossil fuels. Ireland has made some progress in transforming the electricity system through the deployment of wind farms, with renewable energy currently providing more than 40% of electricity used. However, electricity represents only one-fifth of Ireland's energy use, and our transport and heating systems remain heavily reliant on fossil fuel systems, with lock-ins that need to be addressed.*
>
> *While Ireland's renewable energy share has increased from 10.7% in 2018 (reported in the last State of the Environment Report) to 13.1% in 2022, this is the lowest level in the EU (well below the EU average of 23.0%), and Ireland is not on track to meet the EU-wide binding target of 42.5% renewable energy share by 2030. Reaching the target of 80% renewable electricity by 2030, while ensuring a stable energy supply, will require new capacity, a more flexible grid and increased interconnectivity (EC, 2024)*
>
> *Established technologies, such as wind energy, solar photovoltaics and bioenergy, will be key in meeting short-term emission reduction targets (i.e. 2030), whereas significant growth in offshore wind infrastructure is expected to be the key essential element of future energy systems."*

The Project therefore represents an opportunity to further harness Ireland's significant renewable energy resources, with valuable benefits to air quality and in turn to human health. The consumption of fossil fuels for energy results in the release of particulates, sulphur dioxide and nitrogen dioxide to our air. The use of wind energy, by providing an alternative to electricity derived from coal, oil or gas-fired power stations, results in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide SO_2, thereby resulting in cleaner air and associated positive health effects.

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[4] *Europe's air quality status 2024 briefing. https://www.eea.europa.eu//publications/europes-air-quality-status-2024*

[5] *Environmental Protection Agency (2024). Irelands State of the Environment Report 2024) <https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/state-of-environment-report-/*

Whilst there is the potential of such emissions to be generated from the site operations, several mitigation measures will be implemented at the Project site to reduce the impact from dust and vehicle emissions, which are discussed in Section 9.2.6.3 below.

9.2.3.2 Clean Air Strategy for Ireland 2023

Irelands Clean Air Strategy 2023[6] sets out the detail of seven strategic frameworks that will be used to ensure that air quality continues to improve (Figure 10-1). The aims of these key strategic frameworks are:

- To set the appropriate targets and limits to ensure continuous improvements in air quality across the country, and to deliver health benefits for all.
- To ensure the integration of clean air considerations into policy development across Government.
- To increase the evidence base that will help Ireland to continue to evolve it's understanding of the sources of pollution and their impacts on health, in order to address them more effectively.
- To enhance regulation required to deliver improvements across all pollutants.
- To improve the effectiveness of our enforcement systems.
- To promote and increase awareness of the importance of clean air, and the links between cleaner air and better health.
- To develop the additional targeted/specific policy measures as required to deal with national or local air quality issues.

Figure 9-1 Seven Strategic Frameworks for Air Quality, with associated chapters in brackets. Reproduced as Figure 1 from Clean Air Strategy 2023

Chapter 11 of the Clean Air Strategy discusses Air Quality Policy Development. The chapter discusses energy policy and acknowledges how the States accelerated transition to renewable electricity will be critical to successfully meeting the ambitious renewable energy and greenhouse gas emission reduction targets outlined in the European Green Deal and Ireland's Climate Action Plan 2023, as well as to protecting against security of supply risks and removal of fossil fuels from power generation. Wind

[6] **Government of Ireland (2023)** *Clean Air Strategy for Ireland 2023.* https://www.gov.ie/pdf/?file=https://assets.gov.ie/255392/efe212df-d9a7-4831-a887-bea2703e2c64.pdf#page=null

(offshore and onshore) and solar energy will be the leading cost-effective technologies to achieve our energy and emissions targets, as well as displacing emissions in other sectors, including household heating and vehicle transport, including household heating and vehicle transport. The targets of the Climate Action Plan 2024 and the European Green Deal are to deliver net-zero greenhouse gas emissions by 2050 and reduce GHG emissions to at least 55% by 2030, compared to 1990 levels. For further details on greenhouse gas emissions please refer to Section 9.3 below.

9.2.4 Methodology

9.2.4.1 Air Quality Zones

The air quality zone for the site was selected, followed by a review of EPA collated baseline air quality data namely Sulphur Dioxide (SO_2), Particulate Matter (PM_{10}), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Ozone (O_3) for the selected air quality zone to determine the representative levels of such emissions for the Proposed Development.

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin
- Zone B: Cork
- Zone C: Other cities and large towns including Limerick, Galway, Mullingar
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the CAFÉ Directive, Framework Directive and Daughter Directives. The site of the Project lies within Zone D, which represents rural areas located away from large population centres.

9.2.4.2 Air Quality Data Review

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2023' was published by the EPA in 2024. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. These are detailed in the Baseline Air Quality section below.

9.2.4.3 Dust

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) was considered in the dust impact assessment. The guidance document outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. This methodology has been used to predict the likely risk of dust as a result of the operational phase activities and decommissioning phase. The use of UK guidance is considered best practice in the absence of applicable Irish guidance. The major dust generating activities are divided into four types within the IAQM (2024) guidance to reflect their different potential impacts. These are:

- Demolition,
- Earthworks.
- Construction.
- Trackout[7].

[7] The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when Heavy Goods Vehicles (HGVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HGVs transfer dust and dirt onto the road having travelled over muddy ground on site

The magnitude of dust generating activities is divided into '*Large*', '*Medium*' or '*Small*' scale depending on the nature of the activities involved. The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities.

Table 9-5 Description of magnitude for nature of activities IAQM 2024 Guidance

	Large	Medium	Small
Demolition	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12m above ground level	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months
Earthworks	Large: Total site area >110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height	Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height	Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height
Construction	Total building volume >75,000 m^3, on site concrete batching, sandblasting	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m
	Note: A vehicle movement is a one way journey. i.e. from A to B and excludes the return journey. HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average		

The Project is currently operational and there are no proposed demolition, earthworks or construction activities on site, which would produce the opportunity for trackout to occur. However, this EIAR includes for an assessment of the decommissioning of the Proposed Development. On this basis, the following assessment looks to examine the potential for dust impacts to occur relative to the decommissioning of the Proposed Development.

9.2.4.3.1 Defining the Sensitivity of the Area

For the purposes of this assessment, high sensitivity receptors are residential properties and dust sensitive ecological habitats. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

The IAQM (2024) guidance has outlined three types of effects to be considered:

- Sensitivities of People to Dust Soiling Effects
- Sensitivities of People to the Health Effects of PM10

- Sensitivities of Receptors to Ecological Effects

Sensitivities of People to Dust Soiling Effects

Dust soiling effects can occur for a distance of 250m from works areas, but the majority of deposition occurs within the first 50m (IAQM, 2024). Table 9-6 below identifies the sensitivity of an area to dust soiling effects on people and their properties, relative to different receptor sensitivities.

Table 9-6 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Sensitivities of People to the Health Effects of PM_{10}

When assessing sensitivity of people to the health effects of PM_{10}, the IAQM (2024) guidance recommends the use of sensitivities bands based on whether or not the receptor is likely to be exposed to elevated concentrations of PM_{10} over a 24-hour period. Table 9-7 below identifies the sensitivity of an area to human health effects of PM_{10}, relative to different receptor sensitivities.

Table 9-7 Sensitivity of the Area to Human Health Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	>32 μg/m^3	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 μg/m^3	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 μg/m^3	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24 μg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
		1-10	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Sensitivities of Receptors to Ecological Effects

Dust deposition due to demolition, earthworks and trackout has the potential to physically and chemically affect sensitive habitats and plant communities. Table 9-8 below identifies the sensitivity of an area to ecological impacts.

Table 9-8 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

There are 3 no. ecological receptors, as described by the IAQM (2024) guidance, which may be sensitive to dust, within 50m of the Proposed Development. These ecologically sensitive habitats, and their designations are listed below:

- Cahore Polders and Dunes SAC (000700)
- Cahore Marshes SPA (004143)
- Cahore Polders and Dunes pNHA (000700)

The above SAC and SPA have been assessed within Chapter 6: Biodiversity Appendix 6-3: Appropriate Assessment. The individual qualifying features which have the potential to be adversely affected by the decommissioning works, along with the site-specific conservation objectives and threats and pressures for the qualifying features of each site were considered. The NPWS Protected Sites

Database, along with the EEA Natura 2000 datahub were also used in order to assess the potential of adverse effects due to the presence of dust within the vicinity of these sites.

There were a number of Individual Qualifying Features within the designated sites which were assessed for their potential to be affected by dust deposition. There are no Annex 1 or Annex II species or habitats for which the sites were selected as designated sites, which have the potential to be affected by dust. Dust was not considered to be a threat, pressure or activity which has the potential to have negative effects on the sites. The proposed decommissioning works are minor in nature involving the removal of the existing turbines and substation infrastructure, and the covering of the hardstanding areas, allowing for them to revegetate naturally. For these reasons, the above designated sites were scoped out of the dust assessment as having a low receptor sensitivity.

Further consideration is given to these ecologically sensitive habitats in Chapter 6: Biodiversity and Appendix 6-3.

9.2.4.3.2 *Defining the Risk of Impacts*

The dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts with no mitigation applied. The matrix in Table 9-9 provides a method of assigning the level of risk for each activity.

Table 9-9 Risk of Dust Impacts for Earthworks, Construction, Trackout and Demolition (IAQM, 2024)

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

EPA classification terminology as presented in Table 1-2 of Chapter 1 of this EIAR have been correlated with the equivalent risk rating from Table 9-9 above.

Table 9-10 Correlation of Impact Classification Terminology (EPA, 2022) to Risk Rating

EPA Term	EPA Description	Risk Rating
Imperceptible	An effect capable of measurement but without significant consequences	Negligible
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities	Low
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends	Medium
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment	High

The risk of dust impacts for the Demolition, Earthwork and Trackout activities from the Proposed Development is summarised in Section 9.2.5.6 below.

9.2.5 Existing Air Quality

The air quality in the vicinity of the Project site is typical of that of rural areas in the South-East of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland.

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2023' was published by the EPA in 2024. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. Values for each of these elements recorded within the Zone D monitoring stations listed in the report, have been averaged to give representative values for Zone D. Similar measurement values for all air quality parameters would be expected for the Project site as it lies in a rural location, within Zone D.

9.2.5.1 Sulphur Dioxide (SO_2)

Sulphur dioxide data for Cork Harbour, Kilkitt, Shannon Estuary/Askeaton, Edenderry and Letterkenny in 2023 is presented in Table 9-11.

Table 9-11 Average Sulphur Dioxide Data for Zone D in 2023.

Parameter	Measurement
Annual Mean	4.3 µg/m³
Hourly values > 350	0.0
Hourly max	80.9 µg/m³
Daily values > 125	0
Daily max	23.2 µg/m³

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can be observed from Table 9-11 the average maximum hourly value recorded during the assessment period was 80.9 µg/m³. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected, based on professional judgement, that SO_2 values at the Project site would be similar or lower than those recorded for the Zone D sites above.

9.2.5.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, dust from soil and road surfaces, construction works and industrial emissions. The EPA report[2] provide annual mean PM_{10} concentration for sixteen Zone D towns, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh Carrignafoy, Claremorris, Kilkitt, Cavan, Edenderry, Mallow, Longford, Cobh Cork Harbour, Roscommon Town and Killarney. Particulate matter (PM_{10}) data for 2023 is presented in Table 9-12.

Table 9-12 Average Particulate Matter (PM10) Data for Zone D Sites in 2023.

Parameter	Measurement
Annual Mean	11.0 µg/m³
% Data Capture	90.8%
Values > 50 ug/m3	Max 6 (Edenderry)
Daily Max	45.4 µg/m³

The daily limit of 50 µg/m³ for the protection of human health was exceeded on 40 days which is greater than the PM_{10} daily limit for the protection of human health of a max 35 days >50 µg/m³ applicable from 2005. The greatest number of exceedances occurred at Edenderry where the PM_{10} daily limit was exceeded on 6 occasions. In the EPA 2023[2] report, it notes that there were breaches in the levels of particulate matter (PM) which "*in Ireland mainly comes from the burning of solid fuel, such as coal, peat,*

***and wood to heat our homes.*"** It is expected based on professional judgement that PM_{10} values at the Project site would be similar or lower than those recorded for the Zone D sites above.

9.2.5.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data for Birr, Castlebar, Carrick-on-Shannon, Edenderry, Emo Court and Kilkitt in 2023 is presented in Table 9-13.

Nitrogen dioxide data for the Birr, Co. Offaly station in the period 29/03/2023 - 27/09/2023 shows that the average measurement for NO_2 for that 6-month period was 9.86 μg/m^3 whilst the maximum reading was 47.63 μg/m^3.

Table 9-13 Average Nitrogen Dioxide Data for Zone D Sites in 2023.

Parameter	Measurement
Annual Mean	8.1 μg/m^3
NO2 Values >200	0
Values > 140 (UAT)	0
Values >100 (LAT)	4
Hourly Max.	67.6 μg/m^3

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 μg/m^3. The lower assessment threshold of 100 μg/m3 was exceeded 4 no. times during the monitoring period in Emo Court, Co. Laois and the upper assessment threshold of 140 μg/m3 was exceeded once during the monitoring period, also in Emo Court, Co. Laois. Both did not exceed the 18 days limit during the monitoring period. In 2023, no other monitoring locations in Zone D had exceedances in the lower and upper assessment thresholds of 100 and 140 μg/m^3. The average hourly max. NO_2 value of 67.6 μg/m^3 measured during the monitoring period was below the hourly max threshold of 200 μg/m^3. It would be expected that NO_2 values at the Project site would be similar or lower than those recorded for the Zone D sites above.

9.2.5.4 Carbon Monoxide (CO)

The EPA report provide rolling 8-hour carbon monoxide concentrations for Birr, a Zone D site. Carbon Monoxide data for 2020 is presented in Table 9-14.

Table 9-14 Carbon Monoxide Data for Birr – Zone D Site in 2023.

Parameter	Measurement
Annual Mean	0.6 mg/m^3
Median	0.6 mg/m^3
% Data Capture	99.8%
Values > 10	0
Max	2.2 mg/m^3

The average concentration of carbon monoxide was 0.6 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 μg/m^3 (or 10mg/m^3). On no occasions were values in excess of the 10 mg/m^3 limit value set out in Directive or 2008/69/EC. It would be expected that CO values at the Project site would be similar or lower than those recorded for the Zone D site above.

9.2.5.5 Ozone (O_3)

The EPA report provides rolling 8-hour ozone concentrations for seven Zone D sites, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. Ozone (O_3) data for 2023 is presented in Table 9-15. As can be observed, from Table 9-15, there were 10 no. exceedances of the maximum daily eight-hour limit of 120 μg/m^3. The CAFÉ Directive stipulates that this limit should not be exceeded on more than 25 days per calendar year averaged over 3 years. It would be expected that O_3 values at the Project site would be similar or lower than those recorded for the Zone D sites below.

Table 9-15 Average Ozone Data for Zone D Sites in 2023.

Parameter	Measurement
Annual Mean	61.5μg/m^3
Median	72.8 μg/m^3
% Data Capture	95.5%
No. of days > 120	10 days

9.2.5.6 Dust

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/day when measured according to the TA Luft Standard 2002.[8,9]

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e., soil, sand, peat, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather.

The Ballywater Wind Farm and Ballywater 110kV Substation and underground grid connection cabling route are currently operational, and there are no construction activities or works envisaged which would produce perceptible levels of dust during the continued operation of the Project.

9.2.6 Likely Significant Effects and Associated Mitigation Measures

9.2.6.1 'Do-Nothing' Effect

If the Project were not to proceed, the existing wind farm and substation would be decommissioned in 2025 under the requirements of its current permission. In doing so, the environmental effects in terms of emissions are likely to be medium-term, slight negative effects.

The opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than the renewable energy sources such as the extended operational life of this wind farm and substation. This will result in an indirect negative impact on air quality nationally, regionally and locally.

Under the Do-Nothing scenario, the existing Ballywater Wind Farm and Ballywater 110kV Substation would be decommissioned in accordance with the conditions of the current planning permission (WCC Pl. Ref. 2001/0458 and WCC Pl. Ref. 2004.2901) once this permission expires in 2025.

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[8] *Environmental Protection Agency Office of Environmental Enforcement (OEE) (2018). Air Emissions Monitoring Guidance Note (AG2), Revision 4 (May 2018). EPA: Wexford, Ireland Available at: http://www.epa.ie/pubs/advice/air/emissions/Emission_Monitoring_Guidance_AG2_May2018.pdf*

[9] *Technical Instructions on Air Quality Control TA Luft (2002). English Translation. Available at: http://www.cement.or.kr/mater_down/UMEG_TA-Luft2002_Englisch.pd*

As per the original grants of permission for the existing wind farm and substation, if the 'Do-Nothing' alternative was chosen, decommissioning of the Proposed Development would involve the restoration of the site to its original state prior to development. Decommissioning activities have evolved since the original planning applications were submitted and a Decommissioning Plan has been prepared to account for such updates and is included in Appendix 4-4 of this EIAR. The removal of wind farm and substation infrastructure such as turbine foundations under the 'Do Nothing' scenario is not considered to be the most environmentally prudent option. In order to remove this infrastructure, a significant volume of reinforced concrete, over 180m^3, would have to be removed from the ground. This could result in significant environmental nuisance such as dust and/or pollution of surface waters and/groundwaters, soils, traffic, and negative impacts on sensitive habitats within the vicinity of the Project. In addition, the removal of the access roads has the potential to create significant dust issues as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm infrastructure, a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

A Decommissioning Plan will be agreed with the local authority at least 3 months prior to the start of decommissioning works which would include mitigation measures to reduce any potential negative impacts on the environment. However, a preliminary decommissioning plan has been prepared and is included in Appendix 4-4 of this EIAR.

The effect of decommissioning is considered **Medium-Term, Slight Negative Effects** in the context of the EIAR.

9.2.6.2 Construction Phase

The Project is currently operational, and it is proposed to extend the duration of operation of the existing wind farm and substation by 10 years, until 2035. No construction activities will occur as part of the extension of operational life, therefore there are **no construction phase impacts** on air quality.

9.2.6.3 Operational Phase

9.2.6.3.1 *Exhaust Emissions*

Exhaust emissions associated with the operational phase of the Project will arise from occasional machinery and Light Goods Vehicles (LGV) that are intermittently required onsite for maintenance. This will give rise to a **Medium-Term Imperceptible Negative Effect**.

Mitigation

Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.

Residual Effects

The implementation of the above mitigation measures will result in a residual **Medium-Term, Imperceptible, Negative Effect** upon air quality. However, any negative impacts associated with maintenance of the existing turbines will be offset by the continued operation of the wind farm and substation.

Significance of Effects

Based on the assessment above there will be **No Significant Direct or Indirect Effects**.

9.2.6.3.2 *Air Quality*

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Project has resulted, and will continue to result in emission savings of carbon dioxide (CO2), oxides of nitrogen (NO_2), and sulphur dioxide (SO_2) during its operational phase. The production of renewable energy from the Development will have a **Medium-Term Moderate Positive Effects** on air quality. Further details on the carbon dioxide savings associated with the Development are presented in Section 9.3.4.

Mitigation

There are no proposed mitigation measures regarding air quality as part of the continued operational phase of the Project.

Residual Impact

Production of renewable energy at the Project will result in a residual **Medium-Term, Moderate, Positive Impact** on air quality.

Significance of Effects

Based on the assessment above there will be a significant positive direct and indirect effect on-air quality due to the continued operation of the Project.

9.2.6.3.3 *Human Health*

Long-term exposure to chemicals such as SO_2 and NOx are harmful to human health. The production of clean, renewable energy from the Development has offset, and will continue to offset the emission of these harmful chemicals by fossil fuel powered sources of electricity and, therefore, will have a **Medium-Term Slight Positive Impact** on human health. Further information on the impact of the Development on Human Health is contained in Chapter 5: Population and Human Health.

Mitigation

There are no proposed mitigation measures as there are no potential negative effects on human health due to the continued operation of the Project.

Residual Impact

The production of renewable energy from the continued operation of the Ballywater Wind Farm and Ballywater 110kV Substation **Medium-Term Slight Positive Impact** on human health.

Significance of Effects

Based on the assessment above there will be a **Slight Positive Effect** on human health due to the continued operation of the Proposed Development.

9.2.6.4 Decommissioning Phase

The potential impacts associated with decommissioning of the Project (in 2035 should planning permission for the Proposed Development be granted) apply to the existing wind farm and substation only and will be similar to those associated with a typical wind farm and substation construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.7 of this EIAR.

Dust can be generated from on-site activities during decommissioning such as covering of foundations and travelling on site roads during prolonged periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route. The movement of site traffic within, and to and from the site, carrying workers and decommissioning materials has the potential to generate exhaust emissions.

A preliminary Decommissioning Plan for the Proposed Development, see Appendix 4-4, contains details which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

9.2.6.4.1 Exhaust Emissions

Any potential air quality impacts and consequential effects likely to occur during the decommissioning phase are lower than those which would occur under the Do-Nothing alternative (2025 Decommissioning Date). There would be exhaust emissions from construction plant and vehicles, and potential dust emissions due to the movement of the same associated with the decommissioning of the wind farm and substation. Exhaust emissions associated with vehicles and plant such as NO_2, Benzene and PM_{10} will arise as a result of construction activities. This potential effect will not be significant and will be restricted to the duration of the decommissioning phase and localised to works areas. Therefore, this is considered a **Short-term, Slight, Negative Effect.**

The transport of turbine components, construction materials, waste and workers to and from the site, (see Section 13.1 of this EIAR), will also give rise to exhaust emissions associated with the transport vehicles. This constitutes a **Short-term, Slight, Negative Effect** in terms of air quality.

Mitigation

Mitigation measures will be implemented such as the below proposed measures to control exhaust emissions during decommissioning:

- All construction vehicles and plant used onsite during the decommissioning phase will be maintained in good operational order. If a vehicle requires repairs this work will be caried out, thereby minimising any emissions that arise.
- Turbines components will be transported from the Site on specified routes only, as agreed with the Planning Authority prior to decommissioning.
- All machinery will be switched off when not in use.
- Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The Materials Recovery Facility (MRF) facility will be as close as possible to the Proposed Development site to reduce the amount of emissions associated with vehicle movements.

For further information on measures to control exhaust emissions during the decommissioning phase, please see the Decommissioning Plan (see Appendix 4-4).

Residual Effect

The implementation of the above mitigation measures will result in a residual **Short-term, Imperceptible, Negative Effect** upon air quality.

Significance of Effects

Based on the assessment above there will be **No significant effects** upon air quality are envisaged during the decommissioning stage of the Project following implementation of the proposed mitigation measures.

9.2.6.4.2 *Dust Emissions*

The decommissioning of turbines and associated foundations and hard-standing areas will give rise to dust emissions. There is no potential for dust emissions outside the areas of decommissioning works and access tracks.

The IAQM (2024) methodology for *the Assessment of Dust from Demolition and Construction* as discussed in Section 9.2.5.6 above is used to assess the potential risk to sensitive receptors from dust deposition. Dust deposition impacts can occur for a distance of 250m from works areas, but the majority of deposition occurs within the first 50m (IAQM, 2024). The High Sensitivity Receptors were identified using a constraints mapping process, and detailed and updated planning searches which informed the project sensitive receptor dataset.

- There are no High Sensitive Receptors located within 20m of the Proposed Development site boundary;
- There are no High Sensitive Receptor within 50m of the Proposed Development site boundary
- There are 1 no. High Sensitive Receptors within 100m of the Proposed Development site boundary
- There are 9 no. High Sensitive Receptors within 250m of the Proposed Development site boundary

Table 9-16 below identifies the sensitivity of the Area to Dust Soiling Effects on People and Property surrounding the Proposed Development to dust soiling effects, as described in Section 9.2.4.3 above. Receptors were classed as high sensitivity receptors due to the fact that they are residential properties. On assessment of receptor sensitivity and the distance of these receptors from the dust source, the overall sensitivity of the area to dust soiling effects is considered to be Low.

Table 9-16 Sensitivity of the Area to Dust Soiling Effects on People and property from the Proposed Development decommissioning works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 9-17 below identifies the sensitivity of people in the area surrounding the Proposed Development to the health effects of PM_{10}, as described in Section 9.2.4.3 above. The overall sensitivity of the area to human health effects of PM_{10} is considered to be Low.

As indicated in Section 9.2.4.1 above, the Proposed Development is situated in Zone D. According to the 2022 EPA baseline air quality data; the average PM_{10} for Zone D is 11.00µg/m^3. Therefore, the only annual PM_{10} concentration categorised in the IAQM (2024) guidance relevant to the Proposed Development is the minimum concentration of <24µg/m³.

Table 9-17 Sensitivity of the Area to Human Health Impacts from the Proposed Development Decommissioning Works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m³	>10	Low	Low	Low	Low
		1-10				
Low	-	≥1	Low	Low	Low	Low

Table 9-18 below identifies the sensitivity of ecological receptors in the area surrounding the development footprint of the decommissioning area to dust effects from construction and demolition, as assessed in Section 9.2.4.3. As no habitats within the vicinity of the decommissioning area were defined as sensitive to effects by dust soiling, the risk is **Negligible** and any effects will not be significant.

Table 9-18 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

As described in Section 9.2.4.3 above, the Proposed Development is classified as 'Small' for Earthworks, Demolition and Trackout activities. Therefore, when combined with the sensitivity of the area, using Table 9-9 above as guidance, the pre-mitigation risk of impacts from the Proposed Development is summarised in Table 9-19 below.

Table 9-19 Summary Dust Risk Table for the Proposed Development Decommissioning Activities

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	N/A	Low Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

The overall risk of dust emissions impacts with no mitigation applied for the major dust generating activities during the decommissioning phase of the Proposed Development is Low. Therefore, the potential effects of dust from the construction phase of the Proposed Development are considered to be equivalent to **Short-term, Slight Negative** effects.

Mitigation

Mitigation & monitoring measures for the Proposed Development are outlined below:

- Sporadic wetting of loose stone surface will be carried out during the decommissioning phase to minimise movement of dust particles to the air. In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas within the Wind Farm Site.
- Turbines will be transported away from site on specified haul routes only, which will be agreed prior to decommissioning with Wexford County Council.
- The roads adjacent to the site entrances will be checked weekly for damage/potholes and repaired as necessary.
- Waste material will be transferred to a licensed/permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The MRF facility will be local to the Proposed Development to reduce the amount of emissions associated with vehicle movements
- The Decommissioning Plan included in Appendix 4-4 of this EIAR contains dust suppression measures.

Residual Effect

With the implementation of the above, the Proposed Development is considered to have a **Short-term, Not Significant, Negative Effect** on air quality brought about by dust emissions generated during the decommissioning activities.

Significance of Effects

Based on the assessment above there will be **No Significant Direct or Indirect Effects**.

9.2.7 Cumulative Effects

Potential cumulative effects on air quality between the Project and other permitted or proposed projects and plans in the area, (wind energy or otherwise), as set out in Section 2.10 in Chapter 2 of this EIAR, were also considered as part of this assessment.

The nature of the Project is such that it will have a **Medium-Term, Slight, Positive effect** on the air quality and climate.

The existing Ballywater Wind Farm and Ballywater 110kV Substation, and the existing grid connection, are all currently operational, and it is proposed to extend the operational life of the wind farm and substation by 10 years, to 2035. No construction activities will occur as part of the proposed extension of operational life, therefore there are no construction phase cumulative negative effects on air and climate.

There will be no net CO_2 emissions from operation of the Project. Emissions of CO_2, NOx, SO_2 and dust during the operational phase of the Project will be minimal, relating to the use of operation and maintenance vehicles on-site, and therefore there will be no measurable negative cumulative effect with other projects on air quality and climate.

9.3 Climate

All relevant legislation and policy in relation to climate is outlined in detail in Chapter 2 of this EIAR. A summary of the same is provided in the following sections.

9.3.1 Relevant Guidance

The climate section of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and has been prepared in accordance with guidance listed in Section 1.7.2 of Chapter 1: Introduction. Due to the nature of the Proposed Development, a wind farm project, the following methodology and guidance was utilised for the climate section of this EIAR:

- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment' (2013) European Commission
- Calculating Carbon Savings from Wind Farms on Scottish Peat Lands' (University of Aberdeen and the Macauley Institute 2008); and
- 'Wind Farms and Carbon Savings' (Scottish Natural Heritage, 2003).
- Macauley Institute Carbon Calculator for Wind Farms on Scottish Peatlands (Version 1.7.0) (2022)
- Transport Infrastructure Ireland (TII) Carbon Assessment Tool (Version 0.6.19) (TII, 2020)

Consideration has also been given to the 'Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022 (2022a)), Climate Assessment of Proposed National Roads – Standard and Overarching Technical Documentation (Transport Infrastructure Ireland December 2022b/c) and Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106 (TII 2022d).

9.3.2 Climate Change and Greenhouse Gases

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing the world today and is primarily the result of increased levels of greenhouse gases in the atmosphere.

Increasing human emissions of carbon dioxide and other greenhouse gases cause a positive radiative imbalance at the top of the atmosphere, meaning energy is being trapped within the climate system. The imbalance leads to an accumulation of energy in the Earth system in the form of heat that is driving global warming[10],[11]. Greenhouse gases come primarily from the combustion of fossil fuels in energy use.

In March 2023 the European Environment Agency (EEA) published the European Climate Risk Assessment[12]. This assessment states that Europe is the fastest warming continent on the planet and is warming at about the twice the global rate. The average global temperature in the 12-month period between February 2023 and January 2024 exceeding pre-industrial levels by 1.5°C. 2023 was the warmest year on record over more than 100,000 years globally, at 1.48°C above pre-industrial levels, with the world's ocean temperature also reaching new heights.

The Intergovernmental Panel on Climate Change (IPCC), in their AR6 Synthesis Report: Climate Change 2023[13], state that widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. This has led to widespread adverse impacts and related losses and damages to people and nature due to the pressures of climate change and the inability to adapt to a rapidly

[10] Hansen, J.; Sato, M.; Kharecha, P. et al. Earth's Energy Imbalance and Implications. Atmospheric Chemistry and Physics 2011, 11 (24), 13421–13449. https://doi.org/10.5194/acp-11-13421-2011
[11] von Schuckmann, K.; Palmer, M. D.; Trenberth, K. E. et al.-An Imperative to Monitor Earth's Energy Imbalance. Nature Clim Change 2016, 6 (2), 138–144. https://doi.org/10.1038/nclimate2876.
[12] European Environment Agency (2023) European Climate Risk Assessment <https://climate-adapt.eea.europa.eu/en/eu-adaptation-policy/key-eu-actions/climate_risk_assessment/index_html/>
[13] IPCC (2023) Climate Change 2023: AR6 Synthesis Report. Available https://www.ipcc.ch/report/sixth-assessment-report-cycle/

changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

9.3.2.1 International Greenhouse Gas Emission and Climate Targets

Globally, governance relating to climate change has changed significantly since 1994 when the United Nations Framework Convention on Climate Change (UNFCCC) entered into force. Greenhouse Gas emissions have been a primary focus of climate related international agreements for almost two decades.

International greenhouse gas emission and climate targets play an important role in stimulating and enabling action for developed and developing nations. The following sections provide an overview of the international agreements that have played key roles in establishing climate governance.

9.3.2.1.1 *Kyoto Protocol*

The Kyoto Protocol was adopted on 11 December 1997; this Protocol operationalised the UNFCCC and was the first international agreement that committed countries to reduce their greenhouse gas emissions (GHGs). It set limitations and reduction targets for greenhouse gases for developed countries. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, became binding for the first time.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. These EU emission targets are legally binding in Ireland. Ireland's contribution to the EU commitment for the period 2008 – 2012 (the first commitment period) was to limit its greenhouse gas emissions to no more than 13% above 1990 levels. Ireland achieved its Kyoto Protocol targets under the EU burden-sharing agreement.

Doha Amendment to the Kyoto Protocol

- In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:
- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from starting in 2013 and lasting until 2020.
    - The amendment entered into force on 31 December 2020
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of 5% below 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The composition of Parties in the second commitment period is different from the first; however, Ireland and the EU signed up to both the first and second commitment periods. Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

Although the 1997 Kyoto Protocol and 2012 Doha Amendment were in force in 2020, the 2015 Paris Agreement superseded the Kyoto Protocol as the principle regulatory instrument governing the global response to climate change.

9.3.2.1.2 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

9.3.2.1.3 COP25 Climate Change Conference

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the European Union launched its most ambitious plan, 'The European Green New Deal' which aims to lower CO2 emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. On the 4th of March 2020, the European Commission put forward the proposal for a European climate law. This aims to establish the framework for achieving EU climate neutrality. It aims to provide a direction by setting a pathway to climate neutrality and to this end, aims to set in legislation the EU's 2050 climate-neutrality objective.

9.3.2.1.4 COP26 Climate Change Conference

The UN Climate Change Conference of the Parties (COP26) was held in Glasgow from the 31st of October to the 12th of November 2021. There were four key objectives that had been identified for COP 26 which included:

- Secure global net zero by 2050 and keep 1.5 degrees within reach.
- Adapt to protect communities and natural habitats to the already changing climate.
- Mobilise climate finance whereby developed countries must deliver on raising $100bn in climate finance per year.
- Finalise the Paris Rulebook (rules needed to implement the Paris Agreement) and turn ambitions into action.

Although COP26 was considered unsatisfactory in delivering the action and commitments needed to reach the Paris Agreement targets, it did raise the global ambition on climate action. Whilst COP26 failed to meet the 1.5-degree target and did not manage to secure the $100bn in climate finance there were a number key successes which included the following:

- Green finance for the net zero economy – establishment of the Glasgow Financial Alliance for Net Zero of $130 trillion of private capital to accelerate the transition to a net-zero economy.
- Disclosure and transparency for the private sector.
- Increasing the pace of implementing the Paris Agreement.

9.3.2.1.5 COP28 Climate Change Conference – Dubai

The 28th Conference of the Parties for the United Nations Framework Convention on Climate Change (COP28) took place in Dubai from the 30th of November 2023 to the 13th of December 2023.

COP28 resulted in a landmark deal to 'transition away' from fossil fuels, the United Arab Emirates (UAE) Consensus. The agreement calls for 'transitioning away from fossil fuels in energy systems, in a just, orderly, and equitable manner.' This is the first time in 28 years that fossil fuels have been mentioned in a COP outcome. However, it is noted that the text of 'phase out as soon as possible inefficient fossil fuel subsidies' does not address energy poverty or the just transition. The UAE Consensus also calls for more explicit near-term goals in the lead up to 2050, calling for the world to cut greenhouse gas emissions by 43% by 2030 as compared to 2019 levels. However, many island states have criticised that despite the text being an improvement over previous agreements, there is a litany of loopholes that will enable destructive environmental practices to continue and do not assuage their concerns over rising sea levels and other climate change impacts.

COP28 concluded the first ever Global Stocktake under the Paris Agreement. The Global Stocktake recognises that the world is not on track to meet 1.5°C and will require Parties to align their national targets and measures with the Paris Agreement. Parties have two years to submit their Nationally Determined Contributions for 2035, these need to be aligned with the best available science and the outcomes of the Global Stocktake.

An unusual aspect that came out of COP28 in the final hours of discussion was the quantity of decisions and documents which remain unfinished and not signed off. Notably, discussions on carbon markets collapsed in the final days of COP28 as no consensus could be reached on the country-to-country trading regimes or rules for the market in relation to Article 6 of the Paris Agreement. Negotiations will be continued at COP29 in Azerbaijan.

9.3.2.2 United Nations Sustainable Development Goals Report 2023

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 Sustainable Development Goals (SDGs), and 169 targets was adopted by all UN Member States at a UN summit held in New York in 2015. The agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets are to be actions over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State. On 10th July 2023, the United Nations published '*The Sustainable Development Goals Report 2023*'[14], highlighting that the lasting impacts of the COVID-19 pandemic, the war in Ukraine and subsequent refugee crisis, and the increasing consequences of the climate crisis have hindered the achievement of the SDGs. The report stipulates that due to these unprecedented events, the world is falling short of meeting most of the SDGs by 2030, especially in terms of climate action. An assessment of the around 140 targets for which trend data is available shows that about half of these targets are moderately or severely off track; and over 30% have either seen no movement or regressed below the 2015 baseline.

In October 2022 the Department of Communications, Climate Action & Environment in partnerships with all Government Departments, key stakeholders, and based on input from two public consultation processes published the Sustainable Development Goals National Implementation Plan 2022-2024[15] (the SDG Plan). The SDG Plan identifies that, overall, the world is not on track to achieve the global Goals by 2030. The SDG Plan sets out how Ireland will work to achieve the goals and targets of the Agenda for Sustainable Development both domestically and internationally. Irelands first National Implementation Plan provided a framework for Ireland to work towards the implementation of the

[14] *United Nations (2023) The Sustainable Development Goals Report 2023. Available at* https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf

[15] *Department of Environment, Climate and Communications (May 2022). Draft of the Second National Implementation Plan for the Sustainable Development Goals 2022-2024. Available:* https://www.gov.ie/en/publication/e950f-national-implementation-plan-for-the-sustainable-development-goals-2022-2024/

SDGs; the new Implementation Plan aims to build on the structures and mechanisms from the first Plan and to develop and integrate additional approaches in areas identified as requiring further action.

In September 2023, the UN Summit on the SDGs took place in New York and was co-facilitated by Ireland and Qatar. Representing the halfway mark to achieving the SDGs by 2030, it marked the beginning of a new phase of accelerated progress towards the SDGs with high-level political guidance on transformative and accelerated actions. The Global Sustainable Development Report 2023[16] was published in September 2023. The previous Global Sustainable Development Report (2019[17]) found that for some targets the global community was on track, but for many others the world would need to quicken the pace. In 2023, the situation is much more worrisome owing to slow implementation and a confluence of crises. The 2023 Report goes on to highlight the current standing of each SDG and its relevant indicators. A 2023 UN Special Report[18] found that over 30% of the SDGs have seen either no improvement or reverse trends in progress. The push for transformation to achieve the SDGs will come by through shifts in six key entry points:

1. *Human Well Being and Capabilities*
2. *Sustainable and Just Economies*
3. *Food Systems and Healthy Nutrition*
4. *Energy Decarbonisation with Universal Access*
5. *Urban and Peri-Urban Development*
6. *Global Environmental Commons*

The Proposed Development will contribute to Entry Point 4 due to the clean and renewable energy it will provide over its extended operational life. The phase out of fossil fuels in a manner that is globally and domestically just, while strengthening the transition to renewables by increasing energy efficiency and encouraging behavioural change will be key to achieving the relevant SDGs to the Proposed Development.

Relevant SDGs to the Proposed Development and how they are implemented into Irish National plans and policies can be found in Table 9-20.

[16] *Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2023: Times of crisis, times of change: Science for accelerating transformations to sustainable development, (United Nations, New York, 2023).*
[17] *Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development, (United Nations, New York, 2019).* https://sdgs.un.org/sites/default/files/2020-07/24797GSDR_report_2019.pdf
[18] *United Nations (2023) The Sustainable Development Goals Report 2023: Special Edition* https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf

Table 9-20 Sustainable Development Goals Report 2023, Relevant SDGs to the Proposed Development and Implementation into Irish National Plans

SDG	Targets	International Progress/ downfalls to Date (2023) [19]	National Relevant Policy
SDG 7 Affordable and Clean Energy: *Ensure access to affordable, reliable, sustainable and modern energy for all*	› By 2030, ensure universal access to affordable, reliable and modern energy services › By 2030, increase substantially the share of renewable energy in the global energy mix › By 2030, double the global rate of improvement in energy efficiency › By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology › By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	The war in Ukraine and global economic uncertainty continue to cause significant volatility in energy prices, leading some countries to raise investments in renewables and others to increase reliance on coal, putting the green transition at risk. The share of renewable sources in total final energy consumption amounted to 19.1% globally in 2020, or 2.4 percentage points higher than in 2015. Part of this progression is due to lower final energy demand in 2020, as the pandemic disrupted social and economic activities worldwide. The electricity sector shows the largest share of renewables in total final energy consumption (28.2% in 2020) and has driven most of the growth in renewable energy use, while the heat and transport sectors have seen limited progress over the past decade. The rate of improvement in primary energy intensity, which had already slowed in recent years, dropped to 0.6% in 2020. This makes it the worst year for energy intensity improvement since the global financial crisis. This slowdown was influenced by a shift in the economic structure during Covid towards more energy-intensive industrial production, combined with only modest rates of technical efficiency improvements, in the context of low energy prices.	*Ireland's Transition to a Low Carbon Energy Future 2015-2030;* *Energy Poverty Action Plan;* *Ireland's Transition to a Low Carbon Energy Future 2015-2030;* *National Mitigation Plan;* *National Energy Efficiency Action Plan;* *One World, One Future;* *The Global Island* *Economic Recovery Plan* *Project Ireland 2040: National Planning Framework;* *Project 2040;* *National Development Plan 2021-2030;* *Climate Action Plan 2024*
SDG 9: Industry, Innovation, and Infrastructure *Build resilient infrastructure, promote inclusive and sustainable*	› Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.	The manufacturing industry's recovery from COVID-19 remains incomplete and uneven: some high-income regions achieved record-high manufacturing value added per capita in 2022 but levels in least developed countries were not much higher than the 2015 baseline.	*National Development Plan 2021-2030;* *National Economic Recovery Plan;* *Climate Action Plan 2024;*

[19] *United Nations (2023), the 17 Goals – Sustainable Development. Available at: <https://sdgs.un.org/goals>*

SDG	Targets	International Progress/ downfalls to Date (2023) [19]	National Relevant Policy
industrialisation and foster innovation	› Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries › Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	Global carbon dioxide (CO_2) emissions from energy combustion and industrial processes grew by 0.9% in 2022 to a new all-time high of 36.8 billion tonnes. Emissions shrank by more than 5% in 2020, but rebounded past pre – pandemic levels in 2021, growing more than 6% in tandem with economic stimulus and a surge in coal demand even as renewables capacity additions scaled record heights. CO_2 growth in 2022 was well below GDP growth of 3.2%.	*National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *A Better World*
SDG 11: Sustainable Cities and Communities *Make cities and human settlements inclusive, safe, resilient and sustainable*	› By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums › By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons › Strengthen efforts to protect and safeguard the world's cultural and natural heritage › By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Climate change, the pandemic, and conflicts tend to have a disproportionate impact on cities. These factors mean that the world is far from achieving the goal of sustainable cities. In many developing countries, slum populations have been growing, putting at risk the target of adequate housing for all by 2030. Since 2015, the number of countries with national disaster risk reduction strategies has more than doubled. According to 2022 data from 1,507 cities in 126 countries, only 51.6% of the world's urban population has convenient access to public transport, with considerable variations across regions. Data for 2020 from 1,072 cities in 120 countries indicate that more than three-quarters of these cities have less than 20% of their area dedicated to open public spaces and streets, about half of the proportion recommended. By the end of 2022, 102 countries reported having local governments with disaster risk reduction strategies, an increase from 51 countries in 2015.	*Rebuilding Ireland Action Plan for Housing and Homelessness;* *Housing for All;* *EU Regulation 1370/2007 on Public Passenger Transport Services by Rail and by Road;* *Project Ireland 2040* *National Planning Framework;* *National Clean Air Strategy;* *Rural Development Programme 2014-2022;* *National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *A Better World*

SDG	Targets	International Progress/ downfalls to Date (2023) [19]	National Relevant Policy
SDG 12 Responsible Consumption and production: *Ensure sustainable consumption and production patterns.*	- By 2030, achieve the sustainable management and efficient use of natural resources. - By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment - Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle - Promote public procurement practices that are sustainable, in accordance with national policies and priorities. - Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	Unsustainable patterns of consumption and production are the root cause of the triple planetary crisis: 1. *Climate Change* 2. *Biodiversity Loss* 3. *Pollution* The world is seriously off track in its effort to halve per-capita food waste and losses by 2030.The COVID-19 pandemic has had significant impacts on consumption and production patterns, with disruptions to global supply chains and changes in consumer behaviour. Responsible consumption and production must be an integral part of the recovery from the pandemic. But the global economy also needs to speed up the decoupling of economic growth from resource use by maximizing the socio-economic benefits of resources while minimizing their negative impacts. Reporting on corporate sustainability has tripled since the beginning of the SDG period, but the private sector will need to significantly improve reporting on activities that contribute to the SDGs. Global data showed a rise in fossil fuel subsidies in 2021, after a brief fall in 2020 which was largely caused by a drop in energy prices. In 2021, Governments spent an estimated $732 billion on subsidies to coal, oil, and gas, against $375 billion in 2020. This brings the subsidies back to pre-2015 levels. High oil and gas prices in 2022 will likely bring a new increase, as subsidies are often linked to the price of energy.	*National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *Climate Action Plan 2024* *Tourism Action Plan;* *National Clean Air Strategy;* *Towards Responsible Business: Ireland's Second National Plan on Corporate Social Responsibility (CSR) 2017-2020;* *Sustainable, Inclusive and Empowered Communities 2019-2024;*

SDG	Targets	International Progress/ downfalls to Date (2023) [19]	National Relevant Policy
SDG 13 Climate Action: *Take urgent action to combat climate change and its impacts** **Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.*	› Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries › Integrate climate change measures into national policies, strategies and planning › Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	The world is on the brink of a climate catastrophe and current actions and plans to address the crisis are insufficient. Without transformative action starting now and within this decade to reduce greenhouse gas emissions deeply and rapidly in all sectors, the 1.5°C target will be at risk and with it the lives of more than 3 billion people. Failure to act leads to intensifying heatwaves, droughts, flooding, wildfires, sea-level rise, and famines. Emissions should already be decreasing now and will need to be cut almost by half by 2030 - a mere seven years from now. Global temperatures have already hit 1.1°C, rising due to increasing global greenhouse gas emissions, which reached record highs in 2021. Real-time data from 2022 show emissions continuing an upward trajectory. Instead of decreasing emissions as required by the target to limit warming, carbon dioxide levels increased from 2020 to 2021 at a rate higher than the average annual growth rate of the last decade and is already 149% higher than pre-industrial levels. Projected cumulative future CO_2 emissions over the lifetime of existing and currently planned fossil fuel infrastructure exceed the total cumulative net CO_2 emissions in pathways that limit warming to 1.5°C (>50%) with no or limited overshoot.	*National Adaptation Framework;* *Building on Recovery: Infrastructure and Capital Investment 2016-2021;* *National Mitigation Plan;* *National Biodiversity Action Plan 2017-2021;* *National Policy Position on Climate Action and Low Carbon Development;* *Project 2040: National Development Plan 2021-2030;* *Climate Action Plan 2024;* *National Dialogue on Climate Action;* *Agriculture, Forest, and Seafood Climate Change sectoral Adaptation Plan;* *The National Strategy on Education for Sustainable Development in Ireland*

9.3.2.2.1 Climate Change Performance Index 2024

Established in 2005, the Climate Change Performance Index (CCPI) is an independent monitoring tool which tracks countries climate protection performance. It assesses individual countries based on climate policies, energy usage per capita, renewable energy implementation and Greenhouse Gas Emissions (GHG) and ranks their performance in each category and overall. The 2024 CCPI was published in December 2023. While the CCPI 2024 indicates signs of potential reductions in global emissions, no country achieved its Paris Climate targets and therefore the first three places of the ranking system remain unoccupied.

Ireland, ranked 37th in 2023, has fallen 6 places to 43rd for 2024, and remains as a "low" performer in international performance. The CCPI states that Ireland's policies are missing a long-term strategy for phasing out fossil fuel infrastructure and shifting investments from natural gas towards an emissions-neutral energy supply. Rebound effects from economic growth in emissions-intensive sectors (such as agriculture and land use) cause absolute emissions to remain high. The chance to integrate clear sanctions into the framework has so far been missed.

However, the CCPI experts welcome Ireland's medium-term offshore wind and solar plans. They feel the country's offshore wind offers considerable opportunities for capitalising on renewable energy and (over the long term) potential for electricity export.

Ireland has moved to the 'low' category from 'very low' in 2023 on the Greenhouse Gas Emissions ratings despite falling to 54th in the world from 47th in 2023. Ireland remains in the 'Medium' category in the Renewable Energy rating table; however, Ireland has fallen from 23rd in 2023 to 31st in 2024.

9.3.2.3 State of the Global Climate 2023

In March 2023, the World Meteorological Organisation (WMO) published a report entitled the '*State of the Global Climate 2023*'.[12] This report provided a summary on the state of the climate indicators in 2023 with sections on key climate indicators, extreme events and impacts. The key messages in the report include:

- 2023 was the warmest year on record at 1.45 ± 0.12 °C above the pre-industrial average.
- Concentrations of the three main greenhouse gases – carbon dioxide, methane, and nitrous oxide – reached record high observed levels.

The State of the Global Climate report goes on to state that renewable energy generation, primarily driven by the dynamic forces of solar radiation, wind and the water cycle, has surged to the forefront of climate action for its potential to achieve decarbonization targets. There has been a substantial worldwide energy transition, with renewable capacity additions increasing by nearly 50% from 2022, totalling 510 gigawatts (GW).[13] This growth represents the highest rate observed in the past two decades, signalling a significant momentum toward achieving the clean energy goal set at COP28 meeting in 2023 to triple renewable energy capacity globally to 11,000 GW by 2030.

Alterations in the physical climate can trigger a series of repercussions on national advancement and the pursuit of SDGs (Section 9.3.1.3 above). The interconnections between the climate emergency and development pathways can foster synergistic endeavours, resulting in positive benefits for communities and human well-being (refer to Chapter 5 of this EIAR for more details). This synergy serves as a potent driver for adapt to climate change and lay the groundwork for the global energy transition. Emphasizing wind energy and other renewable sources enables the global energy transition towards sustainability.

9.3.2.4 National Greenhouse Gas Emission and Climate Targets

9.3.2.4.1 *Programmes for Government*

The Programme for Government was published in October 2020 and last updated April 2021. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The programme also recognises the severity of the climate challenge as it clarifies that:

> *"Climate change is the single greatest threat facing humanity".*

9.3.2.4.2 *Climate Action and Low Carbon Development (Amendment) Act 2021*

The Climate Action and Low Carbon (Amendment) Act 2021 is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This was passed into law in July 2021.

The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieve net zero emissions by 2050. This Act will manage the implementation of a suite of policies to assist in achieving this target.

The Act includes the following key elements, among others:

- Places on a statutory basis a 'national climate objective', which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.
- Embeds the process of carbon budgeting into law, Government are required to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.
- Actions for each sector will be detailed in the Climate Action Plan, updated annually.
- A National Long Term Climate Action Strategy will be prepared every five years.
- Government Ministers will be responsible for achieving the legally binding targets for their own sectoral area with each Minister accounting for their performance towards sectoral targets and actions before an Oireachtas Committee each year.
- Strengthens the role of the Climate Change Advisory Council, tasking it with proposing carbon budgets to the Minister.
- Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council (CCAC) should equate to a total reduction of 51% emissions over the period to 2030, in line with the Programme for Government commitment.

9.3.2.4.3 *Climate Change Advisory Council 2023*

The CCAC was established on 18th January 2016 under the Climate Action and Low Carbon Development Act 2015. The CCAC aims to provide independent evidence-based advice and recommendations on policy to support Ireland's Just Transition to a biodiversity-rich, environmentally sustainable, climate-neutral, and resilient society.

The Annual Review 2023[20] is the seventh annual review carried out by CCAC and details the CCAC concerns that the necessary national actions are not taking place or being enabled at the required

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[20] *Climate Change Advisory Council (2023) Annual Review and Report 2023. Available at: https://www.climatecouncil.ie/councilpublications/annualreviewandreport/CCAC-AR-2023-FINAL%20Compressed%20web.pdf*

speed, going on to state that 'at the current rate of policy implementation, Ireland will not meet the targets set in the first and second carbon budget periods unless urgent action is taken immediately, and emissions begin to fall much more rapidly.'

9.3.2.4.4 Carbon Budgets

The first national carbon budget programme proposed by the Climate Change Advisory Council, approved by Government and adopted by both Houses of the Oireachtas in April 2022 comprises three successive 5-year carbon budgets. The total emissions allowed under each budget are shown in Table 9-21.

Table 9-21 Proposed Carbon Budgets of the Climate Change Advisory Council

	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2	2031 – 2035 Provisional Carbon Budget 3
	All Gases		
Carbon Budget (Mt CO2eq)	295	200	151
Annual Average Percentage Change in Emissions	-4.8%	-8.3%	-3.5%
The figures are consistent with emissions in 2018 of 68.3 Mt CO2eq reducing to 33.5 Mt CO2eq in 2030 thus allowing compliance with the 51% emissions reduction target by 2030			

Ireland has expended 47% of its emissions for the first carbon budget period in the first two years. Thus only 53% is leftover, requiring a 12.4% reduction in emissions each year to stay in budget.

9.3.2.4.5 Sectoral Emissions Ceilings

The Sectoral Emissions Ceilings were launched in September 2022. The objective of the initiative is to inform on the total amount of permitted greenhouse gas emissions that each sector of the Irish economy can produce during a specific time period. The Sectoral Emissions Ceilings alongside the annual published Climate Action Plan provide a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030.

Section C of the Climate Action and Low Carbon Development (Amendment) Act 2021 provides the minister with a method of preparing the Sectoral Emissions Ceiling within the bounds of the carbon budget. The Sectoral Emission Ceilings for each 5-year carbon budget period was approved by the government on the 28th of July 2022 and are shown in Table 9-22 below.

Table 9-22 Sectoral Emissions Ceiling 2022

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
Sector	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2
Electricity	40	20
Transport	54	37
Built Environment-Residential	29	23
Built Environment-Commercial	7	5
Industry	30	24
Agriculture	106	96

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
LULUCF[1]	Yet to be determined	Yet to be determined
Other (F-Gases, Waste & Petroleum refining)	9	8
Unallocated Savings		-26
Total[2]	Yet to be determined	Yet to be determined
Legally binding Carbon budgets and 2030 Emission Reduction Targets	295	200

[1] Finalising the Sectoral Emissions Ceiling for the land-use, Land-use Change and Forestry (LULUCF) sector has been deferred for up to 18 months to allow for the completion of the Land-use Strategy
[2] Once LULUCF sector figures are finalised, total figures will be available.

The electricity sector is the third largest emitting sector in Ireland and the successful decarbonisation of this sector could lead to decarbonisation in other sectors, such as the electrification of transport and heating. The Annual 2023 Review states that the electricity sector has been set one of the smallest sectoral emission ceilings and the steepest decline in emissions of all sectors with emission ceilings of 40MtCO2eq for the first carbon budget period (2021–2025) and 20MtCO2eq for the second carbon budget period (2026–2030) (further detailed in Section 9.3.2.4 and Section 9.3.2.5 below). This equates to a headline target of a 75% reduction in emissions in the sector from 2018 levels by 2030, which will be achieved by increasing the share of renewable electricity to 80%, encompassing 9GW of onshore wind capacity, at least 5GW of offshore wind capacity, with 2 GW earmarked for green hydrogen production, and 8GW of solar photovoltaic capacity, supported by a range of actions set out in the Climate Action Plan 2024 (CAP 2024).

9.3.2.4.6 *Climate Action Plan 2024*

CAP 2024[21] was launched in December 2023. Following on from Climate Action Plans 2019, 2021, and 2023, CAP 2024 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030.* CAP 2024 seeks to build on the progress made under Climate Action Plan 2023 by delivering policies, measurements and actions that will support the achievement of Irelands carbon budgets, sectoral emission ceilings, and 2030 and 2050 climate targets; while further enabling the closure of identified emissions gaps and the allocation of unallocated emission savings associated with each carbon budget period.

Six Vital High Impact Sectors were identified within Climate Action Plan 2023[22] relating to the sectoral emission ceilings (Section 9.3.2.5 above). These sectors and their associated targets are as follows:

- Powering Renewables – 75% Reduction in emissions by 2030
- Building Better – 45% (Commercial/Public) and 40% (Residential) Reduction in Emissions by 2030
- Turning Transport Around – 50% Reduction in Emissions by 2030
- Making Family Farms More Sustainable – 25% Reduction in Emissions by 2030
- Greening Business and Enterprise – 35% Reduction in Emissions by 2030
- Changing Our Land-Use – Exact reduction target for this sector is yet to be determined.

[21] Department of the Environment, Climate and Communications (2023) Climate Action Plan 2024. Available at: https://www.gov.ie/en/publication/79659-climate-action-plan-2024/#new-approach-to-the-2024-annex-of-actions
[22] Department of the Environment, Climate and Communications (2022) Climate Action Plan 2023 – Summary Document

CAP 2024 provides a more enhanced sectoral breakdown of these Vital High Impact Sectors as the majority have since developed their own independent, but complimentary, analytical approaches to emissions reductions.

CAP 2024 goes on to highlight the need for adaptation to climate change. Adaptation is the process of adjustment to actual or expected climate change and its effects. Observations show that Irelands climate is changing in terms of coastline, sea level rise, seasonal temperatures, and changes in typical weather patterns. Climate change is expected to have diverse and wide-ranging impacts on Ireland's environment, society, and economic development, including on managed and natural ecosystems, water resources, agriculture and food security, the built environment, human health, and coastal zones.

9.3.2.5 Irelands Climate Change Assessment

In 2023 the EPA published Irelands Climate Change Assessment (ICCA).[23] This assessment provides a comprehensive overview and breakdown of the state of knowledge around key aspects of climate change with a focus on Ireland. The ICCA report is presented in four volumes.

- Volume 1: Climate Science – Ireland in a Changing World
- Volume 2: Achieving Climate Neutrality in 2050
- Volume 3: Being Prepared for Irelands Future
- Volume 3: Realising the Benefits of Transition and Transformation

The ICCA Synthesis Report states that having peaked in 2001, Irelands greenhouse gas emissions have reduced in all sectors except agriculture. However, Ireland currently emits more greenhouse gases per person than the EU average. The report goes on to state that there has been an identified gap in policy that indicates that Ireland will not meet its statutory greenhouse gas emission targets. Achieving net zero carbon dioxide emissions by 2050 requires significant and unprecedented changes to Ireland's energy system. Policies tailored to suit different stages of technology development are critical for achieving a net zero energy system. Established technologies, such as wind energy, solar photovoltaics and bioenergy, will be key in meeting short-term emission reduction targets (i.e. 2030), whereas offshore wind infrastructure is expected to be the backbone of future energy systems. This can only be achieved with appropriate support schemes, regulation and investments for synergistic growth of offshore wind and other renewable technologies.

There are well-established 'no-regret options' that need to happen now, which can get Ireland most of the way to net zero carbon dioxide emissions. Beyond that, there are 'future energy choices' relating to the scale and magnitude of technologies that will assist in achieving Ireland statutory climate targets. Ireland's no-regret options are demand reduction (e.g. through energy efficiency and reduced consumption), electrification (e.g. electric vehicles and heat pumps), deployment of market-ready renewables (e.g. wind energy and solar photovoltaics) and low-carbon heating options (e.g. district heating); Irelands future choices include hydrogen, carbon capture and storage, nuclear energy and electro-fuels. Renewable energy can increasingly provide our future energy needs but will need to be complemented with carbon dioxide removals to achieve a net zero energy system in hard-to-abate sectors.

9.3.2.5.1 *Greenhouse Gas Emissions Projections*

In its approach to decarbonising, the EU has split greenhouse gas (GHG) emissions into two categories, the Emissions Trading System (ETS) and the non-ETS. Emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors be reduced by 43% by 2030, relative to 2005 levels. Within the ETS, participants are required to purchase

[23] *Environmental Protection Agency (2023) Irelands Climate Change Assessment.* https://www.epa.ie/our-services/monitoring--assessment/climate-change/irelands-climate-change-assessment-icca/

allowances for every tonne of emissions, with the amount of these allowances declining over time to ensure the required reduction of 43% in GHG emissions is achieved at EU-level[24].

Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation (ERS[25]). This established binding annual GHG emission targets for Member States for the period 2021–2030. Ireland is required to reduce its emissions from these sectors by 30% by 2030, relative to 2005 levels. Under the EU Green Deal, the targets for the ETS and non-ETS sectors will be revised upwards in order to achieve the commitment, at EU level, to reach an economy-wide 2030 reduction in emissions of at least 55%, compared to 1990 levels[1].

The Environmental Protection Agency (EPA) publish Ireland's Greenhouse Gas Emission Projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2023-2050* was published in May 2024. *e.* The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the Effort Sharing Regulation (ESR).

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands greenhouse gas emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2020. This is the cut off point for which the latest national greenhouse gas emission inventory data is available, known as the 'base year' for projections. The WAM scenario has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's Climate Action Plan 2024 that are not yet implemented. As implementation of policies and measures occurs, they will be migrated into the WEM Scenario. The EPA Emission Projections Update notes the following key trends:

- Ireland is not on track to meet the 51% emissions reduction target by 2030 (as compared to 2018 levels) based on most up to date EPA projections which include the majority of CAP 2024 measures
- The first two carbon budgets (2021-2030), which aim to support achievement of the 51% emissions reduction goal, are projected to be exceeded by a significant margin of between 17% and 27%.
- Sectoral emissions ceilings for 2025 and 2030 are projected to be exceeded in almost all cases, including Agriculture, Electricity, Industry and Transport.
  - Total emissions from the agriculture sector are projected to decrease by between 1 and 18% over the period 2022 to 2030
  - Transport emissions are projected to decrease by 5 to 26% over the period 2022-2030
  - Emissions from the LULUCF sector have been revised significantly to reflect new science. Total emissions from the LULUCF sector are projected to increase over the period 2022 to 2030
- Emissions from the Energy Industries sector are projected to decrease by between 57% and 62% over the period 2022 to 2030
  - Renewable energy generation at the end of the decade is projected to range from 69% to 80% of electricity generation as a result of a projected rapid expansion in wind energy and other renewables
- Ireland will not meet its non-ETS EU targets of a 42% emissions reduction by 2030 in WAM even with both the ETS and LULUCF flexibilities.

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[24] *Department of the Environment, Climate and Communications (2023) - Climate Action Plan 2023. Available https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/*

[25] *Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance)*

- Emissions in the WEM Scenario are projected to be 29% lower in 2030 (compared with 2018) whereas in the WAM Scenario the emissions reduction is projected to be 11%
    - There has been no improvement in these figures since EPA projections published in 2023.

9.3.2.6 Local Greenhouse Gas Emission and Climate Targets

9.3.2.6.1 *Wexford County Council Climate Action Plan 2024-2029*

The Wexford County Council Climate Action Plan 2024-2029[26] (Wexford CCCAP) highlights the current state of climate action in Ireland, and how Wexford County Council intends to deliver and enable climate action for a just transition to a low carbon and climate resilient future within County Wexford. The Wexford CCCAP will help address the mitigation of greenhouse gases, the implementation of climate change mitigation and adaption measures, and will strengthen the alignment between national climate policy and the delivery of effective local climate action.

Overall, the greenhouse gas emissions generated from County Wexford equated to 2,460.1 ktCO2eq in the baseline year, 2018. The top emitting sectors within County Wexford in terms of total greenhouse gas emissions in the baseline year were Agriculture, Residential, Transport and Manufacturing and Commercial producing 39.4%, 17.6%, 17.4% and 16.4% respectively of the total greenhouse gas emissions in the county, with Land Use, Land Use Change and Forestry (LULUCF), Waste, Industrial Processes and Wexford Couty Council emissions comprising the remaining 9.2%Wexford County Council, along with all public sector entities must reduce greenhouse gas emissions by 51% by 2030 as compared to 2018 in line with the National Climate Action Plan 2024, with the allowable greenhouse gas emissions for County Wexford in 2030 under this Plan 1,205.5 ktCO2eq.

The Wexford CCCAP for Wexford assesses climate risk relevant to Ireland and to County Wexford, this, plus the evidence Baseline Emissions Inventory, inform the climate objectives and actions that will be undertaken by Wexford County Council to assist in the achievement of national and international climate targets.

The Wexford County Development Plan 2022-2028[27] sets out the overall strategy for the proper planning and sustainable development of the County over a 6-year period. The Development Plan includes numerous objectives on sustainability and climate within, as well as an Energy Strategy.

The Wexford County Council Climate Action Plan was adopted by the Elected members of Wexford County Council in February 2024, in line with the 2021 Climate Action and Low Carbon Development (Amendment) Act.

9.3.3 Climate and Weather in the Existing Environment

Climate change projections show that the Earth is getting warmer and extreme weather events are increasing in frequency on an annual basis. The Project will assist in continuing to mitigate these effects through the deployment of clean renewable energy to the national grid and subsequent decarbonisation of energy systems. Changes to climate and weather in Ireland will occur as a result of climate change, for further details on the risks associated with the Project please refer to Chapter 14 Major Accidents and Natural Disasters.

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[26] *Wexford County Council (2024) Wexford County Council Climate Action Plan 2024-2029.* <https://www.wexfordcoco.ie/sites/default/files/content/Climate%20Action%20Plan%202024-2029%20English.pdf>
[27] *Wexford County Council (2022) Adopted Wexford County Development Plan 2022-2028* <https://consult.wexfordcoco.ie/en/consultation/wexford-county-development-plan-2022-2028>

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Rosslare, which is located approximately 33 kilometres south of the Site, is the nearest weather and climate monitoring station to the Project site that has meteorological data recorded for the 30-year period from 1978-2007. Meteorological data recorded during the 30-year period from 1991 to 2020 has been published by Met Eireann, however data for the Rosslare weather station was not available for this time period, as this station closed in early 2008. Although data was available for this more recent period at the next nearest weather and climate monitoring station at Casement Aerodrome, Co. Dublin, approximately 86km east of the site, it was deemed that the 1979-2008 data from the Rosslare station was more relevant to the site of the Project. Meteorological data recorded at Rosslare over the 30-year period from 1978-2007 is shown in Table 9-23 below. The wettest months are October, November and December, with May, June and July being the driest. July and August the warmest months with an average temperature of 18.3° Celsius and 18.5° Celsius respectively.

Recent monthly meteorological data recorded at Johnstown Castle in Wexford Town, Co Wexford, located approximately 32 kilometres southwest of the site, from January 2021 to January 2024 is available at: https://www.met.ie/climate/available-data/monthly-data. October 2023 was the wettest month in this time period, with 265mm of rainfall recorded, while February 2023 was the driest month with 7.4mm of rainfall. August 2022 was the warmest month in this time period, with a mean monthly temperature of 16.7° Celsius. January 2021 was the coldest month with a mean monthly temperature of 4.6° Celsius.

Table 9-23 Data from Met Éireann Weather Station at Kilkenny, 1978-2007

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (degrees Celsius)													
Mean daily max	8.8	8.5	9.9	11.3	13.6	16.3	18.3	18.5	16.8	14.0	11.3	9.5	13.1
Mean daily min	4.2	4.1	5.1	6.3	8.6	11.0	12.7	12.9	11.6	9.3	6.7	5.2	8.1
Mean temperature	6.5	6.3	7.5	8.8	11.1	13.6	15.5	15.7	14.2	11.6	9.0	7.4	10.6
Absolute max.	14.1	14.1	15.8	17.9	22.3	25.5	26.2	25.9	22.0	21.5	16.7	14.0	26.2
Absolute Min.	-4.4	-3.7	-2.5	-0.1	-0.3	4.7	6.7	7.0	4.0	1.3	-2.5	-3.0	-4.4
Mean No. of Days with Air Frost	1.5	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.1	4.8
Mean No. of Days with Ground Frost	9.4	8.3	6.0	3.5	0.7	0.1	0.0	0.0	0.0	0.7	3.7	7.4	39.8
Relative Humidity (%)													
Mean at 0900UTC	85.7	85.4	85.1	82.1	81.4	82.1	82.6	83.6	84.3	85.3	86.3	86.4	84.2
Mean at 1500UTC	80.8	79.0	77.8	76.1	77.2	77.7	77.2	76.9	77.1	78.7	80.2	82.2	78.4
Sunshine (hours)													
Mean daily duration	2.0	2.6	3.7	5.7	6.9	6.2	6.3	6.0	4.8	3.4	2.4	1.8	4.3
Greatest daily duration	8.2	10.0	11.6	13.4	15.4	15.7	15.6	14.0	12.6	10.5	8.6	7.2	15.7
Mean num. of days with no sun	10.1	8.0	5.4	2.7	1.7	2.0	1.5	1.9	2.7	6.3	8.2	11.0	61.4
Rainfall (mm)													
Mean monthly total	88.4	70.8	69.1	59.1	55.7	54.9	49.9	71.6	75.0	109.3	100.9	100.8	905.5
Greatest daily total	42.7	32.0	42.2	32.0	29.4	31.6	41.4	89.2	42.2	88.6	43.8	48.9	89.2
Wind (knots)													
Max. gust	71	76	66	75	66	50	54	54	64	96	74	80	68.8
Max. mean 10-minute speed	43	44	42	52	40	38	41	36	47	56	48	50	44.8
Mean num. of days with gales	1.4	1.2	0.5	0.8	0.2	0.1	0.2	0.1	0.2	0.6	0.9	1.0	7.1
Mean monthly speed	12.4	12.2	11.9	11.2	10.9	9.7	9.5	9.4	10.6	11.5	11.4	12.2	11.1
Weather (mean no. of days with...)													
Snow or sleet	1.7	2.3	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	6.2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Snow lying at 0900UTC	0.5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Hail	1.2	1.0	1.9	1.3	0.8	0.2	0.1	0.1	0.1	0.4	0.7	0.9	8.7
Thunder	0.2	0.1	0.2	0.2	0.7	0.9	0.8	0.6	0.4	0.6	0.3	0.3	5.2
Fog	1.8	2.2	3.6	3.7	2.9	4.1	4.4	3.4	2.8	1.6	1.7	1.7	33.9

9.3.4 Calculating Carbon Savings from the Project

A simple formula can be used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$CO_2 \text{ (in tonnes)} = \frac{(A \times B \times C \times D)}{1000}$$

where: A = ... The rated capacity of the wind energy development in MW

B = ... The capacity or load factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc.

C = ... The number of hours in a year

D = ... Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the rated capacity of the Project is assumed to be 42 MW (based on 21 No. 2 MW turbines).

A site-specific capacity factor of 0.21 (or 21%) has been used for the Project, based on observed energy production at the existing Wind Farm.

The number of hours in a year is 8,760.

A conservative figure for the carbon load of electricity generated by natural gas in Ireland was sourced from Sustainable Energy Authority Ireland's (SEAI) December 2022 report, '*Energy in Ireland.*' The provisional emission factor for electricity generated in Ireland in 2022 was 297.4 g CO2/kWh[28].

The calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(42 \times 0.21 \times 8{,}760 \times 297.4)}{1000}$$

$$= 22{,}978 \text{ tonnes per annum}$$

Based on this calculation, **22,978** tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Project. Over the proposed 10-year extended lifetime of the Proposed Development, therefore, **229,780.8** tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.

[28] SEAI have published the Energy in Ireland 2023 Report which states that carbon intensity of electricity may be 259 gCO2/kWh for 2023 As this is a provisional value and subject to change it has not been used for the purposes of calculating carbon savings for the Proposed Development.

9.3.5 Likely Significant Effects and Associated Mitigation Measures

9.3.5.1 'Do-Nothing' Effect

Under the Do-Nothing scenario, the existing wind farm and substation would be decommissioned in accordance with the conditions of the current planning permission.

If the Project were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gas emissions, including CO_2, NO_x and SO_2 to the atmosphere would be lost. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and EU law would also be lost. This would be a **Long-Term, Indirect, Slight Negative** effect.

The use of machinery during the decommissioning of the existing wind farm and substation would result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as construction personnel are typical examples of machinery use. This impact is considered to be imperceptible, given the insignificant quantity of greenhouse gases that would be emitted. This would likely result in a **Short-Term, Imperceptible, Negative** effect.

9.3.5.2 Construction Phase

All elements of the Project are currently operational, and it is proposed to extend the operational phase of the wind farm and substation by a further 10 years. No construction activities will occur as part of the proposed extension of duration of operational life of the Proposed Development or the continued operation of the grid connection, therefore there are no construction phase impacts on climate.

9.3.5.3 Operational Phase

9.3.5.3.1 *Greenhouse Gas Emissions*

The Project

The Project will generate energy from a renewable source. This energy generated will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a net positive effect on climate. As detailed in Section 9.3.4 above, the Project will continue to displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 10-year lifespan extension of the existing Ballywater Wind Farm and Ballywater 110kV Substation. The Project will assist in reducing carbon dioxide (CO_2) emissions that would otherwise arise if the same energy that the Project will generate were otherwise to be generated by conventional fossil fuel plants. This is a **Medium-Term Significant Positive** effect.

Some potential long-term imperceptible negative effects that may occur during the operational phase of the Project are the release of small amounts of carbon dioxide to the atmosphere due to potential maintenance and monitoring activities resulting in vehicle emissions. These impacts will be imperceptible and will be nullified by the quantity of carbon dioxide that will be displaced by the Project.

Transport to and from the Project

In the unlikely event that a turbine blade is damaged and must be replaced during the operational phase, the impacts described will be the same. Emissions resulting from routine maintenance at the Project are included in the section above.

Waste

Waste is not proposed to be generated on the site during the operational phase, any waste that does arise will be minimal and any impact will be short-term and imperceptible. Waste management will be carried out in accordance with 'Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021) produced by the EPA.

Residual Impact

Long-term, Moderate, Positive Effect on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will **be a Medium-Term Moderate Positive** Effect on Climate.

9.3.5.4 Decommissioning Phase

The potential impacts associated with decommissioning of the Project (2035 should planning permission be granted for the Proposed Development) will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.7 of this EIAR.

The movement of site traffic within, and to and from the site, carrying workers and decommissioning materials has the potential to generate exhaust emissions. The decommissioning of turbines and substation and all ancillary works and apparatus will require the operation of construction vehicles and plant on and off-site, and the transport of workers to and from the site. The transport of turbine and substation components, supporting infrastructure materials, decommissioning and staff vehicles, small volumes of aggregate material, and waste removal vehicles to/from the and daily staff movements, will give rise to exhaust emissions associated with the transport vehicles. A preliminary Decommissioning Plan for the Proposed Development, see Appendix 4-4, contains details which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

Any potential climate impacts and consequential effects likely to occur during the future decommissioning phase (i.e., 2035) are similar to those which would occur under the Do-Nothing scenario (2025 decommissioning date), but to a lesser extent. The use of machinery during the decommissioning of the wind farm and substation would result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as construction personnel are typical examples of machinery use. The impact of this is considered imperceptible, given the insignificant quantity of greenhouse gases which would be emitted. With the implementation of mitigation measures as outlined within the Decommissioning Plan (see Appendix 4-4), then **No Significant Effects** related to climate are envisaged during the decommissioning stage of the Proposed Development. It is not proposed to decommission the grid connection, therefore **No Significant Effects** related to climate are envisaged during the decommissioning stage of the Project.

9.3.5.5 Cumulative Assessment

Potential cumulative effects on climate between the Project and other projects in the vicinity were also considered as part of this assessment. The projects considered as part of the cumulative effect assessment are described in Section 2.10 of this EIAR.

The nature of the Project is such that it will have a **Medium-term, Moderate, Positive** effect on the air quality and climate.

The existing Ballywater Wind Farm and Ballywater 110kV Substation is currently operational, and it is proposed to extend the operational life of the existing wind farm and substation by 10 years. No construction activities will occur as part of the proposed extension of operational life, therefore there are no construction phase cumulative negative effects on air and climate.

When considering these greenhouse gas emissions within the context of the Electricity Sector Emissions Ceilings detailed in Section 9.3.2.4.4, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 9.3.4, the Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 10-year lifespan extension of the existing Ballywater Wind Farm and Ballywater 110kV Substation. Therefore, while there will be greenhouse gas emissions associated with the operation and decommissioning of the Project, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Project within its operational life. Thus, there will be **no measurable negative cumulative effect** arising on air quality and climate from the Project and other permitted or proposed projects and plans in the area as set out in Section 2.10 in Chapter 2 of this EIAR.

10. NOISE AND VIBRATION

10.1 Introduction

10.1.1 Background & Objectives

This chapter of the EIAR describes the assessment undertaken of the potential noise and vibration impacts associated with the Project. The Project consists of the continued operation of the existing Ballywater Wind Farm (permitted under WCC Pl. Ref 2001/0458) and Ballywater 110kV Substation (permitted under WCC Pl. Ref 2004/2901) for a further period of 10 years from the date of expiry (June 2025) of the current planning permissions, and for the decommissioning of the entire wind farm and substation at the end of that further period. The Project also consists of the ongoing operation of the existing Underground Grid Connection from Ballywater 110kV substation to the Crane 110kV substation.

No modifications are proposed to the existing windfarm and substation.

A full description of the Project, which includes the Proposed Development, is provided in Chapter 4: Description of Project.

As all elements of the wind farm have been constructed, there is no construction phase associated with the Project. Noise and vibration impact assessments have therefore been prepared for the operational and decommissioning phases of the Project.

The nearest operational, permitted or proposed wind turbines are at located at Gorey Business Park and Ballyduff at a distance of 14.1km and 19.9km respectively from the Proposed Development. Based on these distances, a cumulative wind turbine noise review is not required and has therefore been scoped out of this assessment.

The current *Wind Energy Development Guidelines for Planning Authorities*, published by the Department of the Environment, Heritage and Local Government in 2006, defines a noise sensitive location (NSL) as any occupied dwelling house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational amenity importance. In this assessment all the NSLs are treated as dwellings.

To inform this assessment, existing noise levels have been measured at a set of locations, representative of the nearest NSLs in the vicinity of the site to assess the potential impacts associated with the operation of the Project. Background noise levels have been derived for these locations based on guidance in the Institute of Acoustics (IOA) document *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (2013) (IOA GPG).

There are 266 no. NSLs within 1.5 km of the existing turbine locations. The nearest occupied NSL to a turbine is H006 being approximately 324 m from turbine T21.

10.1.2 Statement of Authority

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd.

Dermot Blunnie

Dermot Blunnie (Principal Acoustic Consultant) holds a BEng (Hons) in Sound Engineering, MSc in Applied Acoustics and has completed the Institute of Acoustics (IOA) Diploma in Acoustics and Noise

Control. He has been working in the field of acoustics since 2008 and is a member of the Institute of Engineers Ireland (MIEI) and the Institute of Acoustics (MIOA). He has extensive knowledge and experience in relation to commissioning noise monitoring and impact assessment of wind farms as well as a detailed knowledge of acoustic standards and proprietary noise modelling software packages. He has commissioned noise surveys and completed noise impact assessments for numerous wind farm projects within Ireland.

Mike Simms

This chapter of the EIAR has been reviewed by Mike Simms (Principal Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering and is a member of the Institute of Acoustics (MIOA) and of the Institution of Engineering and Technology (MIET). Mike has worked in the field of acoustics for over 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

10.2 Fundamentals of Acoustics

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. To take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The human audible range of sounds expressed in terms of Sound Pressure Levels (SPL) is 0dB (for the threshold of hearing) to 120 dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.

The frequency of sound is the rate at which a sound wave oscillates is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. The 'A-weighting' system defined in the international standard, BS ISO 226:2003 Acoustics. Normal Equal-loudness Level Contours has been found to provide the best correlations with human response to perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A).

An indication of the level of some common sounds on the dB(A) scale is presented in Figure 10-1.

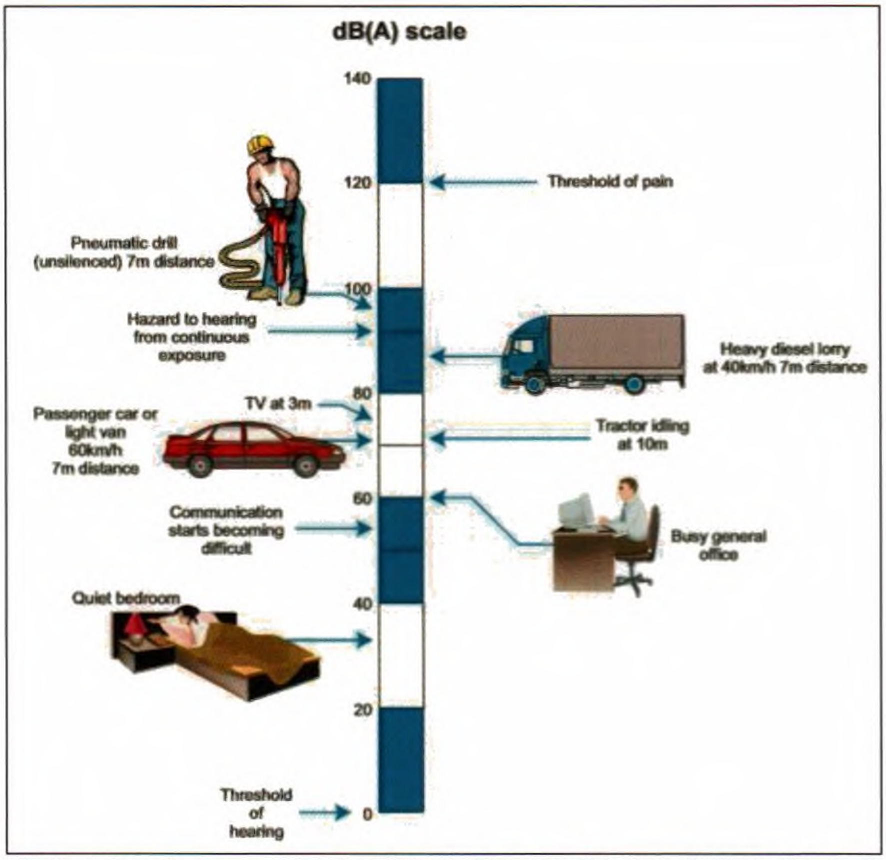

Figure 10-1 The level of typical common sounds on the dB(A) scale (National Roads Authority (NRA) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (NRA, 2014)

For a glossary of terms used in this chapter please refer to Appendix 10-1.

10.3 Assessment Methodology

The assessment of effects has been undertaken with reference to the most appropriate guidance documents relating to noise and vibration for the operational and decommissioning phases of the Project, which are set out within the relevant sections of this chapter.

In addition to the specific guidance documents outlined below, the Environmental Impact Assessment (EIA) guidelines listed in Chapter 1 were consulted for the purposes of preparing this EIAR chapter.

The methodology adopted for this noise impact assessment is summarised as follows:

- Characterise the receiving environment through noise surveys at various NSLs. The NSLs in this instance are at distances from the development selected to minimise the influence of noise from the existing turbines;
- Undertake predictive calculations to assess the potential impacts associated with the operational phase of the Project at NSLs;
- Evaluate the potential noise and vibration impacts and effects;
- Specify mitigation measures to reduce, where necessary, the identified potential outward impacts relating to noise and vibration from the Project; and
- Describe the significance of the residual noise and vibration effects associated with the Project.

10.3.1 EPA Description of Effects

The significance of effects of the Proposed Development shall be described in accordance with the EPA guidance document '*Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)*', (EPA,2022). Details of the methodology for describing the significant of the effects are provided in Chapter 1 – Introduction.

The effects associated with the Project are described with respect to the EPA guidance in the relevant sections of this chapter.

10.3.2 Guidance Documents and Assessment Criteria

The following sections review best practice guidance that is commonly adopted in relation to developments such as the one under consideration here.

10.3.2.1 Decommissioning Phase

There is no construction phase associated with the Project; however, the development if permitted, would be decommissioned in 2035, thus criteria appropriate to the decommissioning phases of the existing wind farm and substation are provided here.

All above-ground turbine components will be removed in compliance with the above conditions and sent for recycling/reuse; however, their foundations will be left in situ.

It is proposed that the site roadways be left in situ, as appropriate, so as to facilitate on-going access to local landowners. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be covered over with local topsoil and left to reseed, however, that is not envisaged at this time. It is proposed to leave underground cables in place where they are below a level likely to be impacted by typical agricultural works.

10.3.2.1.1 *Decommissioning Phase – Noise*

No modifications are proposed to the existing windfarm and substation, as such there is no construction phase associated with the Project. This section refers to the potential noise impacts during the decommissioning phase of the Project.

There is no published statutory Irish guidance relating to the maximum permissible noise levels that may be generated during the decommissioning phase of a project. Local authorities normally control construction activities by imposing limits on the hours of works and may consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible decommissioning noise levels for a development of this scale may be found in the *British Standard 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of a NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of decommissioning noise. This then sets a threshold noise value that, if exceeded (decommissioning noise only) at the façade of residential, noise sensitive locations, indicates a potential significant noise impact is associated with the decommissioning activities.

Table 10-1 sets out the values which, when exceeded, potentially signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1.

Table 10-1 Example Threshold of Potential Significant Effect at Noise Sensitive Locations

Assessment category and threshold value period (T)	Threshold values, $L_{Aeq,T}$ dB		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00hrs)	65	70	75

Note A Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

For the appropriate period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5 dB. In this instance, with the rural nature of the site, properties near the development have daytime ambient noise levels that typically range from 40 to 50 dB $L_{Aeq,1hr}$. Therefore, as a precautionary approach, all properties will be afforded a Category A designation.

If the specific noise level due to decommissioning exceeds the appropriate category value (e.g. 65 dB $L_{Aeq,T}$ during daytime periods) then a significant effect is deemed to have occurred.

10.3.2.1.2 Additional Vehicular Activity on Public Roads - Noise

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that decommissioning traffic from the Project will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the Project. To assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 10-2, adapted from United Kingdom Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2 (UKHA 2020), offers guidance as to the likely impact in the short-term associated with any change in traffic noise level.

Table 10-2 Classification of magnitude of traffic noise changes in the short-term (Source DMRB, 2020)

Change in Sound Level (dB(A))	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
Less than 1 dB	Inaudible	No Change	Imperceptible
1.0 – 2.9	Barely Perceptible	Minor	Slight/Moderate
3.0 – 4.9	Perceptible	Moderate	Significant
≥5	Up to a doubling of loudness	Major	Very Significant

The guidance outlined in Table 10-2 will be used to assess the predicted increases in traffic levels on public roads associated with the decommissioning of the Project. Where an impact is identified due to the change in traffic noise level, reference will be made to the overall predicted noise level from decommissioning traffic in the context of the decommissioning noise criteria outlined in Section 10.3.2.1.1.

10.3.2.1.3 Decommissioning Phase - Vibration

The potential for vibration generation associated with decommissioning is much reduced compared to a typical construction phase; the following guidance is provided to set vibration criteria at sensitive locations.

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. With respect to the Proposed Development, the range of relevant criteria used for building protection is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- *BS 7385 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (1993); and*
- *BS 5228 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (2009+A1:2014).*

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above.

BS 5228-2 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage, these limits may be reduced by up to 50%. In addition, where continuous vibration is generated, the limits discussed above may need to be reduced by 50%.

The Transport Infrastructure Ireland (TII) *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes* (TII, 2014) also contains information on the permissible construction vibration levels during the construction phase as shown in Table 10-3.

Table 10-3 Allowable Transient Vibration at Properties

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

10.3.2.2 Operational Phase Noise

10.3.2.2.1 Wind Turbine Noise

Condition 19 of the grant of planning for the Ballywater Wind Farm (WCC Pl. Ref 2001/0458) set conditions relating to environmental noise from the operation of the wind farm which state:

> *Noise levels from the proposed development when measured at the nearest inhabited house shall not exceed 40dBA (15 minute Leq) at wind speed of 5m/s and 45dBA (15 minute Leq) at a wind speed in excess of 10m/s. Measurements shall be made in accordance with ISO Recommendations R1996/1 'Acoustics-Description and Measurement of Environmental Noise, Part 1: Basic qualities and procedures, In the event that the reviews show that any turbine may*

> ***have a detrimental impact, mitigating measures shall be proposed and submitted for agreement of the Planning Authority.***

Planning condition no. 3 of the existing planning permission (WCC Pl. Ref: 2001/0458) for Ballywater Wind Farm states

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"*

A planning compliance assessment was undertaken by Noise and Vibration Consultants Ltd in 2015, (included in Appendix 10-2) The report concluded that the Ballywater Wind Farm was operating in accordance with Condition 19. It is noted that if the Project is granted permission for continued operation, the wind farm would continue as currently operating and there would be no change expected to the existing noise environment.

Ballywater Wind Farm has been in operation for 19 years and was designed and constructed before latest guidance on wind farm noise assessment was published. The approach adopted for this assessment is to assess operational noise from the wind farm, in so far is practical, as if it were a new wind turbine development.

The noise assessment summarised in the following sections has been based on guidance in relation to acceptable levels of noise from wind farms as contained in the document " *Wind Energy Development Guidelines"* published by the Department of the Environment, Heritage and Local Government in 2006. These guidelines are in turn based on detailed recommendations set out in the Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication " *The Assessment and Rating of Noise from Wind Farms"* (1996). The ETSU document has been used to supplement the guidance contained within the " *Wind Energy Development Guidelines*" publication where necessary.

Wind Energy Development Guidelines

Section 5.6 of the *Wind Energy Development Guidelines* published by the Department of the Environment, Heritage and Local Government (2006) addresses noise and outlines the appropriate noise criteria in relation to wind farm developments.

The following extracts from this document are considered:

> *"An appropriate balance must be achieved between power generation and noise impact."*

While this comment is noted it is stated that the Guidelines give no specific advice in relation to what constitutes an '*appropriate balance*'. In the absence of this, guidance will be taken from alternative and appropriate publications.

Wind Energy Development Guidelines (2006) also state that:

> *"In the case of wind energy development, a noise sensitive location includes any occupied house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational importance. Noise limits should apply only to those areas frequently used for relaxation of activities for which a quiet environment is highly desirable. Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed."*

As shown the calculations presented in Section 10.4.2 of this chapter, the various requirements identified in the extract above have been incorporated in the assessment.

"In general, a lower fixed limit of 45 dB(A) or a maximum increase of 5 dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours."

This represents the commonly adopted daytime noise criterion curve in relation to wind farm developments. However, an important caveat should be noted as detailed in the following extract.

"However, in very quiet areas, the use of a margin of 5 dB(A) above background noise at nearby noise sensitive properties is not necessary to offer a reasonable degree of protection and may unduly restrict wind energy developments which should be recognised as having wider national and global benefits. Instead, in low noise environments where background noise is less than 30 dB(A), it is recommended that the daytime level of the $L_{A90,\,10min}$ of the wind energy development be limited to an absolute level within the range of 35 – 40 dB(A)."

In relation to night-time periods the following guidance is given:

"A fixed limit of 43 dB(A) will protect sleep inside properties during the night."

This limit is defined in terms of the $L_{A90,10min}$ parameter. This represents the commonly adopted night-time lower limit noise criterion curve in relation to wind farm developments.

In summary, the Wind Energy Development Guidelines outlines the following guidance to identify appropriate wind turbine noise criteria curves at noise sensitive locations:

- an appropriate absolute limit level for quiet daytime environments with background noise levels of less than 30 dB $L_{A90,10min}$;
- 45 dB $L_{A90,10min}$ for daytime environments with background noise levels of greater than 30 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise (whichever is higher), and;
- 43 dB $L_{A90,10min}$ for night-time periods.

While the caveat of an increase of 5dB(A) above background for night-time operation is not explicit within the current guidance, it is based on the methodology in ETSU and commonly applied in noise assessments prepared and is utilised in numerous examples of planning conditions issued by local authorities and An Bord Pleanála (ABP). Therefore, a night-time allowance for 5 dB(A) above background has been adopted for this assessment.

This set of criteria has been chosen as it is considered to be in line with the intent of the relevant Irish guidance. The proposed operational noise criteria curves for wind turbine noise at noise sensitive locations are presented in Section 10.4.2

The Assessment and Rating of Noise from Wind Farms – ETSU-R-97

As stated previously the core of the noise guidance contained within the Wind Energy Development Guidelines guidance document is based on the 1996 ETSU publication *The Assessment and Rating of Noise from Wind Farms (ETSU-R-97).*

ETSU-R-97 calls for the control of wind turbine noise by the application of noise limits at the nearest noise sensitive properties. ETSU-R-97 considers that absolute noise limits applied at all wind speeds are not suited to wind turbine developments and recommends that noise limits should be set relative to the existing background noise levels at noise sensitive locations. A critical aspect of the noise assessment of wind energy proposals relates to the identification of baseline noise levels through on-site noise surveys.

ETSU-R-97 states on page 58, "*absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area which contribute to the noise received at the properties in question*". Therefore, the noise contribution from all wind turbine developments in the area should be considered in the assessment. In this instance, the nearest operational, permitted or proposed wind turbines are at located at Gorey Business Park and Ballyduff at a distance of 14.1km and 19.9km respectively from the Proposed Development. Based on these distances, a cumulative wind turbine noise review is not required and is has therefore been scoped out of this assessment.

Institute of Acoustics Good Practice Guide

The guidance contained within the institute of Acoustics (IOA) document *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (2013) (IOA GPG) and Supplementary Guidance Notes are considered to represent best practice and have been adopted for this assessment. The IOA GPG states, that at a minimum continuous baseline noise monitoring should be carried out at the nearest noise sensitive locations for typically a two-week period and should capture a representative sample of wind speeds in the area (i.e. cut in speeds to wind speed of rated sound power of the proposed turbine). Background noise measurements (i.e. $L_{A90,10min}$) should be related to wind speed measurements that are collated at the site of the wind turbine development. Regression analysis is then conducted on the data sets to derive background noise levels at various wind speeds to establish the appropriate day and night-time noise criterion curves.

Noise emissions associated with the wind turbine presented in this Chapter have predicted in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation* (1996). This is a noise prediction standard that considers noise attenuation offered, amongst others, by distance, ground absorption, directivity and atmospheric absorption. Noise predictions and contours are typically prepared for various wind speeds and the predicted levels are compared against the relevant noise criterion curve to demonstrate compliance with the appropriate noise criteria.

Where noise predictions indicate that reductions in noise emissions are required in order to satisfy any adopted criteria, consideration can be given to detailed downwind analysis and operating turbines in low noise mode, which is typically offered by modern wind turbine units.

Reference has been made to the IOA GPG for guidance on the methodology for the background noise survey and operation impact assessment for wind turbine noise.

World Health Organisation (WHO) Noise Guidelines for the European Region

The World Health Organisation (WHO) *Environmental Noise Guidelines for the European Region* (2018) provide guidance on protecting human health from exposure to environmental noise. They set health-based recommendations based on average environmental noise exposure of several sources of environmental noise, including wind turbine noise. Recommendations are rated as either 'strong' or 'conditional'. A strong recommendation, "*can be adopted as policy in most situations*" whereas a conditional recommendation, "*requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply*".

The objective of the WHO Environmental Noise Guidelines for the European Region that was published in October 2018 is to provide recommendations for protecting human health from exposure to environmental noise from transportation, wind farm and leisure sources of noise. The guidelines present recommendations for each noise source type in terms of L_{den} and L_{night} levels above which there is potential for adverse health risks.

In relation to wind turbine noise, the WHO Guideline Development Group (GDG) state the following:

> *"For average noise exposure, the GDG **conditionally** recommends reducing noise levels produced by wind turbines below 45 dB L_{den}, as wind turbine noise above this level is associated with adverse health effects.*
>
> *No recommendation is made for average night noise exposure L_{night} of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.*
>
> *To reduce health effects, the GDG **conditionally** recommends that policymakers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of intervention over another."*

The quality of evidence used for the WHO research is stated as being 'Low', the recommendations are therefore conditional.

There is potential increased uncertainty due to the parameter used by the WHO for assessment of exposure (i.e. L_{den}), which it is acknowledged may be a poor characterisation of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes, as stated below.

> *"Even though correlations between noise indicators tend to be high (especially between LAeq-like indicators) and conversions between indicators do not normally influence the correlations between the noise indicator and a particular health effect, important assumptions remain when exposure to wind turbine noise in L_{den} is converted from original sound pressure level values. The conversion requires, as variable, the statistical distribution of annual wind speed at a particular height, which depends on the type of wind turbine and meteorological conditions at a particular geographical location. Such input variables may not be directly applicable for use in other sites. They are sometimes used without specific validation for a particular area, however, because of practical limitations or lack of data and resources. This can lead to increased uncertainty in the assessment of the relationship between wind turbine noise exposure and health outcomes. Based on all these factors, it may be concluded that the acoustical description of wind turbine noise by means of L_{den} or L_{night} may be a poor characterization of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes*
>
> *Further work is required to assess fully the benefits and harms of exposure to environmental noise from wind turbines and to clarify whether the potential benefits associated with reducing exposure to environmental noise for individuals living in the vicinity of wind turbines outweigh the impact on the development of renewable energy policies in the WHO European Region."*

Based upon the review set out above, it is concluded that the conditional WHO recommended average noise exposure level (i.e. 45 dB L_{den}) should not currently be applied as target noise criteria for an existing or proposed wind turbine development in Ireland.

Future Potential Guidance Change

The 2006 *Wind Energy Development Guidelines* were issued by the Minister pursuant to section 28 of the 2000 Act which, so far as relevant, provides: "*(1) The Minister may, at any time, issue guidelines to planning authorities regarding any of their functions under this Act and planning authorities shall have regard to those guidelines in the performance of their functions ... (2) Where applicable, the Board shall have regard to any guidelines issued to planning authorities under subsection (1) in the performance of its functions.*"

Section 143 of the 2000 Act provides that:

"(1) The Board shall, in performing its functions, have regard to – (a) the policies and objectives for the time being of the Government, a State authority, the Minister, planning authorities and any other body which is a public authority whose functions have, or may have, a bearing on the proper planning sustainable development of cities, towns or other areas, whether urban or rural."

The 2006 Guidelines are accordingly the guidelines that must be considered, and not any drafts. As per the High Court decision in Element Power Ireland Ltd v An Bord Pleanála (2017) nothing in the planning legislation, authorises the planning authorities to consider drafts, or the prospect of new or modified government or local authority policy or objectives. Without prejudice to that background, in December 2019, the *Draft Revised Wind Energy Development Guidelines December 2019* (DRWEDG19) were published for consultation and have yet to be finalised. It is important to note that as part of the public consultation several concerns in relation to the proposed approach have been expressed by various parties and it is the opinion of the authors of this assessment that the DRWEDG19 document does not outline a best practice approach in terms of the assessment of wind turbine noise. Specific concerns expressed by a cross-party group of interested professionals can be reviewed at:

https://www.ioa.org.uk/wind-energy-development-guidelines-wedg-consultation-irish-department-housing-planning-community-and

https://tneigroup-com.stackstaging.com/wp-content/uploads/2022/05/WEDG-consultation-joint-response-R0.pdf

The following statement is of note from the above submission:

"a number of acousticians working in the field have raised serious concerns over the significant amount of technical errors, ambiguities and inconsistencies in the content of the draft WEDG and these were highlighted during the consultation process by a group of acousticians"

Therefore, in line with best practice, which includes ESTU and IOA methodologies as described above the assessment presented in the EIAR is based on the current best practice guidance outlined in Section 5.6 of the Wind Energy Development Guidelines for Planning Authorities, 2006 (WEDG06).

The original ETSU-R-97 concepts, on which both the WEDG06 and DRWEDG19 are based, underwent a thorough standardisation and modernisation in 2013 with the Institute of Acoustics publication of the *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* including 6 Supplementary Guidance Notes, all of which bring together the combined experience of acoustic consultants in the UK and Ireland in the application of these methods. Numerous improvements in the accuracy and robustness are described, in particular the treatment of wind shear and the general adaptation to larger wind turbines. The assessment in the EIAR is therefore in full accordance with the latest best-practice methods.

In the event that updated Wind Energy Guidelines are published during the application process for the Proposed Development, it is anticipated that any relevant changes affecting the noise (if any) will be addressed through an appropriate planning condition, or where a supplementary assessment is necessary, through provision of additional information.

In the preparation of this EIAR Chapter, the EIAR for Carnsore Point Wind Farm was reviewed. It is noted that Wexford County Council (WCC), as a Statutory Consultee, required that the issues of tonality, Amplitude Modulation (AM) and Low Frequency Noise (LFN) be assessed and that the DRWEDG19 guidance be referenced, though limited to the consideration of Special Characteristics.

In respect of LFN, while the DRWEDG19 places a set limit on the noise levels at various 1/3 octave band frequencies based the guidance in the DEFRA NANR45[1] is quite clear that original DEFRA guidance does not intend that these criteria be simple pass/fail limits. From page 62 of the 2005 NANR45 document:

> *It is suggested that the proposed criterion be used not as a prescriptive indicator of nuisance, but rather in the sense of guidance to help determine whether a sound exists that might be expected to cause disturbance. Some degree of judgement by the EHO is both desirable and necessary in deciding whether to class the situation as a nuisance, and is likely to remain so. One of the main reasons is that, from the control cases, it is clear that problems do not necessarily arise when the criteria are exceeded. Indeed, we can conjecture that genuine LFN complaints occur only in a few such cases." (emphasis added)*

For the Project, mitigation measures in respect of LFN are proposed in Section 10.5.4.1.2.

10.3.2.2.2 Noise from Ballywater 110kV Substation

For the existing Ballywater 110kV Substation, it is proposed to set fixed noise limits and consideration has been given to the following best practice guidance:

EPA NG4

In order to establish whether the noise sensitive locations in the vicinity of the site would be considered 'low background noise' areas as defined in the Environmental Protection Agency (EPA) publication Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) guidance, the noise levels measured during the environmental noise survey need to satisfy the following criteria:

- Arithmetic Average of LA90 During Daytime Period ≤ 40 dB LA90, and;
- Arithmetic Average of LA90 During Evening Period ≤ 35 dB LA90, and;
- Arithmetic Average of LA90 During Night-time Period ≤ 30 dB LA90.

Table 10-4 outlines the noise emission limit criteria detailed in the NG4 document.

Table 10-4 NG4 Approach for Determining Appropriate Noise Criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00hrs)	Night Noise Criterion, dB $L_{Aeq,T}$ (23:00 to 07:00hrs)
Areas of Low Background Noise	45	40	35
All other Areas	55	50	45

Based on a review of the measured noise from the background noise survey (Section 10.4.1), the noise sensitive locations in the vicinity of the site are defined as areas of low background noise as per the NG4 guidance. As the existing substation operates on a 24-hour basis, the potential impact during night-time periods governs this assessment. A night time criterion of 35 dB $L_{Aeq,T}$ is considered appropriate for the operation of the substation. The design must ensure that the noise emissions do not contain audible tones or impulsive characteristics at the nearest noise sensitive locations.

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[1] *Moorhouse, Waddington and Adams, (2011), Proposed criteria for the assessment of low frequency noise disturbance, DEFRA Contract no. NANR45 revision 1 December 2011 and Moorhouse, A., Waddington D. and Adams, M., Procedure for the assessment of low frequency noise complaints, February 2005, Contract no NANR45 to the UK Department for Environment, Food and Rural Affairs (DEFRA)*

A night-time criterion of 35 dB $L_{Aeq,T}$ is considered a low level of noise. However, it is important to consider the likelihood of adverse noise impacts when assessing noise from fixed plant. The NG4 guidance refers to the assessment method prescribed in BS 4142:2014: *Methods for rating and assessing industrial and commercial sound* that can be used to assess the likelihood of complaints from specific plant noise sources.

Other Guidance – BS 4142

BS 4142:2014: *Methods for rating and assessing industrial and commercial sound* is the industry standard method for analysing fixed plant sound emissions to residential receptors. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For a BS 4142 assessment it is necessary to compare the measured external background sound level (i.e. the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T}$) of the various plant items, when operational. Where sound emissions are found to be tonal, impulsive, intermittent or to have other sound characteristics that are readily distinctive against the residual acoustic environment, BS 4142 recommends that penalties be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal sound characteristics outlined in BS 4142 recommends the application of a 2 dB penalty for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible. In relation to intermittency, BS 4142 recommends that If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied. The following definitions as discussed in BS 4142 as summarised below:

"*ambient sound level, $L_{Aeq,T}$*	*equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at any given time, usually from many sources near and far, at the assessment location over a given time interval, T.*
residual sound level, $L_{Aeq,T}$	*equivalent continuous A-weighted sound pressure level of the residual sound (i.e. ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound) at the assessment location over a given time interval, T.*
specific sound level, $L_{Aeq,T}$	*equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.*
Rating level, $L_{Ar,T}$	*specific sound level plus any adjustment for the characteristic features of the sound.*
background sound level, $L_{A90,T}$	*A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.*"

To establish an initial estimate of impact, BS 4142 states the following:

"*Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:*

a. *Typically, the greater this difference, the greater the magnitude of the impact.*

b. *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*

c. *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*

d. *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

Note Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

BS4142 contains the following pertinent factor that must be considered with respect to the context of the sound, which is relevant to this assessment as the background noise levels are typically low at NSL's during periods of low wind speeds:

> *"The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*
>
> *Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

In light of the above guidance from EPA's NG4 and BS4142, is it considered that the proposed absolute criterion of 35 dB $L_{Aeq,T}$ at the noise sensitive location for noise from the substation is robust to prevent adverse impacts at NSL's.

10.3.2.2.3 Noise from Underground Grid Connection

It is not considered that any significant operational noise or vibration effects are likely in relation to the grid connection infrastructure. The 110kV electrical cabling will not generate any noise during the operational phase. Therefore, an assessment of noise and vibration from the continued operation of the grid connection has been scoped out of this assessment.

10.3.3 Special Characteristics of Turbine Noise

10.3.3.1 Infrasound/Low Frequency Noise

Low Frequency Noise is noise that is dominated by frequency components less than approximately 200Hz whereas Infrasound is typically described as sound at frequencies below 20Hz. In relation to Infrasound, the following extract from the EPA document *Guidance Note for Noise Assessment of Wind Turbine Operations at EPA Licensed Sites* (NG3) (EPA, 2011) is noted here:

> *"There is similarly no significant infrasound from wind turbines. Infrasound is high level sound at frequencies below 20 Hz. This was a prominent feature of passive yaw "downwind" turbines where the blades were positioned downwind of the tower which resulted in a characteristic "thump" as each blade passed through the wake caused by the turbine tower. With modern active yaw turbines (i.e. the blades are upwind of the tower and the turbine is turned to face*

> *into the wind by a wind direction sensor on the nacelle activating a yaw motor) this is no longer a significant feature."*

With respect to infrasonic noise levels below the hearing threshold, the World Health Organisation (WHO) document Community Noise (WHO, 1995) has stated that:

> *"There is no reliable evidence that infrasounds below the hearing threshold produce physiological or psychological effects."*

In 2010, the UK Health Protection Agency published a report entitled *Health Effects of Exposure to Ultrasound and Infrasound*, Report of the independent Advisory Group on Non-ionising Radiation. The exposures considered in the report related to medical applications and general environmental exposure. The report notes:

> *"Infrasound is widespread in modern society, being generated by cars, trains and aircraft, and by industrial machinery, pumps, compressors and low speed fans. Under these circumstances, infrasound is usually accompanied by the generation of audible, low frequency noise. Natural sources of infrasound include thunderstorms and fluctuations in atmospheric pressure, wind and waves, and volcanoes; running and swimming also generate changes in air pressure at infrasonic frequencies.*
>
> *For infrasound, aural pain and damage can occur at exposures above about 140 dB, the threshold depending on the frequency. The best-established responses occur following acute exposures at intensities great enough to be heard and may possibly lead to a decrease in wakefulness. The available evidence is inadequate to draw firm conclusions about potential health effects associated with exposure at the levels normally experienced in the environment, especially the effects of long-term exposures. The available data do not suggest that exposure to infrasound below the hearing threshold levels is capable of causing adverse effects."*

The UK Institute of Acoustics Bulletin in March 2009 included a statement of agreement between acoustic consultants regularly employed on behalf of wind farm developers, and conversely acoustic consultants regularly employed on behalf of community groups campaigning against wind farm developments (IAO JS2009). The intent of the article was to promote consistent assessment practices, and to assist in restricting wind farm noise disputes to legitimate matters of concern. The article notes the following with respect to infrasound:

> *"Infrasound is the term generally used to describe sound at frequencies below 20 Hz. At separation distances from wind turbines which are typical of residential locations the levels of infrasound from wind turbines are well below the human perception level. Infrasound from wind turbines is often at levels below that of the noise generated by wind around buildings and other obstacles.*
>
> *Sounds at frequencies from about 20 Hz to 200 Hz are conventionally referred to as low-frequency sounds. A report for the DTI in 2006 by Hayes McKenzie concluded that neither infrasound nor low frequency noise was a significant factor at the separation distances at which people lived. This was confirmed by a peer review by a number of consultants working in this field. We concur with this view."*

The article concludes that:

> *"from examination of reports of the studies referred to above, and other reports widely available on internet sites, we conclude that there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, generally has adverse effects on wind farm neighbours".*

A report released in January 2013 by the South Australian Environment Protection Authority namely, *Infrasound levels near windfarms and in other environments* (EPA, 2013)[2] found that the level of infrasound from wind turbines is insignificant and no different to any other source of noise, and that the worst contributors to household infrasound are air-conditioners, traffic and noise generated by people.

The study included several houses in rural and urban areas, both adjacent to and away from a wind farm, and measured the levels of infrasound with the wind farms operating and switched off.

There were no noticeable differences in the levels of infrasound under all these different conditions. In fact, the lowest levels of infrasound were recorded at one of the houses closest to a wind farm, whereas the highest levels were found in an urban office building.

The EPA's study concluded that the level of infrasound at houses near wind turbines was no greater than in other urban and rural environments, and stated that:

> *"The contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment."*

A German report[3], titled "*Low Frequency Noise incl. Infrasound from Wind Turbines and Other Sources*" presents the details of a measurement project which ran from 2013. The report was published by the State Office for the Environment, Measurement and Nature Conservation of the Federal State of Baden-Württemberg in 2016 and concluded the following in relation to infrasound from wind turbines:

> *"The measured infrasound levels (G levels) at a distance of approx. 150 m from the turbine were between 55 and 80 dB(G) with the turbine running. With the turbine switched off, they were between 50 and 75 dB(G). At distances of 650 to 700 m, the G levels were between 55 and 75 dB(G) with the turbine switched on as well as off."*

> *"For the measurements carried out even at close range, the infrasound levels in the vicinity of wind turbines – at distances between 150 and 300 m – were well below the threshold of what humans can perceive in accordance with DIN 45680 (2013 Draft) [4]"*

> *"The results of this measurement project comply with the results of similar investigations on a national and international level."*

There is a significant body of evidence to show that the infrasound associated with wind turbines will be below perceptibility thresholds and typically in line with existing baseline levels of infrasound within the environment. In conclusion, there are no impacts expected from infrasound from the operation of the Project.

10.3.3.2 Amplitude Modulation

In the context of this assessment, amplitude modulation (AM) is defined in the IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group (AMWG) document A Method for Rating Amplitude Modulation in Wind Turbine Noise (IOA, 2016) as:

> *"Periodic fluctuations in the level of audible noise from a wind turbine (or wind turbines), the frequency of the fluctuations being related to the blade passing frequency (BPF) of the turbine rotor(s)."*

It is now generally accepted that there are two mechanisms which can cause amplitude modulation:

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[2] *EPA South Australia, 2013, Wind farms https://www.epa.sa.gov.au/files/477912_infrasound.pdf*

[3] *Report available at https://www4.lubw.baden-wuerttemberg.de/servlet/is/262445/low-frequency_noise_incl_infrasound.pdf?command=downloadContent&filename=low-frequency_noise_incl_infrasound.pdf*

[4] *DIN 45680:2013-09 – Draft "Measurement and Assessment of Low-frequency Noise Emissions" November 2013*

- 'Normal' AM, and;
- 'Other' AM (sometimes referred to 'Excessive' AM).

In both cases, the result is a regular fluctuation in amplitude at the Blade Passing Frequency (BPF) of the wind turbine blades (the rate at which the blades of the turbine pass a fixed point). For a three-bladed turbine rotating at 20 rpm, this equates to a modulation frequency of 1 Hz.

'Normal' AM	An observer at ground level close to a wind turbine will experience 'blade swish' because of the directional characteristics of the noise radiated from the trailing edge of the blades as it rotates towards and then away from the observer. This effect is reduced for an observer on or close to the turbine axis, and therefore would not generally be expected to be significant at typical separation distances, at least on relatively level sites. The RenewableUK AM project (RenewableUK, 2013) has coined the term 'normal' AM (NAM) for this inherent characteristic of wind turbine noise, which has long been recognised and was discussed in ETSU-R-97 in 1996.
'Other' AM	In some cases AM is observed at large distances from a wind turbine (or turbines). The sound is generally heard as a periodic 'thumping' or 'whoomphing' at relatively low frequencies. On sites where it has been reported, occurrences appear to be occasional, although they can persist for several hours under some conditions, dependent on atmospheric factors, including wind speed and direction. It was proposed in the RenewableUK 2013 study that the fundamental cause of this type of AM is transient stall conditions occurring as the blades rotate, giving rise to the periodic thumping at the blade passing frequency. Transient stall represents a fundamentally different mechanism from blade swish and can be heard at relatively large distances, primarily downwind of the rotor blade. The RenewableUK AM project report adopted the term 'Other AM' (OAM) for this characteristic. The terms 'enhanced' or 'excess' AM (EAM) have been used by others, although such definitions do not distinguish between the source mechanisms and presuppose a 'normal' level of AM, presumably relating back to blade swish as described in ETSU-R-97.

10.3.3.2.1 Frequency of Occurrence of AM

Research by Salford University commissioned by the Department of Environment Food and Rural Affairs (DEFRA), the Department of Business, Enterprise and Regulatory Reform (BERR) and the Department of Communities and Local Government (CLG) investigated the issue of AM associated with wind turbine noise. The results were reviewed and published in the report 'Research into Aerodynamic Modulation of Wind Turbine Noise' (2007). The conclusions of this report were that aerodynamic modulation was only considered to be an issue at four, and a possible issue at a further eight, of 133 sites in the UK that were operational at the time of the study and considered within the review. At the four sites where AM was confirmed as an issue, it was considered that conditions associated with AM might occur between about 7 and 15% of the time. It also emerged that for three out of the four sites the complaints have subsided, in one case due to the introduction of a turbine control system.

It is not possible to predict an occurrence of AM at the planning stage. While OAM can occur it is noted that the research has shown that it is a rare event associated with a limited number of wind farms.

RenewableUK Research Document states the following in relation to matter:

Page 68 Module F	*"even on those limited sites where it has been reported, its frequency of occurrence appears to be at best infrequent and intermittent."*
Page 6 Module F	*"It has also been the experience of the project team that, even at those wind farm sites where AM has been reported or identified to be an issue, its occurrence may be relatively infrequent. Thus, the capture of time periods when subjectively significant AM occurs may involve elapsed periods of several weeks or even months."*
Page 61 Module F	*"There is nothing at the planning stage that can presently be used to indicate a positive likelihood of OAM occurring at any given proposed wind farm site, based either on the site's general characteristics or on the known characteristics of the wind turbines to be installed."*

10.3.3.2.2 Concluding Comments on AM

Research and Guidance in the field of wind turbine noise AM is ongoing with recent publications being issued by the Institute of Acoustics (IOA) Noise working Group (Wind Turbine Noise) Amplitude Modulation Working Group (AMWG) namely, *A Method for Rating Amplitude Modulation in Wind Turbine Noise* (August 2016) (The Reference Method). The document proposes an objective method for measuring and rating AM. The AMWG does not propose what level of AM is likely to result in adverse community response or propose any limits for AM. The purpose of the group is simply to use existing research to develop a Reference Methodology for the measurement and rating of amplitude modulation.

A 2016 report commissioned by the UK government *Wind turbine AM review: Phase 2 report. 3514482A Issue 3. Department for Business, Energy & Industrial Strategy* completed by WSP Parsons Brinckerhoff recommended the use of a penalty.

In the context of a site seeking permission to continue operation, reference is made to the mitigation measures in respect of AM described in section 10.5.4.1.1.

10.3.4 Comment on Potential Human Health Impacts from Wind Turbine Noise

The peer-reviewed research outlined in the subsequent sections supports that there are no direct negative health effects on people with long term exposure to wind turbine noise in the environment. For further details of potential health impacts associated with the Project refer to Chapter 5: Population and Human Health of this EIAR.

10.3.4.1 The National Health & Medical Research Council

The relevant Australian authority on health issues, the National Health and Medical Research Council (NHMRC), conducted a comprehensive independent assessment of the scientific evidence on wind farms and human health. The findings are contained in the NHMRC Information Paper: Evidence on Wind Farms and Human Health 2015, which concluded:

> *"After careful consideration and deliberation, NHMRC concluded that there is no consistent evidence that wind farms cause adverse health effects in humans. This finding reflects the results and limitations of the direct evidence and also takes into account the relevant available*

parallel evidence on whether or not similar noise exposure from sources other than wind farms causes health "effects".

10.3.4.2 Health Canada

Health Canada, Canada's national health organisation, released preliminary results of a study into the effect of wind farms on human health in 2014[5]. The study was initiated in 2012 specifically to gather new data on wind farms and health. The study considered physical health measures that assessed stress levels using hair cortisol, blood pressure and resting heart rate, as well as measures of sleep quality. More than 4,000 hours of wind turbine noise measurements were collected and a total of 1,238 households participated.

No evidence was found to support a link between exposure to wind turbine noise and any of the self-reported illnesses. Additionally, the study's results did not support a link between wind turbine noise and stress, or sleep quality (self-reported or measured). However, an association was found between increased levels of wind turbine noise and individuals reporting of being annoyed.

10.3.4.3 New South Wales Health Department

In 2012, the New South Wales (NSW) Health Department provided written advice to the NSW Government that stated existing studies on wind farms and health issues had been examined and no known causal link could be established.

NSW Health officials stated that fears that wind turbines make people sick are 'not scientifically valid'. The officials wrote that there was no evidence for 'wind turbine syndrome', a collection of ailments including sleeplessness, headaches and high blood pressure that some people believe are caused by the noise of spinning blades.

10.3.4.4 The Australian Medical Association

The Australian Medical Association put out a position statement, *Wind Farms and Health* 2014[6]. The statement said:

> *"The available Australian and international evidence does not support the view that the infrasound or low frequency sound generated by wind farms, as they are currently regulated in Australia, causes adverse health effects on populations residing in their vicinity. The infrasound and low frequency sound generated by modern wind farms in Australia is well below the level where known health effects occur, and there is no accepted physiological mechanism where sub-audible infrasound could cause health effects."*

10.3.4.5 Journal of Occupational and Environmental Medicine

The review titled, Wind Turbines and Health: A Critical Review of the Scientific Literature was published in the Journal of Occupational and Environmental Medicine, 2014. An independent review of the literature was undertaken by the Department of Biological Engineering of the Massachusetts Institute of Technology (MIT). The review took into consideration health effects such as stress,

[5] *Health Canada 2014, Wind Turbine Noise and Health Study: Summary of Results. Available at:* https://www.canada.ca/en/health-canada/services/environmental-workplace-health/noise/wind-turbine-noise/wind-turbine-noise-health-study-summary-results.html

[6] *Australian Medical Association, 2014, Wind farms and health. Available at:* https://ama.com.au/position-statement/wind-farms-and-health-2014

annoyance and sleep disturbance, as well as other effects that have been raised in association with living close to wind turbines. The study found that:

> *"No clear or consistent association is seen between noise from wind turbines and any reported disease or other indicator of harm to human health."*

The report concluded that living near wind farms does not result in the worsening of the quality of life in that particular region.

10.3.4.6 Summary

The peer reviewed research outlined in the preceding sections supports that there are no negative health effects on people with long term exposure to wind turbine noise. Please refer to Chapter 5 of this EIAR for further details of potential health impacts associated with the Project.

10.3.5 Operational Phase Vibration

Vibration generated from the operation of a wind turbine unit will decrease rapidly with distance. Typically, at 100 m from a 1 MW turbine unit the level of vibration associated with a turbine is the order of 10^{-5} mm/s.

A recent report from Germany published by the State Office for the Environment, Measurement and Nature Conservation of the Federal State of Baden-Württemberg in 2016, "low frequency noise incl. infrasound from wind turbines and other sources" conducted vibration measurements study for an operational Nordex N117 – 2.4 MW wind turbine. The report concluded that at distances of less than 300 m from the turbine vibration levels had dropped so far that they could no longer be differentiated from the background vibration levels. The shortest distance from any turbine to a wind turbine is 324 m.

There are no reported cases of perceptible vibration from the operation of the Project at any NSL. Therefore, vibration criteria are not specified for the operational phase of the project.

10.3.6 Background Noise Assessment

As Ballywater Wind Farm is operational, it was necessary to adapt the background noise survey methodology, within the framework and principes of the IOA GPG.

As mentioned in section 2.2.2 of the GPG: "*Any contribution to background noise levels of noise from an existing wind farm must be excluded when assigning background noise and setting noise limits for a new development.*" There are a number of ways of achieving this, as described in section 5.2 of GPG:

> *5.2.2 Where a new wind farm is proposed and a receptor is also within the area acoustically affected by an already operational wind farm, then noise from the existing wind farm must not be allowed to influence the background noise measurements for the proposed development.*
>
> *5.2.3 In the presence of an existing wind farm, suitable background noise levels can be derived by one of the following methods:*
>
> - *switching off the existing wind farm during the background noise level survey (with associated significant cost implications);*
> - *accounting for the contribution of the existing wind farm in the measurement data e.g. directional filtering (only including background data when it is not influenced by the existing turbines e.g. upwind of the receptor, but mindful of other extraneous*

noise sources e.g. motorways) or subtracting a prediction of noise from the existing wind farm from the measured noise levels;

- *utilising an agreed proxy location removed from the area acoustically affected by the existing wind farm/s; or*
- *utilising background noise level data as presented within the Environmental Statement/s for the original wind farm/s (the suitability of the background noise level data should be established).*

In this instance, it is third option is applied, "*utilising an agreed proxy locations*". Further details are presented in the following sections and in Appendix 10-3.

All measurement data collected during the background noise surveys has been carried out in accordance with the IOA GPG and accompanying *Supplementary Guidance Note 1: Data Collection* (2014) discussed in the following Section.

It is important to note that background noise levels are derived without any contribution from the existing wind turbines. In contrast, baseline noise or the existing noise environment, incorporating any contribution from the operation of the existing turbines.

10.3.6.1 Choice of Measurement Locations

A computer-based 3D model of the wind farm was prepared using the coordinates of the operational turbines' coordinates using the selected software DGMR iNoise (See Appendix 10-4 for more detail on wind turbine noise calculations). The model was used to prepare a set of noise contours based on the sound power levels of the operational turbines, at rated power wind speed, i.e. the wind speed at which the turbines reach their rated power and the highest sound power levels.

In the first instance, an environmental model was used to prepare a set of noise contours based on the sound power levels of the operational turbines, at rated power wind speed, i.e. the wind speed at which the turbines reach their rated power and the highest sound power levels.

Based on the 35 dB L_{A90} noise contour, ten candidate proxy locations outside this contour were selected in a desktop exercise, using typical criteria for selecting background noise survey measurement locations; this refers to selecting locations not close to existing forestry or major roads. The principles for the selection are that noise environment must be typical of the noise environment at other nearby locations.

Following a site visit to these locations, three were selected (NML1, NML2 and NML3) on the basis that the turbines were not audible. A fourth location, NML4, was selected closer to the Ballywater Wind Farm. Coordinates for the noise monitoring locations are detailed in Table 10-5 and Figure 10-2 .

Table 10-5 Noise Measurement Location Coordinates

Location	Coordinates – Irish Transverse Mercator (ITM)	
	Easting	**Northing**
NML 1	717,809	645,103
NML 2	719,760	646,911
NML 3	722,100	646,810
NML 4	720,342	645,472

Figure 10-2 I Location of NMLs

Significant noise sources in this area were noted to be distant traffic movements, intermittent local traffic movements, activity in and around the residences and wind generated noise from local foliage and other typical anthropogenic sources typically found in such rural settings. At locations near the shore, surf noise was a contributing noise source to varying degrees, which was dependant on weather conditions.

There were no perceptible sources of vibration noted at any of the survey locations.

Appendix 10-3 presents full details of the background noise survey and results, including the location-specific filtering applied at each location in order to derive the background noise levels.

Section 10.4.1 of this chapter presents the results of the background noise survey and Section 10.4.2 presents the derived noise criteria for the operational wind farm.

10.3.6.2 Analysis of Background Noise Data

As well as the location-specific filtering, the data sets have been filtered to remove issues such as the dawn chorus and the influence of other atypical noise sources. An example of atypical sources would be short, isolated periods of raised noise levels attributable to local sources, agricultural activity, boiler flues, operation of gardening equipment etc. In addition, sample periods affected by rainfall or when rainfall resulted in prolonged periods of atypical noise levels have also been screened from the data sets. The assessment methods outlined above are in line with the guidance contained in the IOA GPG.

The results presented Appendix 10-3 and summarised in the following sections refer to the noise data collated during 'quiet periods' of the day and night as defined in the IOA GPG. These periods are defined as follows:

- Daytime Amenity hours are:
  - all evenings from 18:00 to 23:00hrs;
  - Saturday afternoons from 13:00 to 18:00hrs, and;

- all day Sunday from 07:00 to 18:00hrs.

- Night-time hours are 23:00 to 07:00hrs.

10.3.6.2.1 *Consideration of Wind Shear*

Wind shear is defined as the change of wind speed with height above ground, as discussed in detail in Section 3.2 of Appendix 10-3. Any reference to wind speed in this chapter should be understood to be at standardised 10 m height for a hub height of 64 m.

10.3.7 Turbine Noise Calculations

A series of computer-based prediction models have been prepared to quantify the noise level associated with the operation of the Project. This section discusses the methodology for the noise modelling process.

10.3.7.1 Noise Modelling Software

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, DGMR iNoise Enterprise, calculates noise levels in accordance with ISO 9613: *Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation*, (ISO, 1996).

iNoise is a proprietary noise calculation package for computing noise levels and propagation of noise sources. iNoise calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated considering a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400 m).

10.3.7.2 Input Data and Assumptions

The calculation settings, input data and any assumptions made in the assessment are described in the following sections. Additional information relating to the noise model inputs and calculation settings is provided in Appendix 10-4.

10.3.7.2.1 Turbine Details

Table 10-6 details the co-ordinates of the 21 No. existing turbines that are being considered in this assessment.

Table 10-6 Ballywater Turbine Co-ordinates

Turbine	ITM X	ITM Y	Turbine	ITM X	ITM Y
T03	718,917	644,405	T15	719,932	644,541
T05	719,118	644,521	T16	720,073	644,322
T06	719,191	644,301	T17	719,805	644,204
T07	719,316	644,749	T18	719,748	643,758
T08	719,389	644,528	T19	720,019	643,764
T09	719,332	644,081	T20	719,547	643,641
T10	719,587	644,755	T21	720,648	645,783
T11	719,856	644,873	T22	720,922	645,679
T12	719,661	644,535	T23	720,789	645,564
T13	719,530	644,309	T24	720,727	645,340
T14	719,606	643,977	-	-	-

The Ballywater wind turbines are Enercon E70-E4 models with a hub height of 64 m and a rotor diameter of 70 m.

As this turbine is no longer in production, the assessment is based on information contained in an Enercon document for the Ballywater Wind Farm. The manufacturer indicates a maximum noise emission level of 102 dB(A) with a stated uncertainty of 1 dB (see Appendix 10-5). Additionally, official measured values for the E70-E4 have been confirmed by Enercon from three separate test reports, showing a measured sound power level of ≥ 102 dB L_{WA}.

The IOA GPG states that in noise propagation calculations an allowance for uncertainty of the noise emissions must be taken into account. In accordance with the manufacturer's documentation, an allowance for uncertainty of 1 dB has been included. The sound power levels for the E70-E4 turbines that have been used in this assessment are presented in Table 12-8 below.

Table 10-7 Sound Power Level Spectra for Enercon E70-E4 with a hub height of 64.0 m

Wind Speed (m/s)	Octave Band Centre Frequency (Hz)								dB L_{WA}
	63	125	250	500	1000	2000	4000	8000	
5	73.3	80.5	83.8	87.3	87.5	84.4	77.8	66.3	92.6
6	78.5	85.7	89.0	92.5	92.7	89.6	83.0	71.5	97.8
7	80.6	87.8	91.1	94.6	94.8	91.7	85.1	73.6	99.9

Wind Speed (m/s)	Octave Band Centre Frequency (Hz)								dB L_{WA}
	63	125	250	500	1000	2000	4000	8000	
8	81.8	89.0	92.3	95.8	96.0	92.9	86.3	74.8	101.1
9	82.7	89.9	93.2	96.7	96.9	93.8	87.2	75.7	102.0
10	82.7	89.9	93.2	96.7	96.9	93.8	87.2	75.7	102.0

The turbine sound power levels outlined in Table 10-8 are presented in terms of the L_{Aeq} parameter. As explained further in Section 10.4.2, the wind turbine noise criteria are expressed in terms of an L_{A90} criterion. Best practice guidance in the IOA GPG states that "*L_{A90} levels should be determined from calculated L_{Aeq} levels by subtraction of 2 dB*". A 2 dB reduction has therefore been applied in the noise model calculation. All predicted noise levels in this chapter are presented in terms of L_{A90} parameter, i.e., this reduction of 2 dB is applied in the noise prediction calculations.

Finally, best practice specifies that should any tonal component be present, a penalty shall be added to the predicted noise levels. The level of this penalty is described in ETSU-R-97 and is related to the level by which any tonal components exceed audibility. For the purposes of this assessment a tonal penalty has not been included in the predicted turbine noise levels. In relation to tonal noise from the operation of the wind turbines, refer to mitigation measures in Section 10.5.4.1.3.

10.3.7.3 Consideration of Wind Direction and Noise Propagation

When considering noise impacts of wind turbines, the effects of propagation in different wind directions should be considered. The day-to-day operations of the optimised development will not result in a worst-case condition of all noise locations being downwind of all turbines at the same time i.e. omni-directional predictions. Therefore, to address this issue, a review of expected noise levels downwind of the turbines has been prepared for various wind directions in accordance with the IOA GPG Guidance.

For any given wind direction, a property can be assigned one of the following classifications in relation to turbine noise propagation:

- Downwind (i.e. 0° ±80°);
- Crosswind (i.e. 90° ±10° and 270° ±10°), and;
- Upwind (i.e. 180° ±80°).

Figure 10.3 illustrates the directivity attenuation factor that has been applied to turbines when considering noise propagation in downwind conditions (downwind is represented by 0° with upwind being 180°).

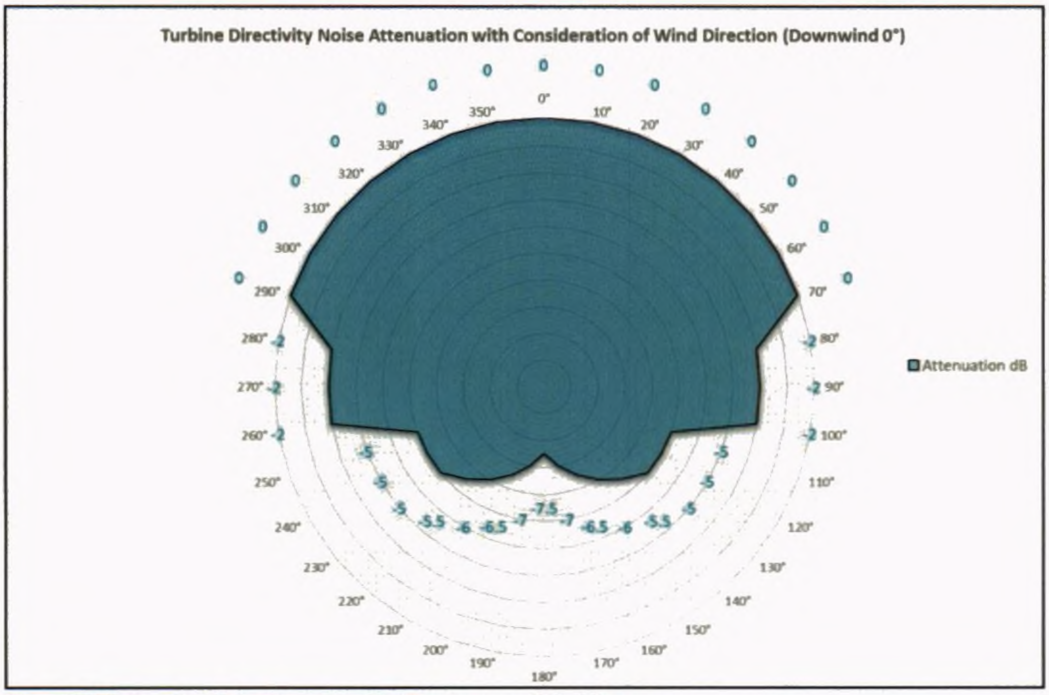

Figure 10.3 Turbine Directivity Attenuation with Consideration of Wind Direction

10.3.7.4 Assessment of Turbine Noise Levels

The predicted turbine noise level from the Project will be compared against the derived turbine noise limits and any exceedances of the limits will be identified and assessed. Where necessary, appropriate mitigation measures will be detailed.

10.4 Receiving Environment

This stage of the assessment was to determine typical background noise levels at representative NSLs surrounding the development site. The background noise survey was conducted through installing unattended sound level meters at four locations in the surrounding area.

10.4.1 Background Noise Levels

Appendix 10.3 presents the results of the background noise surveys as analysed in accordance with the methodology discussed above.

Table 10-8 presents the various derived $L_{A90,10min}$ noise levels for each of the monitoring locations for daytime quiet periods and night-time periods. These levels have been derived using analysis carried out on the data sets in line with guidance contained the IOA *GPG* and its SGN No. 2 *Data Collection.*

Values in parenthesis are used where, for higher wind speeds during night-time periods, the measurement obtained during the survey did not have sufficient data points at these wind speeds. In accordance with IOA GPG Supplementary Guidance Note 2: *Data Processing & Derivation Of Etsu-R-97 Background Curves,* paragraph 2.9.1: "*Where background noise data has not been collected for higher wind speeds it may be appropriate to cap the background noise curve (and therefore the associated noise limit)*".

Table 10-8 Derived Background Noise Levels of $L_{A90,10min}$ for Various Wind Speeds

Location	Period	Derived $L_{A90,10min}$ Levels (dB) at various Standardised 10m Height Wind Speed (m/s)						
		4	5	6	7	8	9	10
NML 1	Day	26.7	28.8	31.9	35.7	39.7	43.4	46.5
	Night	22.6	25.3	29.8	35.5	41.4	(41.4)	(41.4)
NML 2	Day	30.3	31.6	33.8	36.4	39.2	42.0	44.5
	Night	25.1	28.8	30.8	34.0	37.3	40.8	(40.8)
NML 3	Day	29.8	31.7	34.4	37.4	40.3	42.5	43.7
	Night	25.9	28.5	31.8	35.3	38.8	41.9	44.3
Envelope	Day	26.7	28.8	31.9	35.7	39.2	42.0	43.7
	Night	22.6	25.3	29.8	34.0	37.3	40.8	40.8

The background noise data is used to derive appropriate noise limits for each of the NSLs where measurements took place.

At NML4, as this location was significantly closer to the Ballywater wind turbines than any other location, it is not considered that the measured noise levels are representative of background noise in the absence of the wind turbines.

A background noise envelope based on the lowest background noise levels measured across NML1, NML2, and NML3 has been derived for daytime and night-time separately and used to derive assessment criteria at all remaining other non-surveyed NSLs as a conservative approach to the assessment.

10.4.2 Wind Turbine Noise Criteria

With respect to the relevant guidance documents outlined in Section 10.3.2.2 the following noise criteria curves have been identified for the Project. The criteria curves have been derived following a detailed review of the background noise data conducted at the nearest noise sensitive locations.

It is proposed to adopt a lower daytime threshold of 40 dB $L_{A90,10\text{-}min}$ for low noise environments where the background noise is less than 30 dB(A). This follows a review of the prevailing background noise levels and is considered appropriate in light of the following:

- The EPA document '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*' proposes a daytime noise criterion of 45 dB(A) in 'areas of low background noise'. The proposed lower threshold here is 5 dB more stringent than this level.
- It is reiterated that the 2006 *Wind Energy Development Guidelines* states that "*An appropriate balance must be achieved between power generation and noise impact.*" Based on a review of other national guidance in relation to acceptable noise levels in areas of low background noise it is considered that the criteria adopted as part of this assessment are robust.

Based on the guidance listed above, the proposed operational limits in $L_{A90,10min}$ for the Project are:

- 40 dB $L_{A90,10min}$ for quiet daytime environments of less than 30 dB $L_{A90,10min}$;
- 45 dB $L_{A90,10min}$ for daytime environments greater than 30 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise (whichever is higher), and;
- 43 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise (whichever is higher) for night-time periods.

Worst-case envelopes, based on the lowest average levels at the various wind speeds for both day and night-time, is presented in Table 10-8. Therefore, the noise criteria curves for this assessment will be based on this baseline noise level envelope for all NSLs where background noise measurement was not undertaken.

Table 10-9 outlines the derived noise criteria curves based on the information contained within Table 10-8. Note that results in the wind speeds 4 to 9 m/s are presented. With reference to Table 12-10, the sound power level of the turbine reaches its maximum at 9 m/s, beyond which the rotational speed is controlled and the wind turbine noise levels to not increase. It is sufficient therefore to consider the range 4 to 9 m/s for this assessment, in line with the guidance.

Table 10-9 Noise Criteria Curves

Location	Period	Turbine Noise Limits (dB, $L_{A90,10min}$) at Various Standardised 10 m Height Wind Speed (m/s)					
		4	5	6	7	8	9
NML 1	Day	40.0	40.0	45.0	45.0	45.0	48.4
	Night	43.0	43.0	43.0	43.0	46.4	(46.4)
NML 2	Day	45.0	45.0	45.0	45.0	45.0	47.0
	Night	43.0	43.0	43.0	43.0	43.0	45.8
NML 3	Day	40.0	40.0	45.0	45.0	45.3	47.5
	Night	43.0	43.0	43.0	43.0	43.0	46.9
Envelope	Day	40.0	40.0	45.0	45.0	45.0	47.0
	Night	43.0	43.0	43.0	43.0	43.0	45.8

10.5 Likely Significant Effects and Associated Mitigation Measures

10.5.1 Do-Nothing Scenario

If the Proposed Development were not to proceed, the existing wind farm and substation will be decommissioned when the current permission expires. As part of the decommissioning stage, the existing turbines and substation would be dismantled, and the site reinstated to its original condition; please see Section 3.2 in Chapter 3 of this EIAR for further details regarding decommissioning. In the do-nothing scenario, there will be potential short-term, moderate negative noise impacts on nearby sensitive receptors during the decommissioning phase. However, once the existing turbines and substation are decommissioned, there will be no further potential for noise effects.

10.5.2 Operational Phase Potential Impacts

10.5.2.1 Turbine Noise Assessment

The noise levels for the Project site have been calculated for a set of 266 no. NSLs identified within 3km of the Ballywater turbines.

An omni-directional noise prediction assessment has been completed assuming all noise locations are downwind of all turbines at the same time. The predicted levels have been compared against the adopted noise criteria curves as detailed in Table 12.10. Results for the full set of receptors are presented in Appendix 10-6.

Using the turbine noise emissions for the installed turbines (refer to Section 10.3.7.2.1 for details) and allowing for a +1 dB uncertainty factor in the calculations, potential exceedances of the noise criteria are noted at 4 locations: H006, H012, H013 and H031.

Table 10-10 presents the predicted noise levels for each of these locations, along with the applicable criteria and the level potential exceedance predicted (where applicable).

Table 10-10 Predicted Noise Levels (including +1 dB uncertainty)

House Ref	Parameter	Predicted Noise Level dB L_{A90} at Standardised Wind Speed at 10m				
		5	6	7	8	9
H006	Predicted	34.6	39.8	41.9	43.1	44.0
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	0.1	–
H012	Predicted	34.6	39.8	41.9	43.1	44.0
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	0.1	–
H013	Predicted	34.8	40.0	42.1	43.3	44.2
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	0.3	–
H031	Predicted	34.8	40.0	42.1	43.3	44.2

House Ref	Parameter	Predicted Noise Level dB L_{A90} at Standardised Wind Speed at 10m				
		5	6	7	8	9
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	0.3	–

Using the turbine noise emissions for the installed turbines without the allowance for the +1 dB uncertainty, all predicted turbine noise levels are within the criteria. By way of a summary Table 10-11 presents the predicted noise levels for H006, H012, H013 and H031.

Contours of omni-directional noise levels for standard mode operation rated power wind speed (i.e. highest noise emission) are presented in Appendix 10-7.

Table 10-11 Predicted Noise Levels (without +1 dB uncertainty allowance)

House Ref	Parameter	Predicted Noise Level dB L_{A90} at Standardised Wind Speed at 10 m				
		5	6	7	8	9
H006	Predicted	33.6	38.8	40.9	42.1	43.0
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	–	–
H012	Predicted	33.6	38.8	40.9	42.1	43.0
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	–	–
H013	Predicted	33.8	39.0	41.1	42.3	43.2
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	–	–
H031	Predicted	33.8	39.0	41.1	42.3	43.2

House Ref	Parameter	Predicted Noise Level dB L_{A90} at Standardised Wind Speed at 10 m				
		5	6	7	8	9
	Daytime Criterion	40.0	45.0	45.0	45.0	47.0
	Daytime Excess	–	–	–	–	–
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	–	–

The remainder of this chapter discusses the situation where the +1 dB allowance for uncertainty has been taken into account in the turbine noise predictions.

The predicted noise levels at various wind speeds have been compared against the noise criteria curves outlined in Table 10-9. The predicted omni-directional noise levels for all turbines operating in standard mode has identified some exceedances of up to 0.3 dB(A) at certain windspeeds and locations. These exceedances are summarised as follows:

- There are four locations with exceedances of 0.3 dB or less during night-time periods at wind speeds of 8 m/s.

The next stage in the assessment is to consider the effects of wind direction. As presented in Section 10.3.7.3 above, the effect of the directionality of noise emissions from wind turbines means that certain wind directions, noise levels are less than the values presented, as a given noise-sensitive location is not downwind of all turbines at the same time.

Directional noise prediction models have been developed to identify the number and magnitude of exceedances of the noise criteria at the various noise sensitive locations. As in the omni-directional predictions, no exceedances were present during daytime periods. Tables 10-11 to 10-14 compare the predicted noise levels against the noise criteria curves for various wind directions. It is noted that only in North and Northeast wind directions that the exceedances occur.

Table 10-12 Review of Predicted Exceedances in Various Wind Direction Sectors – Night-time, H006

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
H006	Omni-directional	34.6	39.8	41.9	43.1	44.0
	North	32.4	37.6	39.7	40.9	41.8
	Northeast	33.7	38.9	41.0	42.2	43.1
	East	34.1	39.3	41.4	42.6	43.5
	Southeast	34.0	39.2	41.3	42.5	43.4
	South	33.0	38.2	40.3	41.5	42.4
	Southwest	30.9	36.1	38.2	39.4	40.3
	West	30.2	35.4	37.5	38.7	39.6
	Northwest	30.4	35.6	37.7	38.9	39.8

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess Accounting for Wind Direction	–	–	–	–	–

Table 10-13 Review of Predicted Exceedances in Various Wind Direction Sectors – Night-time, H012

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
H012	Omni-directional	34.6	39.8	41.9	43.1	44.0
	North (N)	34.6	39.8	41.9	43.1	44.0
	Northeast	34.4	39.6	41.7	42.9	43.8
	East	32.8	38.0	40.1	41.3	42.2
	Southeast	30.7	35.9	38.0	39.2	40.1
	South	28.4	33.6	35.7	36.9	37.8
	Southwest	29.3	34.5	36.6	37.8	38.7
	West	32.4	37.6	39.7	40.9	41.8
	Northwest	33.8	39.0	41.1	42.3	43.2
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess Accounting for Wind Direction	–	–	–	0.1 (N)	–

Table 10-14 Review of Predicted Exceedances in Various Wind Direction Sectors – Night-time, H013

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
H013	Omni-directional	34.8	40.0	42.1	43.3	44.2
	North (N)	34.8	40.0	42.1	43.3	44.2
	Northeast (NE)	34.6	39.8	41.9	43.1	44.0
	East	33.1	38.3	40.4	41.6	42.5
	Southeast	30.2	35.4	37.5	38.7	39.6
	South	28.8	34.0	36.1	37.3	38.2

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
	Southwest	29.6	34.8	36.9	38.1	39.0
	West	32.7	37.9	40.0	41.2	42.1
	Northwest	34.4	39.6	41.7	42.9	43.8
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess Accounting for Wind Direction	–	–	–	0.3 (N) 0.1 (NE)	–

Table 10-15 Review of Predicted Exceedances in Various Wind Direction Sectors – Night-time, H031

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
H031	Omni-directional	34.8	40.0	42.1	43.3	44.2
	North (N)	34.5	39.7	41.8	43.0	43.9
	Northeast (NE)	34.8	40.0	42.1	43.3	44.2
	East	34.1	39.3	41.4	42.6	43.5
	Southeast	32.3	37.5	39.6	40.8	41.7
	South	29.7	34.9	37.0	38.2	39.1
	Southwest	28.8	34.0	36.1	37.3	38.2
	West	31.1	36.3	38.4	39.6	40.5
	Northwest	33.5	38.7	40.8	42.0	42.9
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess Accounting for Wind Direction	–	–	–	0.3 (NE)	–

At all NSL's the predicted turbine noise levels are below the noise criterion curves which the exception of a potential exceedance of between 0.1 dB and 0.3 dB at 8 m/s wind speeds during night-time periods as summarised below:

- Location H012 in northerly wind directions;
- Location H013 in northerly and northeasterly wind directions;
- Location H031 in northeasterly wind directions;

It is noted that the predicted exceedances of the derived wind turbine noise criteria, if realised, would not be experienced in all wind conditions. The exceedances are only present in northwest and north conditions; no exceedances are predicted in other wind direction sectors.

The noise prediction calculations have been made using the ISO 9613-2 standard and relate to conditions favourable to noise propagation (typically downwind propagation from source to receiver and/or downward refraction under temperature inversions). A +1 dB uncertainty has been applied to turbine emissions.

The magnitude of the predicted potential exceedances for the N163 turbine are considered negligible in the context of this assessment, changes of this magnitude (±0.3 dB) would typically be imperceptible to the human ear. Notwithstanding this, mitigation in the form of turbine curtailment is addressed in Section 10.5.4.1.

10.5.2.1.1 Description of Effects

In terms of the effects of on environmental noise of continuing the operation of the wind farm, the following comment is provided: notwithstanding the potential exceedances of the proposed turbine noise criteria in the predicted noise levels, Ballywater has been operating for 19 years and such is it not considered that a significant effect on the noise environment is associated with the continuation of its operation.

With respect to the EPA criteria for description of effects, the potential worst-case cumulative effects at the nearest noise sensitive locations associated with the operation of the turbines at the Wind Farm Site are described below.

Quality	Significance	Duration
Neutral	**Imperceptible**	**Medium-term**

If permission to continue is granted and the noise conditions are in line with the current guidelines, mitigation measures in respect of noise may be required and these are discussed in the section 10.5.4.1.

10.5.2.2 Substation

The Project contains a 110kV substation which will continue to operate on a 24/7 basis, and the noise impact at the nearest NSL has been assessed to identify the potential greatest impact associated with the continued operation of the substation at the nearest NSL.

The noise emission level associated with a standard substation that associated with development of this nature is the order of 92 dB(A) L_w.

Noise prediction calculations for the operation of Ballywater 110kV Substation have been undertaken in accordance with ISO 9613. The predicted noise level from the operation of the substation at the nearest NSL (H037) at approximately 336 m from the noise source at the substation (transformer of substation layout) is 33 dB $L_{Aeq,T}$. This level of noise is within the criteria presented in 10.3.2.2.2, and it is concluded that there will be no significant noise emissions from the operation of the substation at any NSL.

10.5.2.2.1 Description of Effects

Similar to the Ballywater Wind Farm turbines, Ballywater 110kV substation has been operating for almost 20 years and such is it not considered that a significant effect on the noise environment is associated with the continuation of its operation.

With respect to the EPA's criteria for description of effects, the potential effects at the nearest NSLs associated with the operation of the existing substation is described below.

Quality	Significance	Duration
Neutral	**Imperceptible**	**Medium-term**

10.5.3 Decommissioning Phase Potential Impacts

The noise levels referred to in this section are indicative only and are intended to demonstrate that it will be possible for the contractor to comply with current best practice guidance. The highest predicted noise levels are expected to occur for only short periods of time at a very limited number of properties. Decommissioning noise levels will be lower than these levels for most of the time at the properties in the vicinity of the Project.

A variety of items of plant will be in use for the various elements of the decommissioning activities. There will be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, there is potential for generation of levels of noise at noise-sensitive locations. This is discussed in the following Sections.

Decommissioning noise prediction calculations have been conducted using the assessment methodology outlined in Section 10.3.2.1. Noise levels are predicted at the nearest NSL to each element of the works and compared against the criteria in Section 10.3.2.1.1. Noise from decommission the turbines are calculated to the closest noise sensitive receptors, with the nearest NSL being H006 at a distance of 324 m from T21. Assuming the same construction activities for the decommissioning of the substation which is at a similar setback distance to the nearest NSL, being H037 at a distance of 336 m.

In general, the distances between the construction activities associated with the Project and the nearest NSL's are such that there will be no significant noise and vibration impacts at NSL's. The following sections present an assessment of the main stages of the construction phase that have the potential for associated noise and vibration impacts, all other stages and elements are considered unlikely to have any significant noise and vibration impacts.

Decommissioning activities will be carried out during normal daytime working hours (i.e., weekdays 0700 – 1900 hrs and Saturdays 0700 – 1300 hrs). 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.

Several indicative sources that would be expected on a site of this nature have been identified and noise predictions of their potential impacts prepared to nearby houses. This represents a conservative approach to the assessment; decommissioning noise levels will be lower at properties located further from the works.

Table 10-16 details the noise levels associated with decommissioning noise sources assessed in this instance along with typical sound pressure levels from BS 5228 – 1: 2009. Calculations have assumed an on-time of 66% for each item of plant i.e. 8 hours over a 12-hour assessment period.

Table 10-16 Typical decommissioning Noise Levels – Turbines

Item (BS 5228 Ref.)	Activity/Notes	Plant Noise level at 10m Distance (dB $L_{Aeq,T}$)[7]	Predicted Noise Level (dB $L_{Aeq,T}$) at distance (m) 324 m – nearest NSL to turbine location
HGV Movement (C.2.30)	Transporting fill and other materials	79	36
Tracked Excavator (C.4.64)	**Moving soil and rubble**	**77**	**34**
General Works (Various)	All general activities plus deliveries/removals of materials and plant	84	41
Dumper Truck (C.4.4)	**Backfilling Turbine Foundations**	**76**	**33**
Mobile Telescopic Crane (C.4.39)	Turbine dismantling	77	34
Dewatering Pumps (D.7.70)	**If required**	**80**	**37**
Cumulative Predicted Construction Noise Level		-	51

The predicted noise level of 51 dB $L_{Aeq,T}$ is within the construction noise criterion outlined in Table 10-1

Table 10-1, therefore it is concluded that there will be no significant noise impact associated with decommissioning activities, therefore no specific mitigation measures are required.

10.5.3.1 Vibration

Due to the distance of the proposed works from sensitive locations vibration effects are not likely at any NSL.

10.5.3.2 Decommissioning Traffic

A detailed Traffic Management Plan will be prepared in consultation with the local authority prior to any future decommissioning. It is not expected that there will be any significant increase in traffic along public roads directly associated with the decommissioning phase of the Project that would result in a perceptible negative effect at residential receptors. This is concluded on the basis that light good vehicles would need to increase by at least 25% and heavy good vehicles by 50% along a typical busy road, to result in a change in noise level of +2 dB. Assuming this conservative scenario, a traffic noise level change of this magnitude is subjectively considered a 'barely perceptible' in accordance with the assessment methodology in Section 10.3.2.1.2.

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[7] *All plant noise levels are derived from BS5228: Part 1*

10.5.3.3 Description of Effects

The likely predicted noise and vibration impacts are below the limits and/or thresholds identified. With respect to the EPA's criteria for description of effects, the likely potential associated effects at the nearest noise sensitive locations associated with decommissioning of Project is as described below:

Quality	Significance	Duration
Neutral	**Not Significant**	**Short-term**

10.5.4 Operational Phase Mitigation Measures

10.5.4.1 Wind Turbines

An assessment of the operational wind turbine noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Section 10.3. The findings of the assessment, presented in Section 10.5.2.1 has confirmed that the predicted operational noise levels will be within the relevant best practice noise criteria curves at all locations with the exception of locations H012, H013 and H031 where potential exceedances of 0.1 dB and 0.3 dB at wind speeds of 8 m/s respectively during night-time periods, in north and northeast wind directions only.

It is re-iterated that the predicted noise levels include an allowance for uncertainty as required by the IOA GPG, in this instance of 1 dB, which is greater than the exceedances noted in the predicted noise levels.

If the Project is granted permission to continue operating, a commissioning noise survey will be carried out at these dwellings (H006, H012, H013 and H031) or at other locations with the prior agreement with the local authority. Should the exceedances predicted above be confirmed through the commissioning exercise, 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 E70-E4 turbine installed on the site in order to achieve the relevant noise criteria at all NSLs.

The E70-E4 can be programmed to run in reduced modes of operation (or low noise modes) to achieve the attenuation required in the specific wind conditions (i.e. wind speed and direction). Operating the turbines in reduced noise modes is referred to as curtailment, which typically results in a corresponding reduction in energy generation capacity for the turbine(s).

To demonstrate the principle of curtailment, the example is taken of location H013, where exceedances of the night-time noise criterion of 0.3 dB L_{A90} and 0.1 dB are predicted in north and northeast wind directions, respectively.

The following outline curtailment strategy would apply during night-time periods at 8 m/s windspeeds:

- Turbine T18 operating in at -1 dB in North wind directions; and
- Turbine T19 operating in at -1 dB in North and Northeast wind directions.

With these mitigation measures in place, the predicted wind turbine noise levels are as in Table 10-15 and thus within the criterion of 43 dB L_{A90}.

Table 10-17 Review of Predicted Exceedances in Various Wind Direction Sectors – Night-time, H013, with mitigation

House Ref	Parameter	Predicted exceedance in Noise Level dB L_{A90} at Standardised Wind Speed at 10m A.G.L.				
		5	6	7	8	9
H013	North	34.8	40.0	42.1	42.9	44.2
	Northeast	34.6	39.8	41.9	42.9	44.0
	East	33.1	38.3	40.4	41.6	42.5
	Southeast	30.2	35.4	37.5	38.7	39.6
	South	28.8	34.0	36.1	37.3	38.2
	Southwest	29.6	34.8	36.9	38.1	39.0
	West	32.7	37.9	40.0	41.2	42.1
	Northwest	34.4	39.6	41.7	42.9	43.8
	Night-time Criterion	43.0	43.0	43.0	43.0	45.8
	Night-time Excess	–	–	–	–	–

10.5.4.1.1 Amplitude Modulation

In the event that a complaint which indicates potential amplitude modulation (AM) associated with Project, the operator will employ a qualified acoustic consultant to assess the level of AM in accordance with the methods outlined in the Institute of Acoustics IOA Noise Working Group (Wind Turbine Noise) *Amplitude Modulation Working Group Final Report: A Method for Rating Amplitude Modulation in Wind Turbine Noise* (9 August 2016) or subsequent revisions.

The measurement method outlined in the IOA AMWG document, known as the 'Reference Method', will provide a robust and reliable indicator of AM and yield important information on the frequency and duration of occurrence, which can be used to evaluate different operational conditions including mitigation.

These mitigation measures, if required, will consist of the implementation of operational controls for the relevant turbine type, which will include turbine curtailment under specific operational conditions.

10.5.4.1.2 Low-frequency Noise

In the unlikely event that a complaint which indicates potential low-frequency noise (LFN) associated with the Project, the operator will employ a qualified acoustic consultant an assessment in accordance with guidance in Appendix VI of the EPA document entitled *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4) (EPA, 2016). This guidance is based on the threshold values outlined in the Salford University document *Procedure for the assessment of low frequency noise complaints, DEFRA Contract no. NANR45 Revision 1, December 2011.* If an exceedance of the threshold values associated with the wind farm operations is confirmed, then further investigation of the LFN will be carried out. If considered necessary by that investigation, measures to mitigate LFN at noise-sensitive locations will be implemented through operational controls for the relevant turbine type, which may include turbine curtailment under specific operational conditions.

10.5.4.1.3 *Monitoring*

As discussed above, 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. The commissioning survey will include a review for the presence of audible tones associated with the operation of the wind turbine farm in accordance with Annex C of ISO 1996-2:2017 *Acoustics – Description, measurement and assessment of environmental noise Part 2: Determination of sound pressure levels.*

For example, implementation of noise reduced operational modes resulting in curtailment of turbine operation can be implemented for specific turbines in specific wind conditions to ensure turbine noise levels are within the relevant noise criterion curves/planning conditions limits. Such curtailment can be applied using the wind farm SCADA system without undue effect on the wind turbine performance, as demonstrated in Section 10.4.5.1. Following implementation of these measures, noise surveys will be repeated to confirm compliance with the noise criteria.

10.6 Description of Residual Effects

10.6.1 Operational Phase

10.6.1.1 Wind Turbine Noise

The noise levels associated with the Project at noise-sensitive locations will be within best practice noise criteria curves recommended in the 2006 WEDGs, therefore, it is not considered that a significant effect is associated with the Project.

With respect to the EPA criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with the continued operation of the turbines at the Wind Farm Site are described below. In the context of this review, it is noted that if the Proposed Development is permitted there will be no change to the existing noise environment.

Quality	Significance	Duration
Neutral	**Imperceptible**	**Medium-term**

10.6.1.2 Substation Noise

With the mitigation measures in place, the associated effect from the continued operation of the substation is summarised below. In the context of this review it is noted that if the Proposed Development is permitted there will be no change to the existing noise environment.

Quality	Significance	Duration
Neutral	**Imperceptible**	**Medium-term**

10.6.1.3 Vibration

There are no expected sources of vibration associated with the operational phase of the Project. In relation to of vibration the associated effect is summarised as follows:

Quality	Significance	Duration
Neutral	**Imperceptible**	**Medium-term**

10.6.2 Decommissioning Phase

During the decommissioning phase of the Project there will be some effect on nearby noise sensitive locations due to noise emissions from site traffic and other on-site activities. The underground electrical cabling will remain in place on decommissioning following the lifetime extension. The noise and vibration impacts associated with any decommissioning of the site within the criteria in Section 10.3.2.1.1.

With respect to the EPA criteria for description of effects, the anticipated associated effects at the nearest noise sensitive locations associated with the decommissioning phase are described below.

Quality	Significance	Duration
Negative	**Not Significant**	**Medium-term**

11. ARCHAEOLOGY AND CULTURAL HERITAGE

11.1 Introduction

This archaeological, architectural, and cultural heritage chapter was prepared by Tobar Archaeological Services Ltd. It presents the results of an archaeological, architectural and cultural heritage impact assessment for the Proposed Lifetime Extension of the existing Ballywater Wind Farm and existing onsite 110kV Substation (the Proposed Development), together with the ongoing operation of the Underground Grid Connection (the Project). Planning permission is sought for the continued operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation, as permitted by Wexford County Council (WCC Pl. Ref. 2001/0458 and Pl. Ref. 2004/2901), for a further 10 years.

The purpose of this chapter is to assess the potential direct and indirect effects of the Project on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and a programme of field walking of the Proposed Development site. The report amalgamates desk-based research and the results of field walking to identify areas of archaeological/architectural/ cultural significance or potential, likely to be affected either directly or indirectly by the Project. An assessment of potential effects, including cumulative effects, is presented, and mitigation measures are recommended where appropriate. The visual effect of the Project on any newly discovered monuments/sites of significance as well as known recorded monuments is also assessed.

11.1.1 The Project

A detailed description of the Project, which includes the Proposed Development, is provided in Chapter 4 of this Environmental Impact Assessment Report (EIAR).

11.1.2 Statement of Authority

This chapter of the EIAR has been prepared by Miriam Carroll of Tobar Archaeological Services Ltd. Miriam graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish Archaeology. She is licensed by the Department of Housing, Local Government and Heritage (HLGH) to carry out excavations and is a member of the Institute of Archaeologists of Ireland (IAI). Miriam Carroll has been working in the field of archaeology since 1994 and has undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIAR) and surveys. Miriam Carroll is a director of Tobar Archaeological Services Ltd which has been in operation for over 20 years.

11.1.3 Legislation and Guidelines

The chapter has been prepared in compliance with all relevant Environmental Impact Assessment (EIA) legislation and guidance, see Chapter 1: Introduction for relevant guidance and legislation.

11.1.3.1 Current Legislation

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The RMP was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The RMP affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

The term 'national monument' as defined in Section 2 of the National Monuments Act 1930 means a monument *'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'*. National monuments in State care include those which are in the ownership or guardianship of the Minister for Arts, Heritage and the Gaeltacht. Section 5 of the National Monuments Act (1930) allows owners of other national monuments to appoint the Minister for the Arts, Heritage and the Gaeltacht or the relevant local authority as guardian of such monuments, subject to their consent. This means in effect that while the property of such a monument remains vested in the owner, its maintenance and upkeep are the responsibility of the State. Some monuments are also protected by Preservation Orders and are also regarded as National Monuments. National Monuments also includes (but not so as to limit, extend or otherwise influence the construction of the foregoing general definition) every monument in Saorstát Éireann to which the Ancient Monuments Protection Act, 1882, applied immediately before the passing of this Act, and the said expression shall be construed as including, in addition to the monument itself, the site of the monument and the means of access thereto and also such portion of land adjoining such site as may be required to fence, cover in, or otherwise preserve from injury the monument or to preserve the amenities thereof.

Under the Heritage Act (1995) architectural heritage is defined to include *'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents...'*. A heritage building is also defined to include *'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'*.

11.1.3.1.1 Granada Convention

The Council of Europe, in Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention), states that *'for the purpose of precise identification of the monuments, groups of structures and sites to be protected, each member State will undertake to maintain inventories of that architectural heritage'*. The Granada Convention emphasises the importance of inventories in underpinning conservation policies.

The National Inventory of Architectural Heritage (NIAH) was established in 1990 to fulfil Ireland's obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland. Article 1 of the Granada Convention establishes the parameters of this work by defining 'architectural heritage' under three broad categories of Monument, Groups of Buildings, and Sites:

- Monument: all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures and fittings;
- Group of buildings: homogeneous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest, which are sufficiently coherent to form topographically definable units;
- Sites: the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogenous to be topographically definable, and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest.

The Council of Europe's definition of architectural heritage allows for the inclusion of structures, groups of structures and sites which are considered to be of significance in their own right, or which are of significance in their local context and environment. The NIAH believes it is important to consider the architectural heritage as encompassing a wide variety of structures and sites as diverse as post boxes, grand country houses, mill complexes and vernacular farmhouses.

11.1.4 Wexford County Development Plan 2022-2028

The Wexford County Development Plan 2022-2028 outlines a number of policies and objectives relating to archaeology and built heritage as follows:

11.1.4.1 Archaeological Heritage

Objective AH01 To conserve and protect archaeological sites, monuments (including their settings), underwater archaeology and objects including those listed or scheduled for inclusion on the Record of Monuments and Places and/or the Register of Historic Monuments or newly discovered sub-surface archaeological remains.

Objective AH02 To recognise the importance of monuments and sites and protect the character and integrity of these monuments and sites where appropriate. The Council will consult the National Monuments Service where a development is proposed that may impact on an archaeological monument and/or site.

Objective AH03 To protect the heritage of groups of important archaeological sites and monuments, inclusive of their contextual setting and interpretation, in the operation of development management.

Objective AH04 To fully consider the protection of archaeological heritage when undertaking, approving or authorising development. In considering such protection the Council will have regard to the advice and recommendations of the National Monuments Service and the principles set out in Framework and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and the Islands, 1999).

Objective AH05 To require an archaeological assessment and/or investigation by qualified persons for development that may, due to its size, location or nature, have a significant effect upon archaeological heritage and to take appropriate measures to safeguard this archaeological heritage. In all such cases the Planning Authority shall consult with the National Monuments Service in the Department of Culture, Heritage and the Gaeltacht.

Objective AH06 To promote a presumption in favour of preservation in-situ of archaeological remains and settings when dealing with proposals for development that would impact upon archaeological sites and/or features. Where preservation in-situ is not possible the Council will consider preservation by record in appropriate circumstances.

Objective AH07 To protect historic and archaeological landscapes, including battlefields, and promote access to such sites provided that this does not threaten the feature.
Objective AH08 To include archaeological landscapes, battlefields and historic landscapes as part of the updated Landscape Character Assessment of the County to be prepared following the publication of a National Landscape Character Assessment.

Objective AH09 To protect historic urban defences (both upstanding and buried) and associated features and safeguard them from inappropriate development in accordance with National Policy on Town Defences (Department of Environment, Heritage and Local Government, 2008).

Objective AH10 To identify appropriate archaeological sites in the county to which public access could be provided, and work to secure public access and the provision of signage and interpretation panels where appropriate in consultation with the landowner and the National Monument Service, subject to normal planning and environmental criteria and the development management standards contained in Volume 2.

Objective AH11 To retain existing street layouts, historic building lines and traditional plot widths which derive from medieval or earlier origin.

Objective AH12 To protect historical burial grounds within County Wexford and encourage their maintenance in accordance with best practice conservation principles.

Objective AH13 To have regard to the Historic Battlefield sites as listed in Table 13.6 (and those which are not listed thereon but that are, or become, known) and when assessing planning applications in the vicinity of a Historic Battlefield ensure there is no harm to the physical character or setting of these sites. Where development is proposed within the identified battlefields, archaeological assessment and recording may be required.

11.1.4.2 Built Heritage

Objective BH01 To protect the architectural heritage of County Wexford and to include structures considered to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest in the Record of Protected Structures.

Objective BH02 To support targeted investment in the built heritage of our region including the Built Heritage Investment Scheme and Historic Structures Fund to assist owners to maintain our built heritage assets.

Objective BH03 To promote the development of heritage-led regeneration and engage in and promote initiatives to revitalise the historic cores of our towns and villages together with local communities, heritage property owners and other stakeholders.

Objective BH04 To consider, in the preparation of future local area plans, a Town first approach to the revitalisation of historic urban centres, which focuses on the repair and upgrade of existing historic buildings and their adaptation to new uses with regard to their architectural character and significance.

Objective BH05 To protect our Architectural Heritage in the form of the Record of Protected Structures (RPS) and identify important groups of buildings/localities suitable for designation as Architectural Conservation Areas (ACAs). Wexford County Council will also endeavour to undertake monitoring and review of the RPS and ACAs which may result in recommendations for additions or deletions and enlist measures to prevent dereliction and to support re-use of built heritage.

Objective BH06 To protect the curtilage of Protected Structures or proposed Protected Structures from any works which would cause loss of, or damage to, the special character of the structure and loss of or damage to, any structures of heritage value within the curtilage or attendant grounds of the structure.

Objective BH07 To ensure development within the curtilage of a Protected Structure is compatible with its character. This does not preclude putting forward innovative contemporary designs that respect the context of the Protected Structure.

Objective BH08 To promote the retention of any original or early building fabric including for example timber sash windows, stonework, brickwork, joinery, ironmongery, traditional mortars, render and decorative or weather finishes and slate and vernacular architectural details (whether relating to a Protected Structure or not). Likewise, the Council will encourage the re-instatement of historically correct traditional features and retention of original ridge heights as appropriate.

Objective BH09 To protect, maintain and enhance the established character and setting of vernacular buildings which are worthy of protection or have architectural heritage value, farmyards and settlements where they make a positive contribution to the built heritage and encourage the re-use and sensitive refurbishment of vernacular buildings using appropriate design and materials and having regard to best practice conservation guidelines.

Objective BH10 To ensure that applications in relation to Protected Structures include an Architectural Heritage Impact Assessment report where it is considered the proposed development entails extensive or complex works with a potential to have an impact on the architectural heritage. This report should assess the implications of the development on the character of the structure and the area in which it is located. This should be prepared by a suitably qualified person competent to make a qualitative assessment of the potential impact of works on the character and special interest of the Protected Structure and in accordance with the Architectural Heritage Protection- Guidelines for Planning Authorities (DAHG, 2011) and any subsequent guidelines.

Objective BH11 To ensure that all applications for Protected Structures are assessed taking into consideration the advice contained in Architectural Heritage Protection Guidelines for Planning Authorities (DAHG, 2011) and any subsequent guidelines.

Objective BH12 To encourage the repair and retention of traditional timber, rendered and/or tiled shop fronts and pub fronts, including those which may not be Protected Structures. There will be a general presumption against the replacement of original shopfronts with emphasis on retention and reinstatement of traditional proportions and details.

Objective BH13 To facilitate the retention of older buildings, the Planning Authority will give consideration to the relaxation of car parking and other development management requirements in appropriate circumstances.

Objective BH14 To ensure that elements of the architectural heritage of the county, such as historic gardens and historic designed landscapes, stone or brick walls, ditches and street furniture that make a positive contribution to the built heritage, are retained.

Objective BH15 To encourage improvements to energy efficiency in traditional buildings while maintaining the architectural character and significance in line with the Heritage Protection Guidelines for Planning Authorities (Department of Arts, Heritage and the Gaeltacht, 2011) and the Advice Series Guide on Energy Efficiency in Traditional Buildings (Department of Environment, Heritage and Local Government) and any future guidelines and advice.

Objective BH16 To protect and manage trees in the curtilage of a Protected Structure or in close vicinity that contribute to its special character and setting.

Objective BH17 To support economic development of large country houses in their role as tourist attractions and other commercial uses to ensure their continued survival.

Objective BH18 In the event of catastrophic accidental fire damage the rebuilding of a Protected Structure will not be required. Support and advice will be provided in assisting the repair of damaged Protected Structures to achieve a balance between new works and the remaining original features.

11.1.4.3 Statutory Consultations

Scoping letters were issued to all consultees in September 2023; details regarding scoping and consultation are provided in Chapter 2 of this EIAR. Included in the list of consultees was the Department of Housing, Local Government and Heritage, which includes the National Monuments Service.

No specific comments were received from the Development Applications Unit (DAU) of the Department of Housing, Local Government and Heritage or the National Monuments Service. Copies of all scoping responses are presented in Appendix 2-1 of this EIAR.

11.1.5 Location and Topography

Ballywater Wind Farm and Ballywater 110kV Substation are located in east county Wexford, north-east of Enniscorthy. The turbines are currently grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines. The larger cluster in the south of the site, comprises of 17 no. turbines, as well as the onsite substation, which is located to the west of this cluster. Access to the southern section of the site for general traffic, such as maintenance vehicles, is via the current existing entrance at the R742 Regional Road, which runs along the western side of the site boundary. Access to the northern section of the site is via the Cahore Local Road which runs along the northern side of the site boundary. The Proposed Development is connected to the national grid via approximately 21km of cabling, as part of the Project, that runs underground, predominantly in the local road network, to the existing Crane 110kV substation.

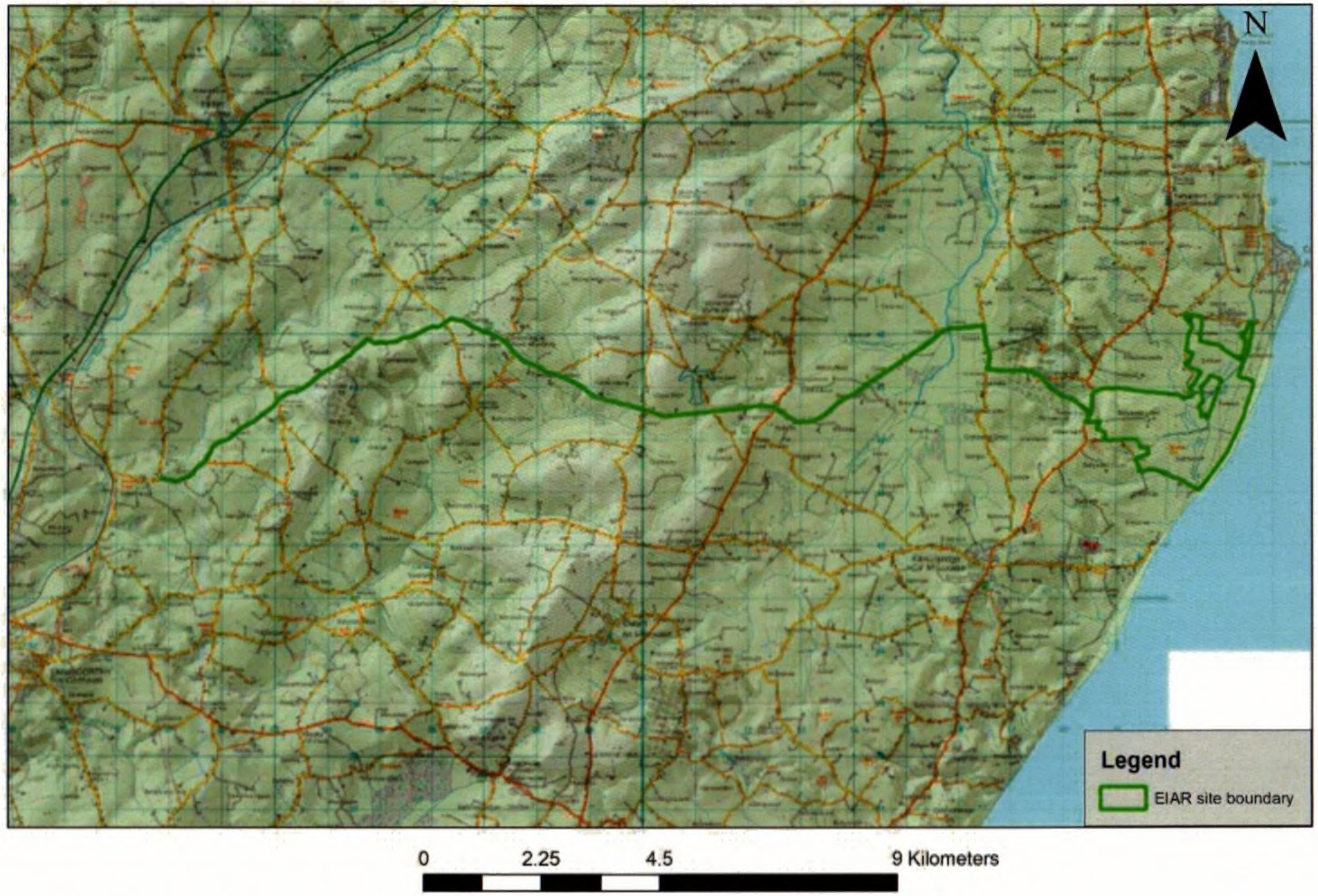


Figure 11.1: Site location map.

11.2 Assessment Methodology

The assessment of the archaeology, architecture and cultural heritage of the Project included GIS mapping and desk-based research followed by field inspection. A desk-based study of the Project was initially undertaken in order to assess the archaeological, architectural and cultural heritage potential of the area and to identify constraints or features of archaeological/cultural heritage significance within or near to same. For the purposes of this assessment, the Project site relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary shown in green.

11.2.1 Geographical Information Systems

A Geographic Information System (GIS) is a computer database which captures, stores, analyses, manages and presents data that is linked to location. GIS includes mapping software and its application with remote sensing, land surveying, aerial photography, mathematics, photogrammetry, geography and tools that can be implemented with GIS software. An industry-standard GIS system was used to manage the datasets relevant to the archaeological and architectural heritage assessment and for the creation of all the maps in this section of the report. This involved the overlaying of the relevant archaeological and architectural datasets on georeferenced aerial photographs and road maps (ESRI), where available. The integration of this spatial information allows for the accurate measurement of distances of a proposed development from archaeological and cultural heritage sites and the extraction of information on 'monument types' from the datasets. Areas of archaeological or architectural sensitivity may then be highlighted in order to mitigate the potential negative effects of a development on archaeological, architectural and cultural heritage.

11.2.2 Desktop Assessment

The following sources were consulted as part of the desktop assessment for the Project:

- The Record of Monuments and Places (RMP)
- The Sites and Monuments Record (SMR)
- National Monuments in State Care County Wexford
- The Topographical Files of the National Museum of Ireland on www.heritagemaps.ie
- First edition Ordnance Survey maps (Tailte Eireann)
- Second edition Ordnance Survey maps (Tailte Eireann)
- Third edition Ordnance Survey Map (Record of Monuments and Places)
- Down Survey maps (www.downsurvey.tcd.ie)
- Aerial photographs (copyright of Tailte Eireann)
- Excavations Database
- National Inventory of Architectural Heritage (NIAH)
- Record of Protected Structures (County Development Plan)
- Previous archaeological surveys or assessments carried out on or near to the Project site (various)

11.2.2.1 Record of Monuments and Places, Sites and Monuments Record and National Monuments

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Wexford. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments and SMRs which may be accessed at https://heritagedata.maps.arcgis.com.

A review of all National Monuments in State Care and those subject to Preservation Orders was undertaken as part of the assessment in order to ascertain any potential effects on their setting as a result of the Project.

11.2.2.2 Cartographic Sources and Aerial Photography

The 1st (1840s) and 2nd (1900s) edition OS maps for the area were consulted, where available, as was Tailte Eireann aerial photography.

11.2.2.3 Topographical Files - National Museum of Ireland

Details relating to finds of archaeological material and monuments in numerous townlands in the country are contained in the topographical files held in the National Museum of Ireland. In order to establish if any new or previously unrecorded finds had been recovered from within the EIAR Site Boundary or its surroundings these files were consulted on www.heritagemaps.ie.

11.2.2.4 Archaeological Inventory Series

Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of Housing, Local Government and Heritage. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are undiscovered at the time of their publication. Many sites have been discovered since the publication of the Inventory Series which have now been added to the Sites and Monuments Record.

11.2.2.5 Record of Protected Structures

The Record of Protected Structures for County Wexford was consulted for the schedule of buildings and items of cultural, historical or archaeological interest which may be affected by the Project. The County Development Plan also outlines policies and objectives relating to the protection of the archaeological, historical and architectural heritage landscape. The dataset for the Wexford RPS was downloaded on to the base mapping for the Project in order to assist with assessment of effects.

11.2.2.6 Excavations Database

The Excavations Database is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2024. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within, or near to, the Project site.

11.2.2.7 National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county-by-county basis by the Department of Housing, Local Government and Heritage. The NIAH database was consulted for all townlands within and adjacent to the Project site. The NIAH survey for Wexford has been published and was downloaded on to the base mapping for the Project (www.buildingsofireland.ie). The NIAH is a state initiative under the administration of the Department of Housing, Local Government and Heritage and established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Housing, Local Government and Heritage to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities. They are also a research and educational resource. It is hoped that the work of the NIAH will increase public awareness and appreciation of Ireland's architectural heritage.

11.2.3 Field Inspection

A visual inspection of the Proposed Development site was carried out in February 2024 by Tobar Archaeological Services Ltd. The inspection included a photographic record of the existing wind farm which is included in Appendix 11-1.

11.2.3.1 Limitations Associated with Fieldwork

No limitations to fieldwork were encountered.

11.2.4 Assessment of Likely Significant Effects

The likely effects on the existing archaeological, architectural and cultural heritage environment are assessed using the criteria as set out in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, May 2022). Further details regarding these guidelines and the classification of impacts as set out in this EIAR are provided in Section 1.7 in Chapter 1.

The following terminology is used when describing the likely effects of the Project from a Cultural Heritage perspective.

11.2.4.1 Types of Effect

The following types of effect have been considered throughout this EIAR:

- Direct effects arise where an archaeological heritage feature or site is physically located within the footprint of the development whereby the removal of part, or all of the feature or site is thus required.
- Indirect effects may arise as a result of subsurface works undertaken outside the footprint of the development, secondary environmental change such as a reduction in water levels and visual effects.
- Cumulative effects arise when the addition of many effects create a larger, more significant effect.
- Residual effects are the degree of environmental changes that will occur after the proposed mitigation measures have been implemented.

11.2.4.1.1 *Magnitude of Effects (Significance)*

The impact assessment throughout the EIAR has been classified under the following magnitudes:

Profound: Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. An effect which obliterates sensitive characteristics. These effects arise where an archaeological site is completely and irreversibly destroyed.

- Very Significant: An effect which by its character, magnitude, duration or intensity significantly alters most of the sensitive aspect of the environment.
- Significant: An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. An effect like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about an archaeological site.
- Moderate: An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. A moderate effect arises where a change to an archaeological site is proposed which though noticeable, is not such that the integrity of the site is compromised and which is reversible. This arises where an archaeological site can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.
- Slight: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. A slight effect would not directly impact or affect an archaeological site.
- Not Significant: An effect which causes noticeable changes in the character of the environment but without significant consequences.
- Imperceptible: An effect on an archaeological site capable of measurement but without significant consequences.

11.2.5 Methodology for the assessment of effects on visual setting (indirect effects)

A standardised approach was utilised for the assessment of effects on visual setting (indirect effects) according to types of monuments and cultural heritage assets which may have varying degrees of sensitivity. This assessment does not include visits to each and every site as this is considered to be beyond the scope of the EIAR as they are mainly located on private lands.

The assessment of effects on visual setting was undertaken using the Zone of Theoretical Visibility (ZTV) map in the Landscape and Visual Impact Assessment (LVIA), as presented in Chapter 12 of this EIAR. As detailed in Section 12.1.3.1 in Chapter 12 of the EIAR, the tall, vertical nature of the proposed turbines make them the most prominent elements of the Project from a landscape and visual perspective and have the most potential to give rise to significant landscape and visual effects.

While direct physical effects to a site or monument can easily be assessed in quantitative terms, the assessment of effects on setting can be subjective and as such is a matter of qualitative, professional judgement and experience. The distances below used in the assessment of effects on setting are regarded as appropriate and are based on professional judgement.

Table 11.1: Cultural Heritage Assets considered according to sensitivity in the baseline environment.

Cultural Heritage Asset	Distance Considered
UNESCO World Heritage Site (including tentative sites) – **if relevant**	20km
National Monuments (State Ownership and Preservation Order Sites)	10km
Recorded Monuments, RPS	2km
NIAH structures	2km
Undesignated sites, if relevant	500m from Proposed Development

11.3 Existing Environment

11.3.1 Existing Ballywater Wind Farm

11.3.1.1 Archaeological Heritage

Archaeological heritage includes World Heritage Sites, National Monuments, sites which are subject to a Preservation Order, sites listed in the RMP/SMR and newly discovered archaeological sites. Each of these are addressed in the following sections.

11.3.1.1.1 *UNESCO World Heritage Sites and those on Tentative List*

Irelands Tentative list of World Heritage sites was consulted for those sites that may occur within the 20km study area from the nearest turbine, and none were identified.

11.3.1.1.2 *National Monuments (State Care and those with Preservation Orders)*

National Monuments are those recorded monuments which are in the ownership / guardianship of the Minister for Housing, Local Government and Heritage. They are frequently referred to as being in 'State Care'. Those with Preservation Orders (also National Monuments) are also included. An assessment of all National Monuments within 10km of the existing turbines was undertaken to ascertain any potential effects on their visual setting (See Section 11.2.5 for methodology of assessment).

No National Monuments are located within the Project site and none are located within close proximity to same. No National Monuments in State Care are located within 10km of any of the existing turbines. One monument subject to a Preservation Order (PO 7/1956) is situated within 10km of the existing turbines and comprises a moated site at Courtballyedmond townland, c. 5.8km to the north-west of the nearest turbine T3 (Figure 11.2). The monument is described on the Historic Environment Viewer (HEV) as follows:

WX016-022001- : Moated site : COURTBALLYEDMOND
Description: Situated on a slight SE-facing slope with a small NW-SE stream c. 50m to the NE. This is a slightly raised wedge-shaped overgrown area (dims. 37-43m N-S; 29-35m E-W) with raised corners. It is defined by earthen banks (Wth 3-4m; int. H 0.5m; ext. H 1.5m) and a flat-bottomed fosse or moat (Wth 3m; ext. D 0.3m). An outer bank has been removed since the 1940s (SMR file) but slight traces of the moat are still visible at the W. (Barry 1977, 219)

The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore Date of upload/revision: 21 May, 2012

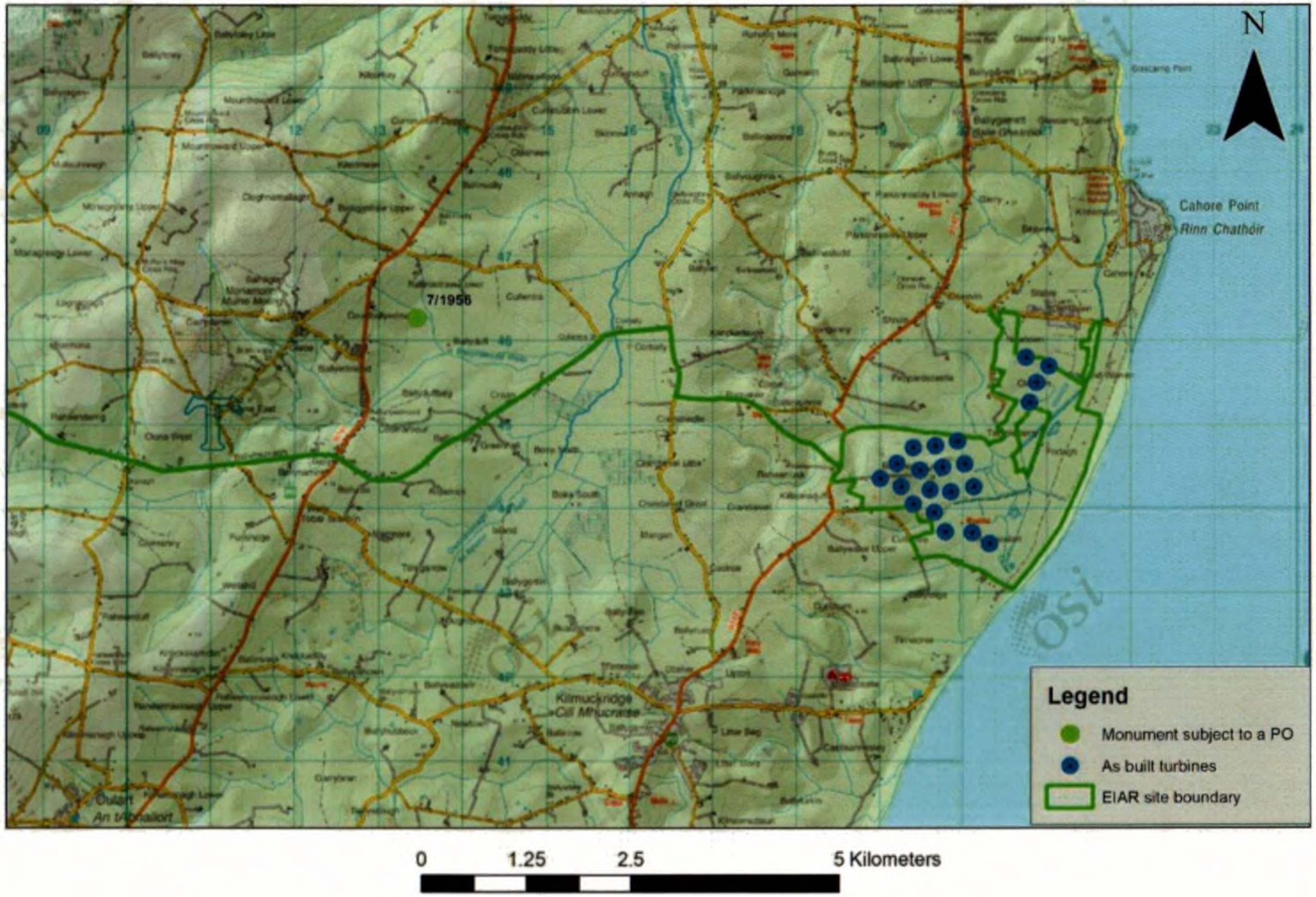


Figure 11.2: Monuments subject to a Preservation Order within 10km of the existing turbines.

11.3.1.1.3 **Recorded Monuments within the Wind Farm**

Five recorded monuments are located within the existing wind farm site. The monuments are listed in Table 11.2 and shown on Figure 11.3. Monuments located along the existing Underground Grid Connection are dealt with in Section 11.3.2.1.2 below.

Table 11.2: Recorded monuments within the existing Wind Farm site.

SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
WX022-032––	720243	643662	Excavation - miscellaneous	BALLINOULART	T20	39
WX022-031––	719050	644360	Burnt mound	BALLYWATER LOWER	T3	123
WX022-011001-	719905	643873	Moated site	BALLINOULART	T19	176
WX022-011002-	719887	643856	Mound	BALLINOULART	T19	179
WX022-010––	718876	644185	Ringfort - rath	BALLYWATER LOWER	T3	222

The monuments are described on the HEV as follows:

WX022-032— : Excavation - miscellaneous : BALLINOULART

Description: Archaeological testing and monitoring (04E0871) identified a gully (Wth 0.65-9m; max. D 0.35m) part of which (L 8.5m) was excavated. Just to the S there were about 8 pits (dims. 0.35m x 0.5m; D 0.15m to 0.85m x 0.8m; max. D 0.35m) that had been disturbed by plough furrows. Prehistoric lithics and medieval Leinster ware were recovered from most contexts suggesting that considerable plough damage had occurred. (McLoughlin 2007b, 460, No. 1790; 2008b, 5-9). Compiled by: Michael Moore. Date of upload: 18 June, 2012

References: McLoughlin, C. 2008 Archaeological monitoring and excavation report, Ballywater Lower, Co. Wexford. Licence: 04E0871 Unpublished report. Stafford/McLoughlin Archaeology.
McLoughlin, C. 2007 Ballywater. Prehistoric and medieval. In I. Bennett (ed.), Excavations 2004: summary accounts of archaeological excavations in Ireland, 460, No. 1790. Wordwell, Dublin.

WX022-031— : Burnt mound : BALLYWATER LOWER

Description: Archaeological monitoring (04E0871) of works in preparation for a windfarm identified archaeological features, some of which were preserved in situ but others were excavated under the same licence. This is a spread of broken and burnt stone (dims 4.6m E-W; 3.5m N-S) overlying a pit or trough (1.4m E-W; 0.7m N-S) filled with a charcoal-rich black silty clay with heat-shattered sandstone. A spread of broken and burnt stone (dims 2.7m E-W; 1.4m N-S) is just E of the trough. The deposits were preserved under a layer of terram, sand and hardcore, during the laying of which further burnt mound material was identified. (McLoughlin 2007; 2008, 4). Compiled by: Michael Moore. Date of upload: 18 June, 2012. Amended: 3 December 2020

References: McLoughlin, C. 2007 Ballywater. Prehistoric and medieval. In I. Bennett (ed.), Excavations 2004: summary accounts of archaeological excavations in Ireland, 460, No. 1790. Wordwell, Dublin.
McLoughlin, C. 2008 Archaeological monitoring and excavation report, Ballywater Lower, Co. Wexford. Licence: 04E0871 Unpublished report. Stafford/McLoughlin Archaeology.

WX022-011001- : Moated site : BALLINOULART

Description: Located on a rise in a low-lying landscape with the sea-shore c. 1 km to the SE. This is a rectangular grass and scrub-covered area (dims. 48m E–W; 43m N–S) defined by a flat-bottomed moat (Wth 6m; D 1.5m) at E and S which had recently been filled in at W and N in 1987. There is a bank (Wth 4m; H 0.4m) on the N side. A mound (diam. of base 13m; diam. of top 3m; H 3m) at the SW corner is known locally as the 'moat'.

The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore. Date of upload/revision: 18 June, 2012

WX022-011002- : Mound : BALLINOULART

Description: Located on a rise in a low-lying landscape with the sea-shore c. 1 km to the SE. A mound (diam. of base 13m; diam. of top 3m; H 3m) at the SW corner of moated site (WX022-011001-) is known locally as the 'moat'. Compiled by: Michael Moore. Date of upload: 18 June, 2012.

WX022-010— : Ringfort - rath : BALLYWATER LOWER

Description: Located on a broad low hill. This is an oval grass and scrub-covered area with some trees surrounding a slight rise (dims. 59m E–W; 52m N–S). The perimeter is defined by interrupted sections of an earthen bank (Wth c. 4m; int. H 0.5-0.8m; ext. H 1-1.5m) E-S and a scarp (H c. 0.3m) elsewhere. An entrance through the bank at E may be modern, and there is no visible fosse.

The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore. Date of upload/revision: 18 June, 2012.

Of the five monuments located within the existing wind farm site, two relate to archaeological features uncovered during archaeological monitoring of the ground works associated with the construction of the wind farm. The features were either archaeologically excavated at that time or were preserved in situ. In both cases these features do not have any above-ground expression.

The remaining monuments WX022-011001-, WX022-011002- (Moated site and Mound) and WX022-010— (Ringfort) comprise upstanding monuments which have visible above-ground remains. The monuments are not located in close proximity to existing wind farm infrastructure and are situated in agricultural land.

Plate 11.1: Moated site WX022-011001- and mound WX022-011002-, looking N.

Plate 11.2: View of Ringfort – rath WX022-010—, looking S.

11.3.1.1.4 Recorded Monuments within 2km of Turbines

Seventeen recorded monuments are located within 2km of the nearest turbines and include the five monuments located within the existing wind farm site as discussed above. This comprises a relatively low density of monuments within the surrounding landscape (within 2km) of the existing turbines. The monuments are listed in Table 11.3 and shown on Figure 11.4.

Table 11.3: SMRs within 2km of the existing turbines.

SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
WX022-032––	720243	643662	Excavation - miscellaneous	BALLINOULART	T20	39
WX022-031––	719050	644360	Burnt mound	BALLYWATER LOWER	T3	123
WX022-011001-	719905	643873	Moated site	BALLINOULART	T19	176
WX022-011002-	719887	643856	Mound	BALLINOULART	T19	179
WX022-010––	718876	644185	Ringfort - rath	BALLYWATER LOWER	T3	222
WX022-006––	719420	645240	Castle - tower house	PEPPARDSCASTLE	T7	484
WX022-009––	718093	643730	Cross	KILLANNADUFF	T3	1074
WX022-008––	717909	643832	Cross	RAHEENLUSK	T3	1171
WX017-020––	721722	646838	Ringfort - rath	CAHORE	T22	1346
WX022-007––	717436	644552	Ringfort - unclassified	RAHEENLUSK	T3	1505
WX022-015––	718440	642757	Ringfort - unclassified	DUNDRUM	T9	1607
WX022-005––	717358	645263	Castle - motte	BARNAREE	T3	1796
WX022-003002-	717587	645600	Ritual site - holy well	GLEBE (Gorey By., Ford ED)	T3	1804
WX017-013––	720822	647692	Moated site	SEAVIEW	T21	1858
WX022-003001-	717480	645580	Church	GLEBE (Gorey By., Ford ED)	T3	1872

SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
WX022-003003-	**717480**	**645580**	**Graveyard**	**GLEBE (Gorey By., Ford ED)**	**T3**	**1872**
WX022-016– –	718130	642620	Ringfort - unclassified	DUNDRUM	T9	1902

The Prehistoric Period

Two of the monuments located within 2km of the existing turbines date to the prehistoric period and comprise the burnt mound and miscellaneous excavation carried out within the wind farm site and discussed above in Section 11.3.1.1.4.

The Early Medieval Period

Five monuments within 2km of the existing turbines date to the early medieval period and comprise ringforts. Ringforts are a roughly circular or oval area surrounded by an earthen bank with an external fosse. Some examples have two (bivallate) or three (trivallate) banks and fosses, but these are less common and have been equated with higher status sites belonging to upper grades of society. They functioned as residences and/or farmsteads and broadly date from 500 to 1000 AD.

One of the five ringforts is located within the existing wind farm site, while the others are located between 1.3km and 1.9km from the nearest existing turbine.

The Medieval Period

Four monuments dating to the medieval period are located within 2km of the existing turbines and comprise two moated sites (one of which is located within the wind farm site), a motte and a tower house. Tower houses were a later development, primarily dating to the 15th and 16th centuries. They comprise a fortified residence in the form of a tower, usually four or five storeys high, and for the most part slightly more rectangular than square in plan. They were constructed by a lord or landholder and were often partially or completely enclosed by a bawn. The majority date to the 15th and 16th centuries AD. Bawns consist of a courtyard of a medieval house, tower house or fortified house (12th - 17th centuries AD). There are some instances where the bawn survives but the building it was constructed to defend does not.

Moated sites comprise a square, rectangular or occasionally circular area, sometimes raised above the ground, enclosed by a wide, often water-filled, fosse, with or without an outer bank and with a wide causewayed entrance. They date to the late 13th/early 14th centuries and were primarily fortified residences/farmsteads of Anglo-Norman settlers though they were also built by Gaelic lords.

Mottes comprise an artificial, steep-sided, earthen mound on or in which is set the principal tower of a castle. Constructed by the Anglo-Normans in the late 12th and early 13th century AD.

Sites with religious or ritual association

Five monuments with religious associations are located within 2km of the existing turbines and comprise two crosses, a church, graveyard and holy well. The Church, graveyard and well are all located in association with each other at Glebe townland, c. 1.8km from the nearest turbine, T3. They can be of any date from c. 500 AD onwards.

Holy wells comprise a well or spring, though in some unusual cases a natural rock basin, which usually bears a saint's name and is often reputed to possess miraculous healing properties. They may have their origins in prehistory but are associated with devotions from the medieval period (5th-16th centuries AD) onwards. Holy trees are often found in association with holy wells. They comprise a named tree or bush, sometimes associated with a particular saint, often considered to have miraculous properties. They are generally found in close proximity to holy wells and formed part of the associated patterns or rounds performed on certain days. They are known in Irish as 'bile', which translates as sacred tree, sometimes corrupted into the English words 'bell' or bellow'.

Figure 11.3: Recorded monuments within the existing wind farm site.

Figure 11.4: Recorded monuments within 2km of the existing turbines.

11.3.1.1.5 Archaeological Investigations undertaken within the Proposed Development Site

The Proposed Development site is located within the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, and Templederry, Co. Wexford. The database of excavations carried out in Ireland contains details regarding licensed excavations undertaken between 1985 and 2024. The following was noted within the database from the aforementioned townlands and comprises a summary of the monitoring and excavation carried out during the construction stage of the existing wind farm.

2004:1790 - BALLYWATER, Wexford
County: Wexford Site name: BALLYWATER
Sites and Monuments Record No.: N/A Licence number: 04E0871
Author: Catherine McLoughlin, Stafford McLoughlin Archaeology
Site type: Pit and Cultivation ridges
Period/Dating: Multi-period
ITM: E 718352m, N 644020m
Monitoring was carried out at the above development site in response to planning conditions. The development is a wind farm and the site contains the remains of a moated site, SMR 22:10, and an enclosure, SMR 22:11. Several areas of archaeological activity were uncovered, most notably the remains of a truncated burnt mound and a series of pits and furrows. The burnt mound was preserved in situ, as it was located beneath an access road. The area of pits and gullies was excavated, as it was within the footprint of a turbine pad that was located close to the moated site.

Excavation revealed a system of medieval furrows, and pits containing struck flint. A large pit filled with charcoal-rich soil was also excavated in another turbine pad. Struck flint was also recovered from this feature.
Unit 4, Enniscorthy Enterprise Centre, Milehouse Road, Enniscorthy, Co. Wexford

11.3.1.1.6 Topographical Files

The topographical files of the National Museum of Ireland as available on www.heritagemaps.ie was consulted for finds spots on or within the immediate vicinity of the Proposed Development. No finds are registered within the site. The nearest find spot comprises anchors which appear to have been found just off the coast to the east of Oldtown and Newtown townlands.

National Museum Point: Anchors (3)
Name IA/217/2009
Object Type Anchors (3)

11.3.1.1.7 Cartographic Evidence

1st and 2nd Edition OS maps

The Ordnance Survey came to Ireland in 1824 in order to carry-out a precise admeasurement of the country's 60,000 or so townlands as a preliminary to the larger task of reforming Ireland's local taxation system. The townland boundaries were demarcated by a Boundary Commission, and the Ordnance Survey had the task of measuring them. In addition to boundaries the maps are truly topographical in content. Drawn at the large scale of six inches-to-one-mile (1:10,560) it was important to mark all buildings, roads, streams, placenames, etc, that were required for valuation purposes. Ultimately the maps were used as a basis for the rateable valuation of land and buildings in what became known as Griffith's Valuation. Working from north to south, the survey began in Antrim and Derry in 1829 and was completed in Kerry in 1842. It was published as thirty-two county maps between 1832 and 1846, the number of sheets per county varied from 153 for County Cork to 28 for Dublin, each of the 1,994 sheets in the series depicting an area 21,000 by 32,000 feet on the ground. Each county was projected on a different central meridian and so the maps of adjacent counties do not fit neatly together at the edges. Map content stops at the county lines.

The First Edition (6 inch Historic OS)

The early Ordnance Survey maps are an unrivalled source for the period immediately before the Great Irish Famine (1847-50) when the population was at the highest level ever recorded. The first edition OS map for the Proposed Development depicts it as largely comprising agricultural land divided into fields (Figure 11.5). The moated site (WX022-011001-) is clearly depicted, as is the ringfort (WX022-010—) further to the west. Centrally positioned within the existing wind farm site is Ballywater House and its associated demesne which is indicated as a shaded area surrounding the house and garden (Figure 11.6). T8 and T12 are located within the demesne. While the house is still extant (see Section 11.3.1.2 below), the demesne or other original features associated with the house are no longer distinguishable from the surrounding farmland.

The Second Edition (25 inch Historic OS)

The 25 inch OS map also indicates and names Ballywater House which is now shown with outbuildings to the rear (east). The garden depicted on the earlier first edition map is no longer shown (Figure 11.7). No other features or note are depicted.

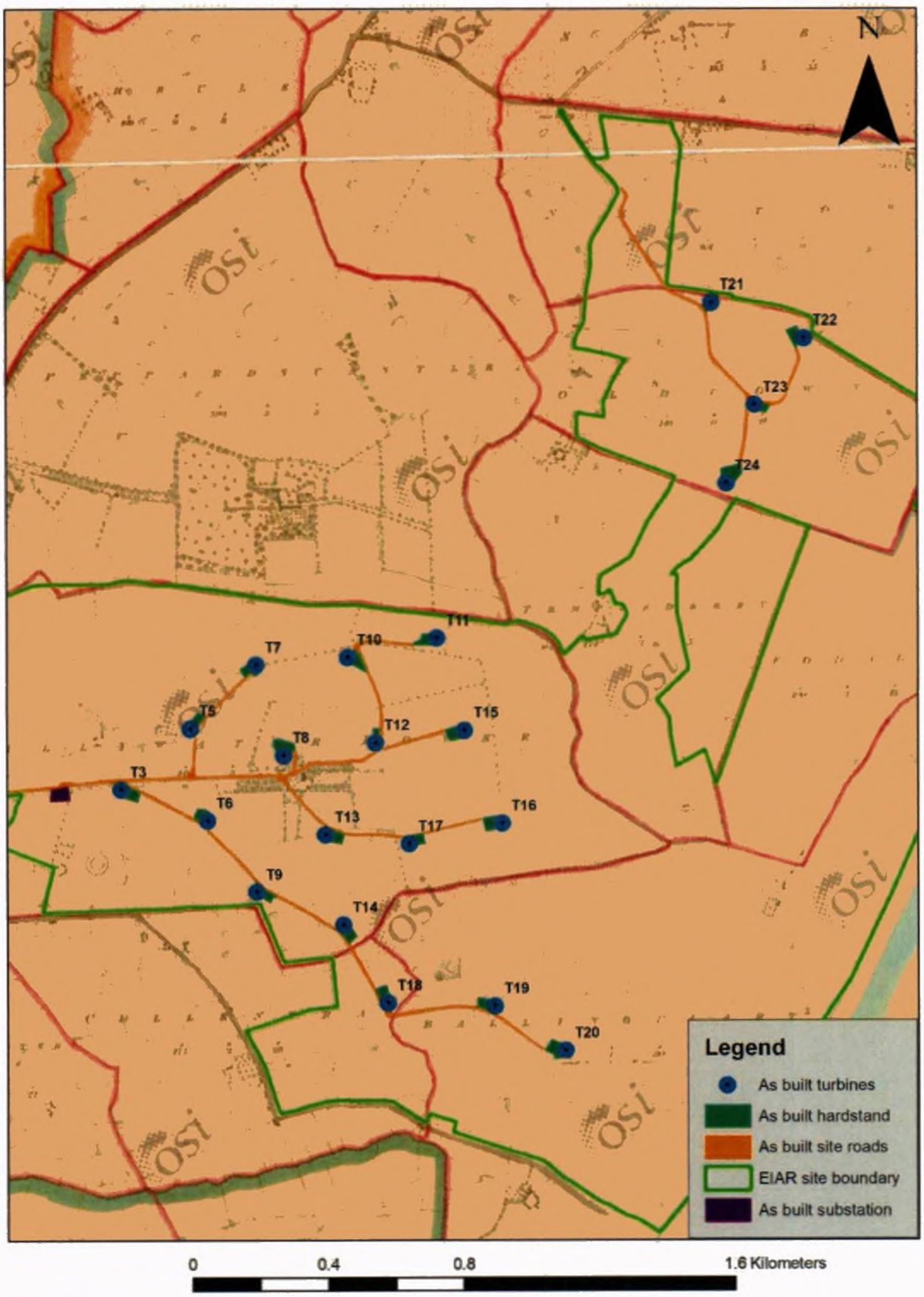


Figure 11.5: Existing wind farm site on first edition OS background.

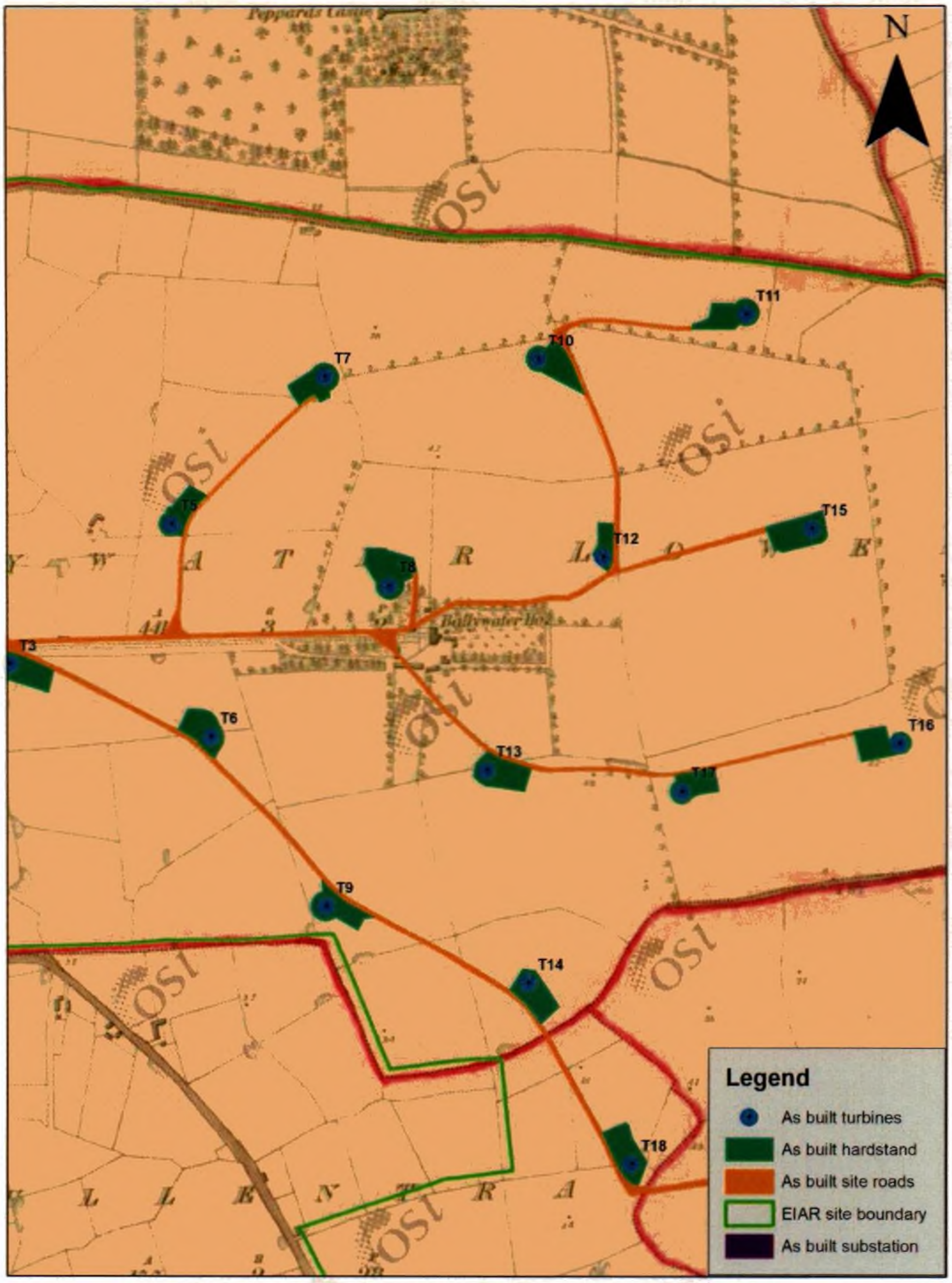


Figure 11.6: Ballywater House, garden and demesne as depicted on first edition OS map in relation to existing wind farm.

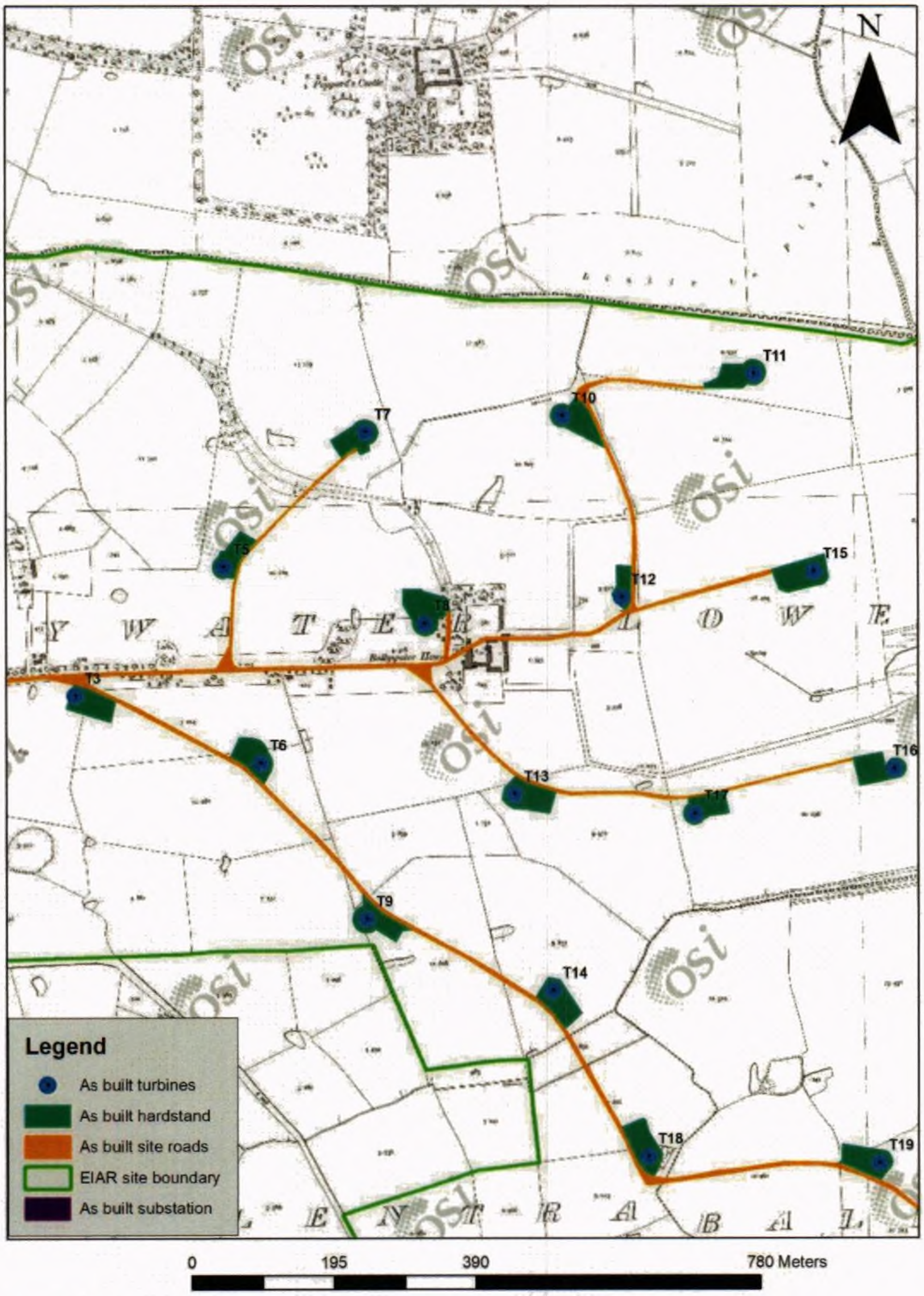


Figure 11.7: Ballywater House as depicted on the second edition OS map in relation to existing wind farm site.

11.3.1.2 Architectural and Cultural Heritage

11.3.1.2.1 Protected Structures and NIAH within the Project Site Boundary

One Protected Structure and two NIAH structures are located within the Project EIAR boundary. The Protected Structure comprises Ballywater House (Ref. WCC0663) and is also listed in the NIAH (Reg. 15702205) (Figure 11.8). The second NIAH structure is situated just within the EIAR site boundary at the NE side of same and comprises a stone road bridge (Reg. 15702206) (Figure 11.9). Ballywater House is upstanding and is now located within a working farmyard. The window openings are now blocked with board painted to resemble windows. The structures are described as follows:

STABLE, WEXFORD Reg No. 15702206

Description

Single-arch hump back road bridge over channel, extant 1840. Coursed rubble stone walls with lichen-spotted rubble stone soldier course coping to parapets. Single segmental arch with lichen-spotted voussoirs. Sited spanning channel with unkempt banks to channel.

Appraisal

A bridge representing an integral component of the civil engineering heritage of County Wexford: meanwhile, a largely weathered benchmark remains of additional interest for the connections with cartography and the preparation of maps by the Ordnance Survey (established 1824).

Plate 11.3: Bridge NIAH Reg. 15702206 (Photo courtesy of www.buildingsofireland.ie).

Ballywater House, BALLYWATER LOWER, WEXFORD Reg No. 15702205

Description

Detached six-bay two-storey farmhouse, extant 1898, on a T-shaped plan with two-bay (two-bay deep) two-storey projecting end bay; eight-bay two-storey lower parallel range along rear (east) elevation. Occupied, 1911. Sold, 1930. Resold, 1961. Resold, 1973. Reroofed, —. Now disused. Replacement hipped fibre-cement slate roof on a T-shaped plan overhanging replacement hipped fibre-cement slate roof (east), lichen-covered ridge tiles, cement rendered chimney stacks having concrete capping supporting yellow terracotta tapered pots, and uPVC rainwater goods on timber eaves boards on slightly overhanging box eaves retaining cast-iron downpipes. Tuck pointed coursed rubble limestone walls with red brick flush quoins to corners. Square-headed off-central door opening with red brick block-and-start surround framing glazed timber double doors having sidelights. Square-headed window opening in tripartite arrangement (first floor) with cut-granite sills, and red brick block-and-start surround framing timber casement window having fixed-pane sidelights. Square-headed window *openings in bipartite arrangement with cut-granite sills, remains of engaged colonette-detailed timber mullions, and red brick block-and-start surrounds framing one-over-one (ground floor) or two-over-two (first floor) timber sash windows. Square-headed window openings to rear (east) elevation with cut-granite sills, and red brick block-and-start surrounds framing three-over-six timber sash windows without horns. Set in unkempt grounds.*

Appraisal
A farmhouse representing an integral component of the later nineteenth-century domestic built heritage of County Wexford with the architectural value of the composition, one refronting an eighteenth-century house (1786) displaying an alternative footprint on the first edition of the Ordnance Survey (surveyed 1840; published 1841), suggested by such attributes as the asymmetrical frontage off-centred on a somewhat featureless doorcase; the construction in '[a] dark slatey limestone with brick dressings' producing a pleasing palette (Craig and Garner 1975, 55); the diminishing in scale of the openings on each floor producing a graduated visual impression with those openings showing elegant bipartite glazing patterns; and the slightly oversailing roofline. A prolonged period of unoccupancy notwithstanding, the elementary form and massing survive intact together with quantities of the original fabric, both to the exterior and to the interior, including some crown or cylinder glazing panels in hornless sash frames, thus upholding much of the character or integrity of a farmhouse having historic connections with the Pounden family including Reverend Patrick Colley Pounden (d. 1847); John Colley Pounden (1827-98), 'late of Ballywalter [sic] County Wexford (Calendars of Wills and Administrations 1899, 403; cf. 15701723); Patrick Colley Pounden MB (1861-1902), 'Gentleman Farmer late of Ballywalter [sic] Gorey County Wexford' (Calendars of Wills and Administrations 1902, 392); and Captain John Colley Pounden (—), 'MD [and] Farmer' (NA 1911).

Plate 11.4: Ballywater House Reg. 15702205.

Figure 11.8: Ballywater House RPS Ref. WCC0663 and NIAH Reg. 15702205 within the existing wind farm site.

Figure 11.9: NIAH reg. 15702206 within EIAR site boundary.

Figure 11.10: RPS structures within 2km of the existing turbines.

11.3.1.2.2 Protected Structures within 2km of Turbines

Eight Protected Structures are located within 2km of the existing turbines, and includes Ballywater House which is situated within the existing Wind Farm site. The structures are listed in Table 11.4 and shown on Figure 11.10. All of the Protected Structures are also included in the NIAH (See below).

Table 11.4: Protected Structures within 2km of the existing turbines.

RPS	NIAH	TYPE	ITM E	ITM N	Turbine No.	Distance (m)
WCC0663	15702205	Ballywater House	719470	644434	T8	87
WCC0704	15702202	Peppard's Castle Country House	719405	645229	T7	470
WCC1137	15701726	Farmhouse	719609	646484	T21	1247
WCC1133	15701723	Saint Patrick's Church	719566	646548	T21	1317
WCC1146	15701727	Farmhouse	720875	647179	T21	1355
WCC1143	15701734	Coastguard station	721871	647192	T22	1724
WCC0922	15701722	Thatched House	719939	647621	T21	1928
WCC1134	15701711	Farmhouse	718159	646317	T7	1946

11.3.1.2.3 NIAH within 2km of Turbines

Thirteen NIAH structures are located within 2km of the existing turbines and include Ballywater House which is located within the existing Wind Farm site. The structures are listed in Table 11.5 and shown on Figure 11.11. Five historic gardens are located within 2km of the existing turbines and include one within the wind farm site which is associated with Ballywater House. The historic garden at Ballywater is no longer extant with no original features other than the house currently visible. The gardens are listed in Table 11.6 below.

Table 11.5: NIAH structures within 2km of the existing turbines.

Reg. No.	TYPE	Date from-to	Townland	ITM E	ITM N	Turbine No.	Distance (m)
15702205	farm house	1842 to 1898	BALLYWATER LOWER	719476	644444	T8	84
15702202	country house	1755 to 1765	PEPPARDSCASTLE	719412	645236	T7	479
15702206	bridge	1700 to 1840	BOG AND WARREN, CAHORE, NEWTOWN (Ballaghkeen	721566	646250	T22	803

Reg. No.	TYPE	Date from-to	Townland	ITM E	ITM N	Turbine No.	Distance (m)
			By., Cahore ED), STABLE				
15702203	gates/railings/walls	1755 to 1840	PEPPARDSCASTLE	718513	645402	T5	1035
15701726	farm house	1842 to 1885	CLONEVIN	719612	646488	T21	1247
15701725	RIC barracks	1842 to 1901	CLONEVIN	719698	646720	T21	1316
15701723	church/chapel	1840 to 1845	CLONEVIN	719569	646552	T21	1317
15701727	farm house	1700 to 1789	SEAVIEW	720875	647179	T21	1354
15701724	rectory/glebe/vicarage/curate's house	1840 to 1885	CLONEVIN	719602	646665	T21	1355
15701734	coastguard station	1842 to 1901	CAHORE	721872	647187	T22	1720
15701739	farm house	1800 to 1839	CAHORE	722100	647089	T22	1777
15701722	farm house	1700 to 1748	GERRY	719939	647621	T21	1928
15701711	country house	1820 to 1825	CLONGANNY	718163	646318	T7	1944

Table 11.6: Historic gardens located within 2km of the existing turbines.

Site Name	ITM E	ITM N	Turbine No.	Distance (m)
Ballywater House	719524	644445	T8	124
Peppard's Castle	719424	645245	T7	490
Seaview House	720824	647145	T21	1314
Kilmichael House	721324	647245	T21	1548
Clonganny House	718124	646345	T7	1989

Figure 11.11: NIAH structures and historic gardens within 2km of the existing turbines.

11.3.1.2.4 Cultural Heritage Items

No new sites or cultural heritage features either of local or regional importance were recorded during the site inspection of the existing Wind Farm site or during the review of the available historic mapping.

11.3.2 Underground Grid Connection

11.3.2.1 Archaeological Heritage

11.3.2.1.1 National Monuments

No National Monuments or those subject to a Preservation Order are located within 100m of the existing Underground Grid Connection route.

11.3.2.1.2 Recorded Monuments

Six recorded monuments are located within 100m of the existing Underground Grid Connection route (the 'grid connection'). They are listed in Table 11.7 and shown on Figure 11.12. Three of the monuments at Tinnacross townland are located in association with each other and comprise a roadside ecclesiastical enclosure, a bullaun stone and the site of a church. The grid connection extends through the Zone of Notification (ZoN) for these monuments. The ringfort WX022-004— at Coolatrindle no longer has any above-ground remains, however, it is depicted on the first edition OS map as an oval enclosure immediately south of the public road. The grid connection extends through the ZoN for this monument. Further to the east the motte (WX022-005—) is situated to the south-west of the public road along which the existing grid connection extends. The latter also extends through the north-east portion of the ZoN for this monument. The monuments are described on the HEV as follows:

Table 11.7: Recorded monuments within 100m of the existing Underground Grid Connection

SMR	TOWNLAND	TYPE	ITM E	ITM N	Distance To UGC (m)
WX020-005003-	TINNACROSS	Bullaun stone	702662	644513	8
WX020-005001-	TINNACROSS	Church	702662	644513	8
WX021-050—	TOBERGAL	Bullaun stone (present location)	707283	645948	22
WX020-005002-	TINNACROSS	Ecclesiastical enclosure	702663	644550	38
WX022-004—	COOLATRINDLE	Ringfort - unclassified	716918	645297	45
WX022-005—	BARNAREE	Castle - motte	717358	645263	53

WX020-005001- : Church : TINNACROSS
Description: Described as the site of Kildenis church on the 1839 and 1940 eds of the OS 6-inch map, and located on the NW-facing slope of a slight NE-SW spur of Ballydonigan Hill, the summit of which is c. 1.5 km to the ENE. This is a D-shaped grass-covered area (dims 40m NE-SW; 30m NW-SE) with some trees defined by a scarp SW–NE, with portion of a bank at NE. A vegetation change (Wth at SW: 5.5m) at the base of the scarp may indicate a silted fosse but the site is truncated by a NE-SW road at SE. There is no visible evidence of a church at ground level and there is no evidence of burial. A bullaun stone (dims 0.83m x 0.45m; H 0.5m) within a single basin (dims 0.32m x 0.26m; D 0.2m) is at the centre of the enclosure.
The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore. Date of upload/revision: 31 May, 2012.

WX020-005002- : Ecclesiastical enclosure : TINNACROSS
Description: Indicated as a D-shaped enclosure on the 1839 ed. of the OS 6-inch map, and located on the NW-facing slope of a slight NE-SW spur of Ballydonigan Hill, the summit of which is c. 1.5 km to the ENE. This is a D-shaped grass-covered area (dims 40m NE-SW; 30m NW-SE) with some trees defined by a scarp SW–NE with portion of a bank at NE. A vegetation change (Wth at SW: 5.5m) at the base of the scarp may indicate a silted fosse but the site is truncated by a NE-SW road at SE. There is no visible evidence of a church (WX020-005001-) at ground level but a bullaun stone (WX020-005003-) was at the centre of the enclosure.
Compiled by: Michael Moore. Date of upload: 31 May, 2012.

WX020-005003- : Bullaun stone : TINNACROSS
Description: Described as the site of Kildenis church on the 1839 and 1940 eds. of the OS 6-inch map, and located on the NW-facing slope of a slight NE-SW spur of Ballydonigan Hill, the summit of which is c. 1.5 km to the ENE. There is no visible evidence of a church (WX020-005001-) at ground level but there is a bullaun stone (dims 0.83m x 0.45m; H 0.5m) within a single basin (dims 0.32m x 0.26m; D 0.2m) at the centre of the ecclesiastical enclosure (WX020-005002-).
Compiled by: Michael Moore. Date of upload: 31 May, 2012.

WX021-050— : Bullaun stone (present location) : TOBERGAL
Description: A green stone (dims 0.85m plus x 0.8m; T 0.1-0.22m) with a single basin (diam. 0.42-00.45m; D 0.1-0.13m) in its upper surface is built on top of the wall of the graveyard at St Cormac's Roman Catholic Church in Boleyvogue just beside the entrance pier. It had been lying in a bog near the site of Kilcormick medieval parish church (ME021-010001-), from which it was recovered and placed in its present position in 1934 (IFC: Schools' MSS Volume 0890, 102). It was first reported by Owen Dunbar.
Compiled by: Michael Moore. Date of upload: 17 April 2023.

WX022-004— : Ringfort - unclassified : COOLATRINDLE
Description: Marked as an oval embanked enclosure (ext. dims. c. 60m N-S; c. 50m E-W) on the 1839 ed. of the OS 6-inch map, and situated on the crest of a slight W-E spur. Nothing is visible at ground level in pasture.
The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore. Date of upload/revision: 15 June 2012.

WX022-005— : Castle - motte : BARNAREE
Description: Described as the 'Moat of Kiltriske' in the Civil Survey (1654-6) description of the boundary of Donaghmore parish (Simington 1953, 41), and situated on a low E-W ridge. This is a flat-topped earthen mound (diam. of top 12m; diam. of base 20m; H 1.5–1.8m) with some trees. The top is defined by a slight bank (Wth 3m; int. H 0.3m) and there are slight traces of a fosse (Wth 3m) at the base on the E side. Kiltrisk church site (WX022-003001-) is c. 330m to the NNE.

The above description is derived from the published 'Archaeological Inventory of County Wexford' (Dublin: Stationery Office, 1996). In certain instances the entries have been revised and updated in the light of recent research. Compiled by: Michael Moore. Date of upload/revision: 15 June, 2012.

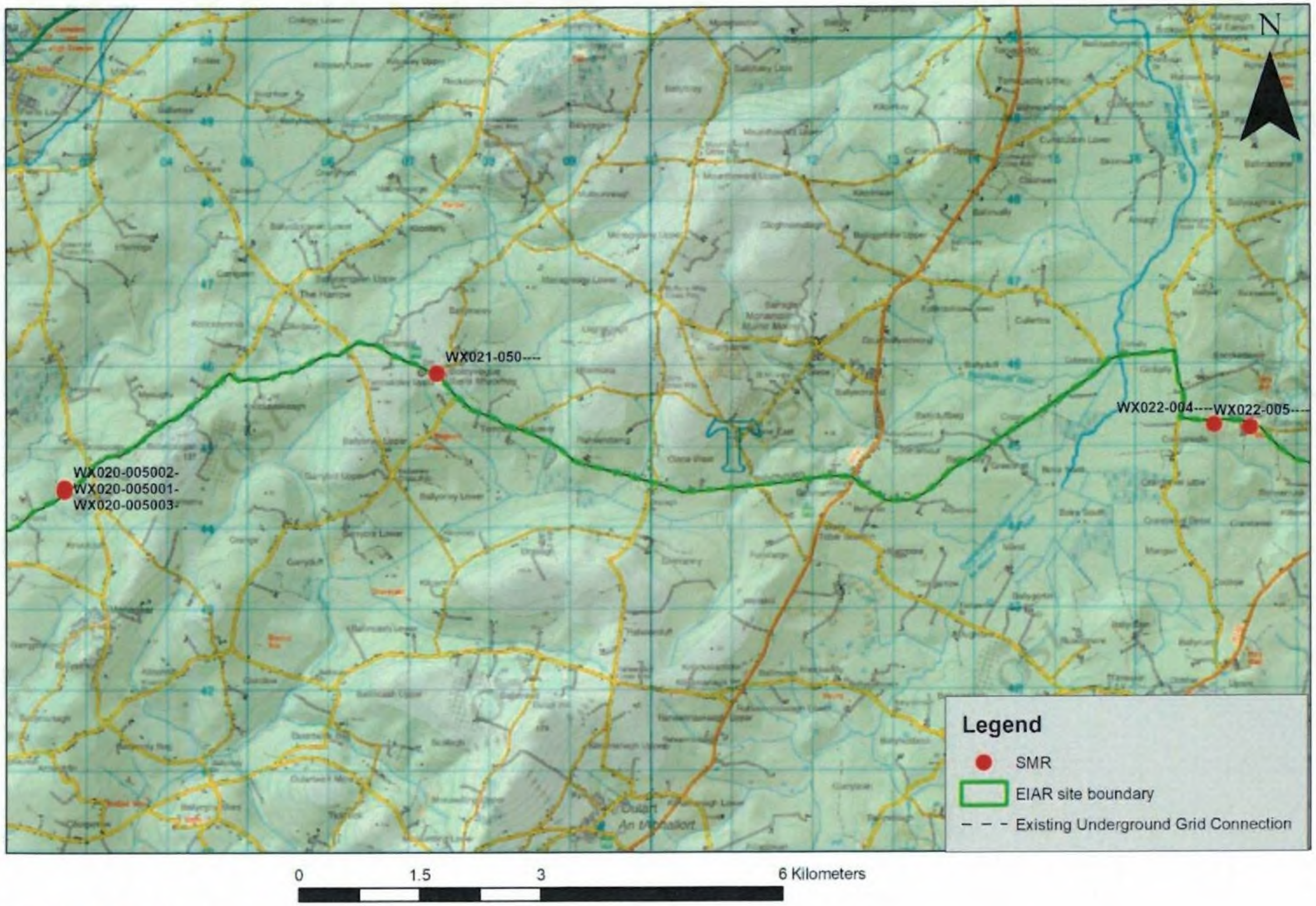


Figure 11.12: Recorded monuments within 100m of the existing Underground Grid Connection.

Figure 11.13: Existing Underground Grid Connection in relation to ZoN around recorded monuments WX020-005001-003.

Figure 11.14: Existing Underground Grid Connection in relation to ZoN around recorded monuments WX022-004— and WX022-005—.

11.3.2.2 Architectural Heritage

11.3.2.2.1 Protected Structures

Four Protected Structures are located within 100m of the grid connection (Figure 11.15). The structures are also included in the NIAH (see below). They all comprise roadside monuments and are not located directly on the grid connection.

Table 11.8: Protected Structures within 100m of the existing Underground Grid Connection.

RPS	NIAH	TYPE	ITM E	ITM N	Distance To UGC (m)
WCC1130	15702102	1798 Monument, Saint Cormac's Catholic Church	707305	645947	30
WCC1131	15702101	Saint Cormac's Catholic Church	707277	645969	37
WCC1120	15702037	Detached four-bay farmhouse with half-dormer attic	703761	645325	61
WCC0899	15702125	Thatched Farmhouse	711860	644556	92

11.3.2.2.2 NIAH

Five structures listed in the NIAH are located within 100m of the grid connection (Figure 11.16). They comprise the four Protected Structures as listed above, in addition to a farmhouse (Reg. 15701610). The descriptions of the structures as provided on www.buildingsofireland.ie are provided below.

Table 11.9: NIAH structures within 100m of the existing Underground Grid Connection.

Reg. No.	TYPE	Date from-to	Townland	ITM E	ITM N	Distance To UGC (m)
15702102	monument	1875 to 1880	TOBERGAL	707306	645946	30
15702101	church/chapel	1840 to 1850	TOBERGAL	707278	645969	38
15702037	farm house	1800 to 1840	MYAUGH	703761	645325	61

Reg. No.	TYPE	Date from-to	Townland	ITM E	ITM N	Distance To UGC (m)
15701610	farm house	1845 to 1855	TOBERGAL	706632	646327	76
15702125	farm house	1700 to 1840	BALLYNAMIRE	711859	644555	92

MYAUGH, WEXFORD Reg No. 15702037

Description

Detached four-bay single-storey lobby entry farmhouse with half-dormer attic, extant 1840, on a rectangular plan. Hipped slate roof with clay ridge tiles, red brick Running bond chimney stack having corbelled stepped capping supporting terracotta pot, and cast-iron rainwater goods on rendered eaves retaining cast-iron downpipes. Roughcast battered walls on rendered chamfered plinth with rendered quoins to corners. Square-headed window openings with concrete sills, and rendered block-and-start surrounds centred on keystones framing two-over-two timber sash windows. Set in landscaped grounds.

Appraisal

A farmhouse representing an integral component of the domestic built heritage of County Wexford with the underlying vernacular basis of the composition suggested by such attributes as the compact rectilinear lobby entry plan form; the feint battered silhouette; the uniform or near-uniform proportions of the openings on each floor; and the high pitched roof originally showing a thatch finish according to an entry in the "House and Building Return" Form of the National Census (NA 1901; NA 1911). Furthermore, adjacent "tin roofed" outbuildings (extant 1904) continue to contribute positively to the group and setting values of a self-contained ensemble making a pleasing visual statement in a rural street scene.

Plate 11.5: NIAH Reg. 15702037 (Photo courtesy of www.buildingsofireland.ie).

TOBERGAL, WEXFORD Reg No. 15701610

Description

Detached three-bay two-storey farmhouse, built 1850, on a T-shaped plan; single-bay (two-bay deep) two-storey lower central return (east). Hipped slate roof on a T-shaped plan centred on pitched slate roof (east), clay ridge tiles, paired red brick Running bond central chimney stacks having stringcourses below capping, and remains of cast-iron rainwater goods on slate flagged eaves. Part repointed coursed rubble stone walls originally rendered with hammered granite or limestone flush quoins to corners.

Hipped segmental-headed central door opening with limestone flagged threshold, timber doorcase with monolithic pilasters on cut-granite padstones supporting ogee-detailed cornice on fluted consoles, and clamp kiln red brick block-and-start surround framing replacement timber panelled door having sidelights below fanlight. Square-headed window openings with cut-granite sills, and clamp kiln red brick block-and-start surrounds framing six-over-six timber sash windows behind wrought iron bars. Square-headed window openings (east) with cut-granite sills, and timber lintels framing one-over-one (ground floor) or three-over-six (first floor) timber sash windows. Set in landscaped grounds with rusticated rendered piers to perimeter having roll moulded gabled capping.

Appraisal

A farmhouse representing an integral component of the mid nineteenth-century domestic built heritage of County Wexford with the architectural value of the composition suggested by such attributes as the compact plan form centred on a Classically-detailed doorcase showing a teardrop fanlight; and the very slight diminishing in scale of the widely openings on each floor producing a feint graduated visual impression. Having been well maintained, the form and massing survive intact together with substantial quantities of the original fabric, both to the exterior and to the interior, thus upholding the character of the composition. Furthermore, adjacent "tin roofed" outbuildings (—) contribute positively to the setting a self-contained ensemble making a pleasing visual statement in a sylvan street scene.

Plate 11.6: NIAH Reg. 15701610 (Photo courtesy of www.buildingsofireland.ie).

Saint Cormac's Catholic Church, TOBERGAL, Boleyvogue, WEXFORD Reg No. 15702101

Description

Detached seven-bay double-height Catholic church, built 1842-8; consecrated 1850, on a rectangular plan comprising six-bay double-height nave opening into single-bay double-height chancel (north) with single-bay single-storey gabled projecting porch to entrance (south) front. Renovated, —, with sanctuary reordered. Pitched slate roofs with lichen-covered clay ridge tiles, and cast-iron rainwater goods on slightly overhanging slate flagged eaves retaining cast-iron hoppers and square profile downpipes. Tuck pointed snecked rubble stone walls with hammered granite flush quoins to corners; cement rendered surface finish to entrance (south) front. Lancet window openings with cut-granite sills, and red brick block-and-start surrounds having chamfered reveals framing storm glazing over fixed-pane fittings having stained glass margins centred on square glazing bars. "Rose Window" to chancel (east), cut-granite surround having moulded reveals with hood moulding over on monolithic label stops framing storm glazing over fixed-pane fittings having leaded stained glass panels. Lancet blind openings to "cheeks" with cut-granite sills, and red brick block-and-start surrounds framing tuck pointed snecked rubble stone infill. Interior including vestibule (south); pointed-arch opening into nave with moulded surround; full-height interior with pair of timber panelled confessional boxes (south), carpeted central aisle between trefoil-detailed timber pews, paired Gothic-style timber stations between frosted glass *windows, groin vaulted ceiling with panelled ribs on ogee corbels, and stepped dais to sanctuary (north) reordered, —, with pointed-arch chancel arch framing replacement altar table below stained glass "Rose Window" (—). Set in relandscaped grounds.*

Appraisal
A church representing an important component of the mid nineteenth-century ecclesiastical heritage of County Wexford with the architectural value of the composition, one eliciting fleeting comparisons with the Augustus Welby Northmore Pugin (1812-5)-designed chapel (1838-41) at Saint Peter's College, Wexford (see 15504041), confirmed by such attributes as the rectilinear "barn" plan form, aligned along a liturgically-incorrect axis; the construction in unrefined local fieldstone offset by red brick dressings producing a pleasing palette; and the slender profile of the openings underpinning a "medieval" Gothic theme with the chancel defined by an elaborate "Rose Window". Having been well maintained, the elementary form and massing survive intact together with quantities of the historic or original fabric, both to the exterior and to the vaulted interior reordered (—) in accordance with the liturgical reforms sanctioned by the Second Ecumenical Council of the Vatican (1962-5) where a jewel-like "Rose Window" highlights the modest artistic potential of a church making an imposing visual statement in a rural village setting.

Plate 11.7: NIAH Reg. 15702101 (Photo courtesy of www.buildingsofireland.ie).

Saint Cormac's Catholic Church, TOBERGAL, Boleyvogue, WEXFORD Reg No. 15702102
Description
Freestanding drag edged cut-limestone Celtic High Cross-style monument, dated 1878; unveiled 1878, on lichen-covered cut-granite stepped base. Set in landscaped grounds shared with Saint Cormac's Catholic Church.

Appraisal
A monument erected 'in memory of the REVd FATHER JOHN MURPHY [1753-98] and his heroic followers who nobly shed their blood for Ireland's freedom' (cf. 15702119).

Plate 11.8: NIAH Reg. 15702102 (Photo courtesy of www.buildingsofireland.ie).

BALLYNAMIRE, Ballyedmond, WEXFORD Reg No. 15702125

Description

Detached three-bay single-storey lobby entry thatched farmhouse with dormer attic, extant 1840, on a T-shaped plan centred on single-bay single-storey flat-roofed projecting porch. Reroofed, 1993. Chicken wire-covered replacement hipped oat thatch roof overhanging gablets to window openings to dormer attic with rope twist above paired exposed bamboo stretchers to ridge having exposed wire scallops, red brick Running bond off-central chimney stack having corbelled stepped capping, and paired exposed bamboo stretchers to eaves having exposed wire scallops. Roughcast battered walls. Square-headed central door opening into farmhouse. Square-headed window openings with limewashed sills, and concealed dressings framing timber casement windows. Set in courtyard.

Appraisal

A farmhouse identified as an integral component of the vernacular heritage of Ballyedmond by such attributes as the rectilinear lobby entry plan form; the construction in unrefined local materials displaying a pronounced battered silhouette with sections of "daub" or mud suggested by an entry in the "House and Building Return" Form of the National Census (NA 1901; NA 1911); the disproportionate bias of solid to void in the massing; and the high pitched roof showing a replenished oat thatch finish.

Plate 11.9: Thatched farmhouse Reg. 15702125 (Photo courtesy of www.buildingsofireland.ie).

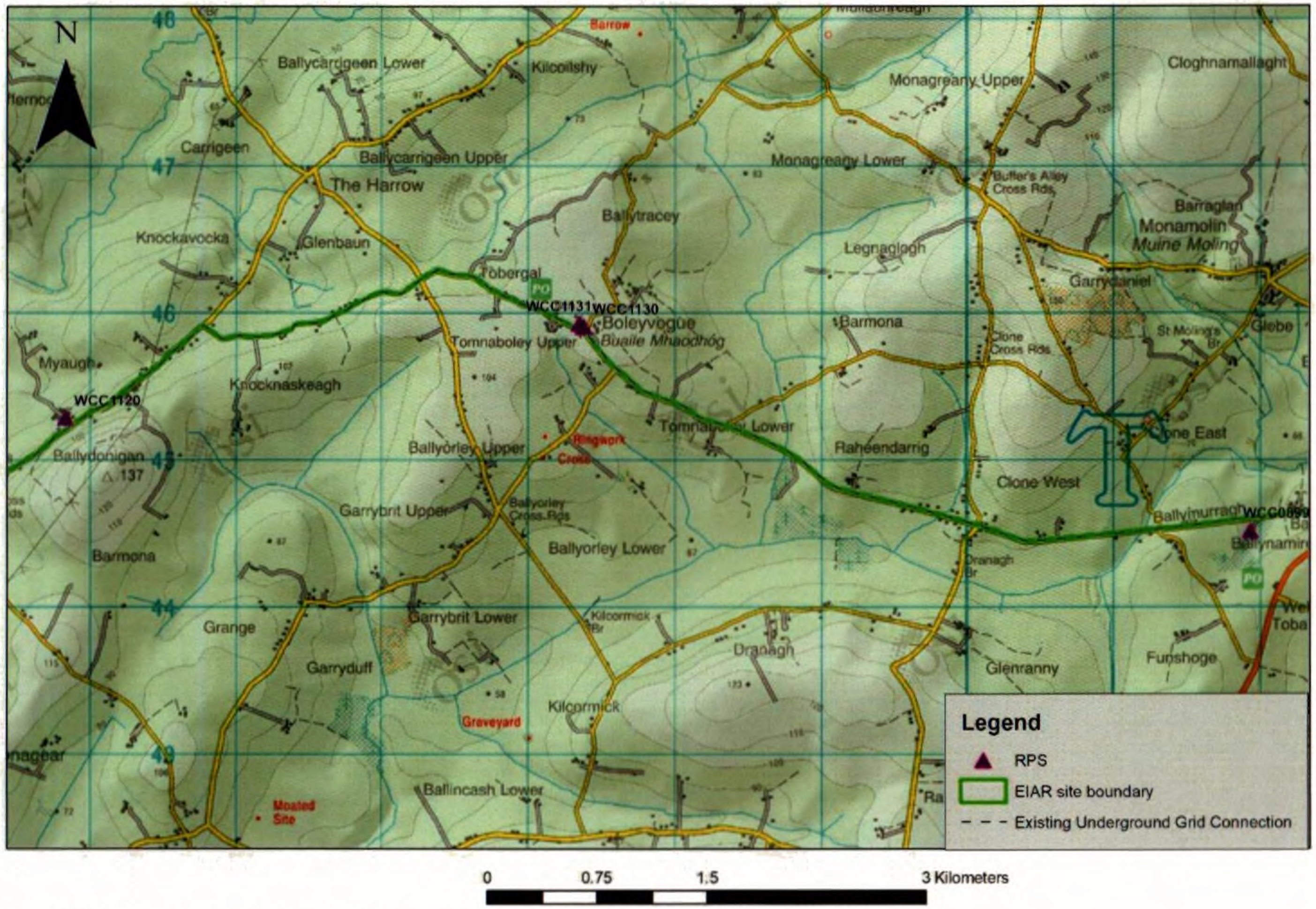


Figure 11.15: Protected Structures within 100m of the existing Underground Grid Connection route.

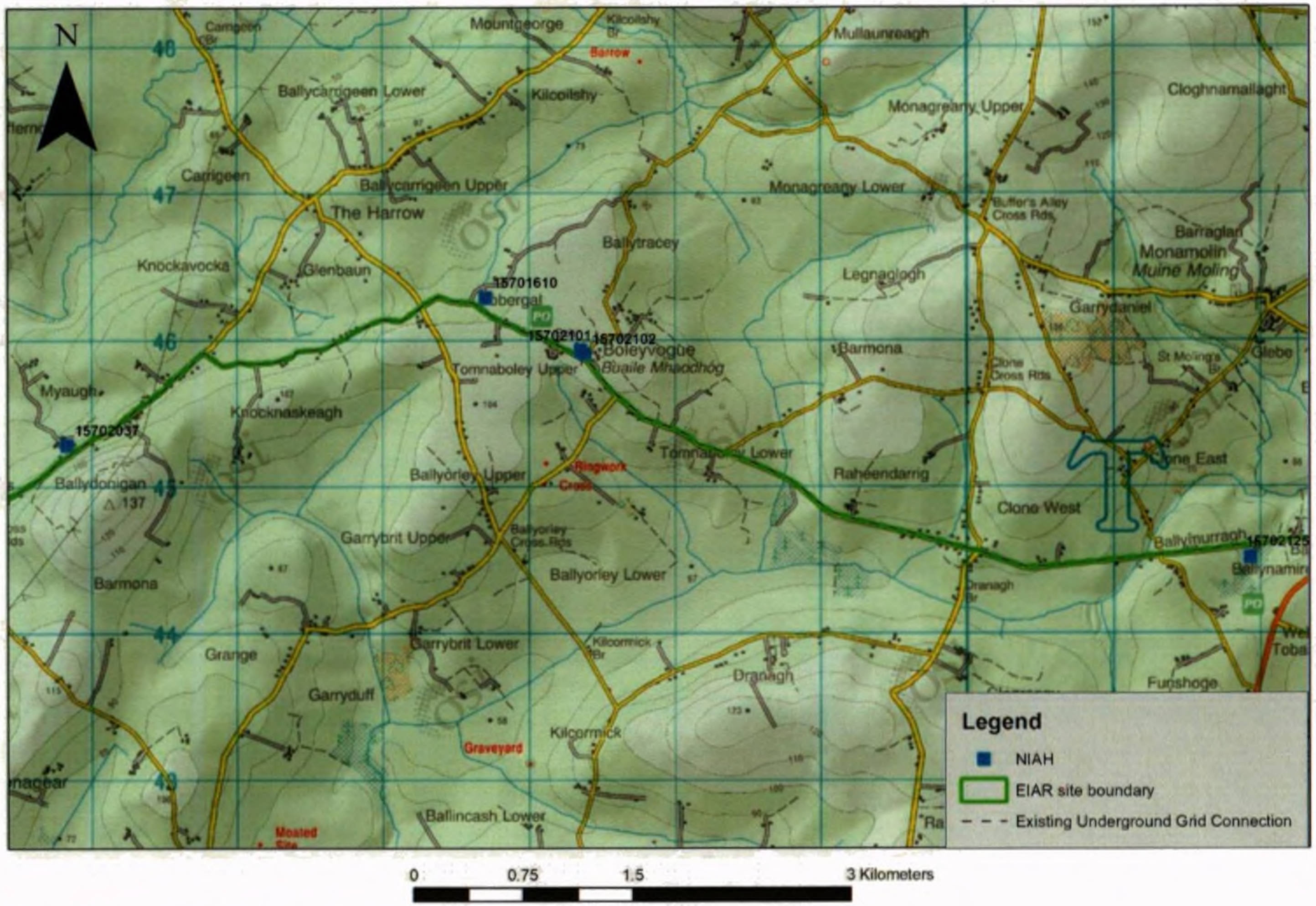


Figure 11.16: NIAH structures within 100m of the existing Underground Grid Connection route.

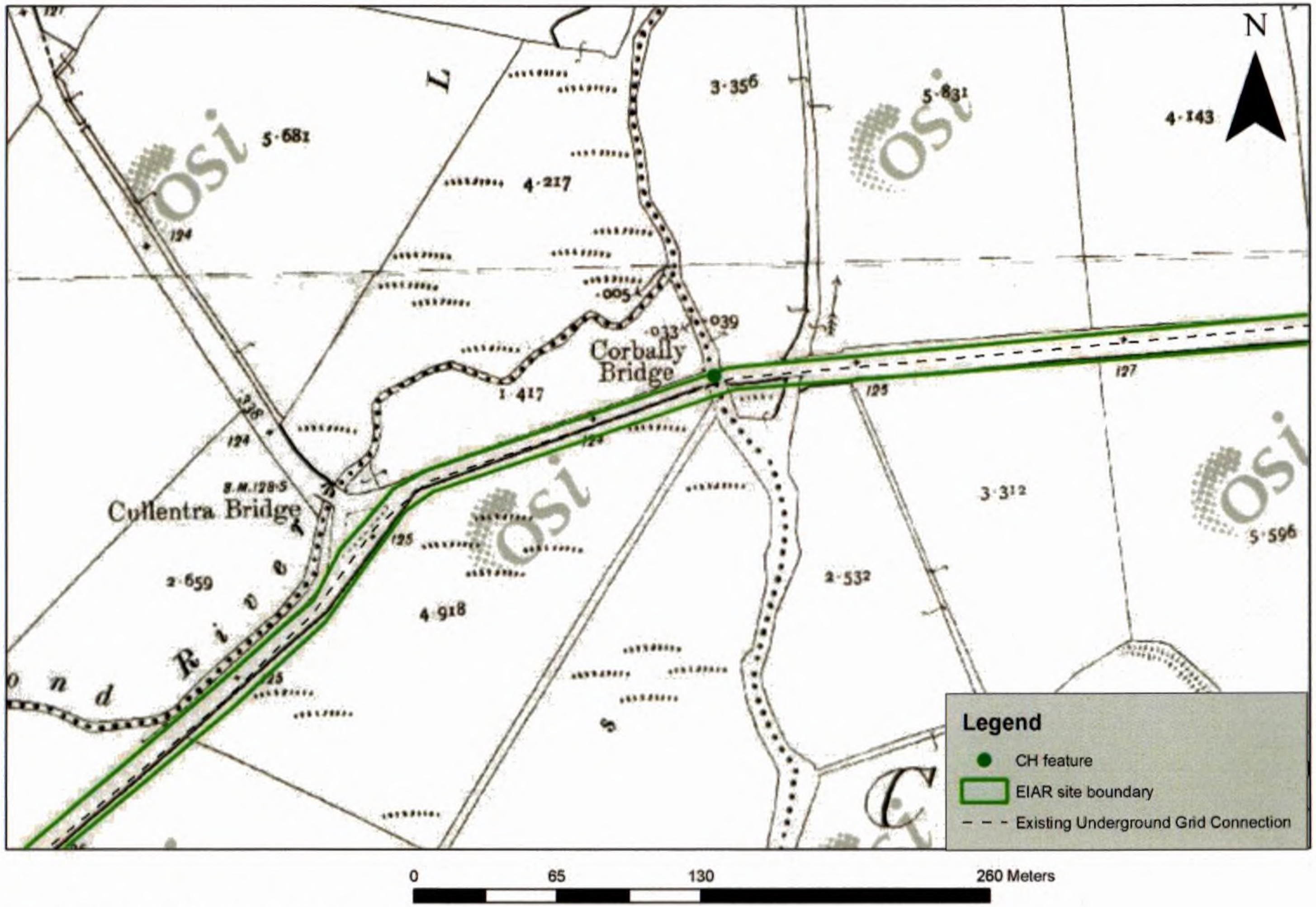


Figure 11.17: Corbally Bridge as indicated on second edition OS map on the existing Underground Grid Connection route.

11.3.2.2.3 Cultural Heritage Items

A review of the available historic mapping identified one cultural heritage feature, CH1, which comprises a road bridge. It is named Corbally Bridge on the second edition OS map (Figure 11.17). It is understood that Horizontal Directional Drilling (HDD) was utilised at all water crossings along the grid connection route.

11.4 Likely Significant Effects and Associated Mitigation Measures

11.4.1 Do Nothing Alternative

Article IV, Part 3 of the EIA Directive states that the EIAR should include "*an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.*" This is referred to as the "*Do-Nothing*" alternative. EU guidance (EU, 2017) states that this should involve the assessment of "*an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario.*"

The 'Do-Nothing' alternative with regard to the Proposed Development, is to decommission the existing wind farm and substation in 2025 when the current permissions expire. As part of the decommissioning stage, the existing turbines and substation would be dismantled, and the site reinstated to its original condition; please see Section 4.7 in Chapter 4 of this EIAR for further details regarding decommissioning. The Proposed Development seeks to extend the operational life of the existing wind farm and substation to 2035, at which stage the wind farm and substation would be decommissioned.

Condition no. 17 of the existing planning permission for Ballywater Wind Farm and by consequence, for the existing Ballywater 110kV Substation states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."*

Similarly, condition no. 13 of the current planning permission states:

> *"This permission shall have a duration of 20 years only. At the end of this period, the proposed use shall cease and the site shall be reinstated to its condition prior to the development taking place unless before the expiration of the period for which this permission is valid permission for its retention for a further period has been granted by the planning authority or by An Bord Pleanála on appeal"* (WCC Pl. Ref. 2001/0458)"

Identification of Effect

The implementation of the 'Do Nothing' alternative for the Proposed Development would mean that the Wind Farm site would be reinstated to its original condition prior to development including removal of all turbine foundations, hardstands and access roads. As outlined above, a number of recorded monuments are located within the Wind Farm site, some of which were detected during archaeological monitoring of ground works associated with the original development. One of these, WX022-031— Burnt mound is located on or immediately adjacent to the access road between T3 and T6 and was preserved in situ meaning that it is still present within the site and was not archaeologically removed at the time. The implementation of the 'Do Nothing' alternative has the potential to directly affect the extant sub-surface remains of this burnt mound, in particular during the removal of the aforementioned access road. In the absence of appropriate mitigation measures a potential direct, negative and permanent effect to the recorded monument is identified.

Residual Effect

The residual effect after the implementation of mitigation measures is regarded as Not Significant.

Significance of Effect

The overall significance of effects is Not Significant.

11.4.2 Construction Phase Potential Effects – Indirect

Indirect effects, in terms of archaeology, architectural and cultural heritage are considered to be those effects which happen away from 'the site'. This includes effects on visual setting of any cultural heritage asset in the wider landscape. Since these effects are only possible after construction activities, they are considered operational effects and are therefore discussed in Section 11.4.4 below. No indirect effects were identified which could occur at the 'construction stage' as no construction activities are proposed (see below).

11.4.3 Construction Phase Potential Effects (Direct)

No construction activities, groundworks or alterations to the existing wind farm are proposed as part of the Project.

Direct effect refers to a 'physical impact' on a monument or site. The construction phase was completed during the initial wind farm construction during which time archaeological monitoring of ground works was undertaken in compliance with the relevant condition of the grant of planning permission. A number of archaeological features were noted within the existing Wind Farm site during monitoring of the works and were either archaeologically excavated (preservation by record) or preserved in situ. Since there are no proposals to alter the footprint of the existing access roads, hardstands or turbines there will be no ground works associated with the Project site. No potential direct effects to the archaeological or architectural heritage resource, including potential sub-surface archaeology will therefore occur.

No construction activities, ground works or alterations to the existing Underground Grid Connection route or the existing Ballywater Wind Farm and Ballywater 110kV Substation are proposed as part of the Project. No archaeological monuments, RPS or NIAH structures are located directly on the existing Underground Grid Connection. The route extends through the ZoN for some monuments located within 100m of same (see Section 11.3.2.1.2 above). The Underground Grid Connection was considered exempted development at the time of construction and archaeological monitoring of ground works did not occur. Direct effects to recorded monuments is unlikely to have occurred given that most are located off road in adjacent agricultural land. There is the potential for direct effects to subsurface remains associated with ecclesiastical enclosure WX020-005002- if such remains extended under the public road along which the existing gird route extends. As no ground works along the existing Underground Grid Connection are proposed as part of the Project, additional direct effects to sub-surface archaeological features, should they exist at this location, will not occur.

At least one stone road bridge (CH1 Corbally Bridge) is located on the existing Underground Grid Connection. It is understood that HDD was utilised at all water crossings along the route. As no ground works along the existing Underground Grid Connection route are proposed as part of the Project, additional direct effects to any bridge structures located along same will not occur.

11.4.4 Operational Phase Potential Effects (Direct)

In terms of direct effects on archaeology, architecture and cultural heritage, since groundworks are already completed as part of the existing wind farm, it is considered that no direct effects would occur at the operational stage.

11.4.5 Operational Phase Potential Effects (Indirect)

The baseline environment consists of the existing wind farm including turbines, existing roads, substation, etc.

Five recorded monuments are located within the existing wind farm site (WX022-032—, WX022-031—, WX022-011001-, WX022-011002- and WX022-010—). Of the five monuments located within the existing wind farm site, two (WX022-032— and WX022-031—) relate to archaeological features uncovered during archaeological monitoring of the ground works associated with the construction of the wind farm. The features were either archaeologically excavated at that time or were preserved in situ. In both cases these features do not have any above-ground expression. The remaining monuments WX022-011001-, WX022-011002- (Moated site and Mound) and WX022-010— (Ringfort) comprise upstanding monuments which have visible above-ground remains. The monuments are not located in close proximity to existing wind farm infrastructure and are situated in agricultural land.

One Protected Structure Ballywater House (WCC0663) which is also included in the NIAH (Reg. 15702205) is located within the existing Wind Farm site at Ballywater Lower, while a second NIAH structure comprising a stone road bridge is located just inside the EIAR site boundary at the NE (see Section 11.3.1.2.1).

The Proposed Development is expected to have a lifespan of 10 years, commencing from the date of expiration of the existing wind farm permission in June 2025. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

No significant operational phase activities are proposed which would require further assessment. The continuation of the operational phase of the wind farm will not arise in any further effects on setting to the Cultural Heritage resource. Cumulative effects on setting are addressed below.

11.4.6 Decommissioning Phase

Decommissioning of the existing wind farm and substation is required to be carried out in June 2025, i.e. 10 years from the grant of permission for 21 no. of the turbines, under the current planning permission. The Proposed Development would extend the operation of the existing wind farm and substation for a further 10 years, thereby postponing decommissioning until 2035.

There are three upstanding recorded monuments within the site which are not located in close proximity to existing wind farm infrastructure. The remaining two monuments relate to sites or features uncovered during archaeological monitoring of the construction phase of the existing wind farm.

As detailed in Section 4.7 in Chapter 4 and in the Decommissioning Plan included as Appendix 4-4, upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling. It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going access and agricultural uses.

Given that minimal works will be required at the decommissioning phase, and it is proposed that the site roads be left in situ, no potential direct effects to the archaeological, architectural or cultural heritage resource are identified and no mitigation is proposed.

11.5 Cumulative Effects

Cumulative effect is defined as *'The addition of many small impacts to create one larger, more significant, impact'* (EPA 2022). Cumulative effects encompass the combined effects of multiple developments or activities on a range of receptors. In this case, the receptors are the archaeological monuments and architectural/cultural heritage sites in the vicinity of the Proposed Development. Cumulative effects at the Construction and Operational Stages are considered. Cumulative effect takes into account other projects (details of which are provided in Chapter 2 of this EIAR).

11.5.1 Cumulative Effects (Direct Effects – Construction stage)

The Project consists of the continued operation of the existing wind farm. All construction works were carried out previously and none form part of the Project. No direct effects were identified during this assessment and therefore if no direct effects were identified, no direct cumulative effects will occur within the EIAR Site Boundary. All potential direct effects were addressed during the construction stage of the existing wind farm. An archaeologist was appointed to monitor all groundworks which sought to identify and protect any existing sites or monuments and potential sub-surface archaeological features within the wind farm site.

The potential **direct** effects arising from other projects would have been dealt with in the same way either through the discharge of mitigation measures outlined in any assessments undertaken or discharge of planning conditions pertaining to archaeology, architectural or cultural heritage. In this regard when the projects are considered together there is no increase in direct cumulative effects.

11.5.2 Cumulative Effects (Indirect)

The operational stage of the Proposed Development will continue in the way that it currently operates. Should the application receive a favourable response from the planning authority, during the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction. Indirect effects on setting occur at the operational stage of the development. No additional activities are being proposed as part of the operational stage of the Proposed Development however, a number of other existing and proposed wind farm developments are located within a 25-kilometre radius of the Proposed Development and are considered cumulatively with the Proposed Development.

No UNESCO World Heritage Sites or those on a Tentative List are located within the Project or within 20km of same. No National Monuments are located within the Project site or within 10km of same. Only one monument subject to a Preservation Order is located within 10km of the existing turbines. Five recorded monuments are located within the EIAR Site Boundary as well as one Protected Structure and, two NIAH structures and a historic garden. Seventeen recorded monuments are located within 2km of the nearest turbines and include the five monuments located within the existing wind farm site. Six recorded monuments, four Protected Structures and five NIAH structures are located within 100m of the existing Grid Connection Route. As no further activities are proposed to occur during the Operational Stage of the Project, no additional cumulative effects to the wider archaeological, architectural and cultural heritage resource are identified as a result of the Project when considered cumulatively with other existing and proposed projects including other wind farms.

11.6 Conclusion

This archaeological, architectural, and cultural heritage chapter was prepared by Tobar Archaeological Services Ltd. It presents the results of an archaeological, architectural and cultural heritage impact assessment for the extension of operation of the existing Ballywater Wind Farm, County Wexford. The application seeks a ten (10) year planning permission for the continuation of the operational life of the existing Ballywater Wind Farm as permitted under the provisions of Wexford County Council (WCC) Pl. Ref 2001/0458 from the date of expiration (June 2025) of the current permissions.

The purpose of this chapter is to assess the potential direct and indirect effects of the Project on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and a site inspection.

As the Project comprises the continued operation of the existing wind farm and no works are proposed at the operational stage, no direct or indirect effects to the archaeological, architectural or cultural heritage resource are identified. Similarly, no additional cumulative effects on this resource are identified as a result of the Project. No potential effect as a result of the proposed decommissioning phase of the Project are identified.

12. LANDSCAPE AND VISUAL

12.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential landscape and visual impacts of the continued operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation. It covers the assessment methodology, a description of the Project and the existing landscape based on relevant guidance. It includes a description of the landscape policy of County Wexford with specific reference to wind energy and the 20km LVIA Study Area (as defined in Section 12.2.1 below) in which the existing Ballywater Wind Farm is located.

The landscape of the area is described in terms of its existing character, which includes a description of landscape values and the landscape's sensitivity to change. The landscape and visual impact assessment of the Proposed Development uses visibility mapping and photos from representative viewpoints. The potential impacts in both landscape and visual terms are then assessed, including cumulative impacts.

It is important to re-iterate that the Proposed Development is an existing facility and has been operational for approximately 19 years to date, with the current planning permission set to expire in June 2025. This EIAR is being prepared in support of a planning application to extend the operational lifespan of the facility beyond 2025, by a further 10 years.

The key component of the Proposed Development with the potential for landscape and visual effects are the 21 No. wind turbines which are currently visible within the landscape. The assessments in this Landscape and Visual Impact Assessment (LVIA) are predominantly informed by the reality of the landscape and visual effects of the existing Ballywater Wind Farm as it is experienced on the ground.

12.1.1 Statement of Authority

MKO has developed extensive expertise and experience over the last 15 years in the Landscape and Visual Impact Assessment of a range of projects, including multiple large scale wind energy developments.

Daniel Mulpeter is an Affiliate Member of the Landscape Institute and an LVIA Specialist with MKO with experience engaging in LVIA assessments for wind energy and public infrastructure. Daniel holds an MSc in Environmental Science from Trinity College Dublin, where he completed his thesis on "Estimating Peat Depth using Gamma-ray Spectrometry and Photogrammetry". Furthermore, he received a BSc (Hons) in General Science, finishing with Applied Maths and Biology. Prior to taking up his position with MKO. Daniel's key strengths include proficiency in GIS tools such as QGIS and ArcGIS, conducting landscape and visual impact assessments, and capturing data through drone surveys and photomontages.

The LVIA was finalised by Jack Workman MSc, TMLI. Jack is member of the British Landscape Institute as a Technician Member (TMLI), and he is the Landscape & Visual Project Director at MKO. He is an Environmental Scientist and LVIA specialist. Jack Workman's primary role at MKO is producing the LVIA chapter of EIA reports for large infrastructure developments. Jack holds an MSc. in Coastal and Marine Environments and a BSc. in Psychology, he is a member of the Landscape Research Group, as well as holding a membership with the Chartered Institute of Water and Environmental Management.

12.1.2 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, the existing turbines and on-site substation will be decommissioned by the end of June 2025, as per the existing permission.

Upon decommissioning of the Proposed Development, the 21 no. turbines would be removed from site. Some of the existing site roads would be left in place as they are currently being used by local landowners to access agricultural lands. The existing hardstands and remaining site roads which will not be re-used will be covered over with a local topsoil and left to reseed. If the Proposed Development were not to proceed, the opportunity to generate renewable energy and electrical supply to the national grid would be lost, as would the opportunity 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.

12.1.3 Proposed Development Description

The Proposed Development comprises an extension of operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation (all elements pre-existing) and is described in detail in Chapter 4 of this EIAR.

For the purposes of the EIAR and the LVIA in this Chapter:

- Where the 'Project' is referred to, this relates to all components which make up the existing Ballywater Wind Farm and are assessed within this EIAR, this is the existing Ballywater Wind Farm, the existing onsite Ballywater 110kV Substation, and the existing 110kV underground grid connection cabling route that connects the electricity generated by the wind farm to the national grid at Crane 110kV electrical substation (as described in Chapter 1 of this EIAR).
- Where the 'Proposed Development' is referred to, this relates to all of the project components which are being proposed under the accompanying planning application, listed in Chapter 4 of the EIAR (as described in Chapter 1 of this EIAR).
- Where the 'existing wind farm and substation' is referred to, this relates to the existing Ballywater Wind Farm and Ballywater 110kV Substation (as described in Chapter 1 of this EIAR).
- The grid connection underground cabling route is assessed as part of this EIAR, it does not form part of the accompanying planning application. The actual site boundary for the purposes of the planning permission application (i.e. Red Line Boundary) occupies a smaller area relative to the EIAR site boundary.

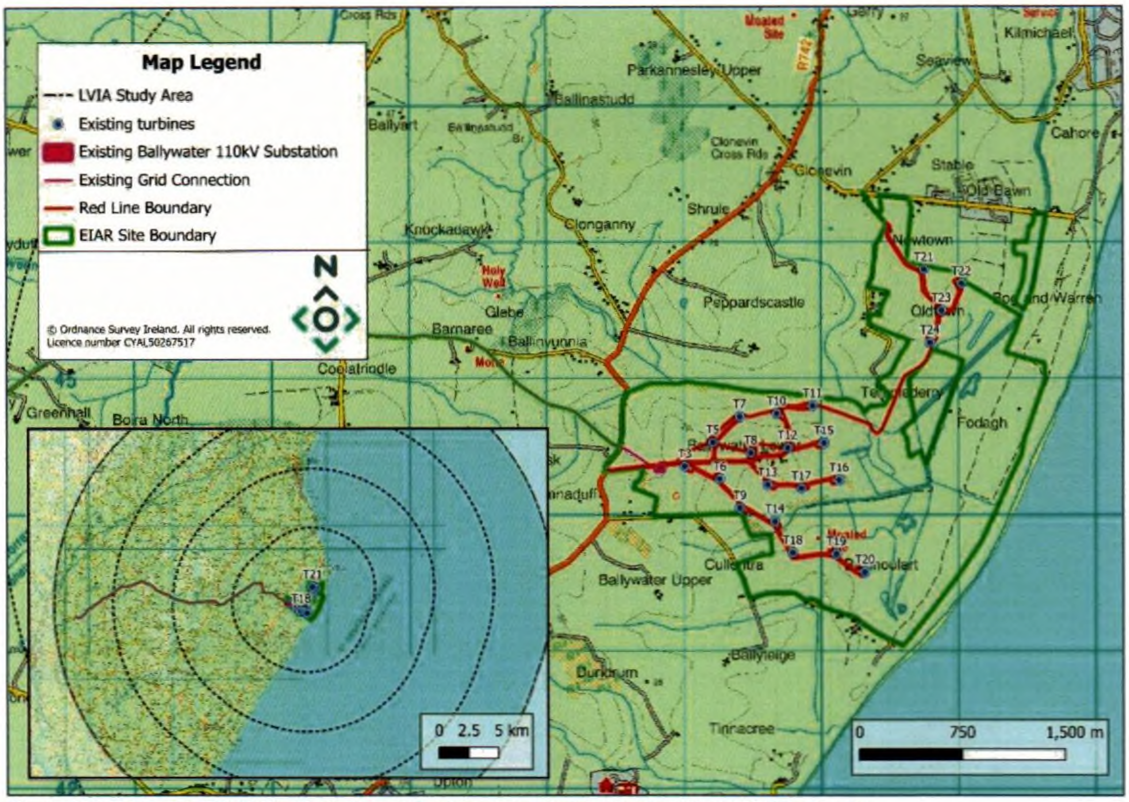


Figure 12-1 Ballywater EIAR Site Boundary and existing wind turbines and existing 110kV substation

12.1.3.1 Essential Aspects of the Proposed Development from an LVIA Perspective

Guidance for LVIA, the Guidelines for Landscape and Visual Impact Assessment (3rd ed., LI & IEMA, 2013) (GLVIA) states:

> *"it is important to make sure that the project description provides all the information needed to identify its effects on particular aspects of the environment. For LVIA it is important to understand, from the project description, the essential aspects of the scheme that will potentially give rise to its effects on the landscape and visual amenity".*

The tall, vertical nature of the turbines make them the most prominent elements of any proposed wind energy development from a landscape and visual perspective and have the most potential to give rise to significant landscape and visual effects. In the context of this Chapter, the 21 no. existing turbines (the existing turbines of the existing Ballywater Wind Farm) are deemed to be the *'essential aspect'* of the Proposed Development which will give rise to potential effects on the landscape and visual amenity and is therefore a primary focus of the LVIA conducted in this chapter.

12.1.3.2 Landscape and Visual Assessment of an Existing Wind Farm

The Proposed Development is an existing wind farm and substation which is built, operational and currently visible in the existing landscape. The assessments in this Chapter are predominantly informed by the reality of the landscape and visual effects of the existing Ballywater Wind Farm as it is currently experienced on the ground. In this regard, the LVIA is mostly reliant on visibility appraisals conducted during site visits and photographic imagery captured from within the surrounding landscape.

As is evident by all photos and visualisations in this Chapter, the proposed extension of operation of the existing Ballywater Wind Farm amounts to little or no change to the existing views of the 21 Ballywater turbines. As detailed in the methodology (See Section 12.2), the term 'Magnitude of Change' is a key factor used to determine impacts. In the context of this assessment, where the turbines already exist in the landscape, the magnitude of the **continued** impact of the turbines is considered. To facilitate the impact assessments, and effectively determine the continued landscape and visual impact of the Proposed Development in the landscape, the magnitude of change was determined by considering the change that would occur against a 'do-nothing scenario' where the turbines would not be visible in the landscape.

A conventional LVIA conducted for a new proposal in the landscape would use other tools of a more theoretical nature such as Zone of Theoretical Visibility (ZTV) Mapping and photomontages. This assessment uses many of the traditional tools used to compile a Landscape and Visual Impact Assessment (LVIA) as these still have relevance to the assessment process by providing context and illustrating the points that are being explained by text. Although the turbines are in place, the ZTV mapping (which will be explained in the Chapter) at a minimum lets the reader know from where the turbines will never be visible. This allows interested parties to focus on the areas and visit the areas where potential visibility may theoretically exist. The ZTV informs visibility appraisals from key sensitive receptors and helps identify key viewpoint locations used for the assessment of visual effects.

Verified photomontages are not required for this LVIA as the turbines exist within the landscape and do not need to be modelled within landscape views. As mentioned previously, the impact assessments are predominantly informed by site visits and photographic imagery captured on the ground. Several representative viewpoints are selected to assess impacts from some of the most prominent receptors where open visibility is evident and there is potential for cumulative landscape and visual effects to occur. In the case of this project, anyone visiting the site, and the surrounding landscape can see the turbines, if visible, from all locations around the site. In this case, the assessment is not reliant on the viewpoints to the extent that it may be for traditional projects where turbines are only proposed.

12.2 Methodology

This section broadly outlines the methodology, and the guidance used to undertake the landscape and visual impact assessment of the Proposed Development. There are five main sections to this assessment:

- Landscape Baseline
- Visual Baseline
- Cumulative Baseline
- Likely and Significant Effects – outlining the assessment of landscape, visual and cumulative effects.

12.2.1 Scope and Definition of the Landscape and Visual Impact Assessment (LVIA) Study Area

This Chapter follows the naming conventions and definitions detailed in Section 1.1 of Chapter 1. For the purposes of this chapter, where 'the site' is referred to, this relates to the immediate environment in which the Proposed Development is located. The Proposed Development site is discussed in some detail in terms of its landscape character in Section 12.4.

The Guidelines for Landscape and Visual Impact Assessment 3rd Edition - GLVIA3 (LI & IEMA, 2013) refers to the identification of the area of landscape that is to be covered while assessing landscape and visual effects. The guidelines state:

> *"The study areas should include the site itself and the full extent of the wider landscape around it which the Proposed Development may influence in a significant manner."*

Landscape and visual baseline mapping and viewpoint selection are based on a wider study area referred to as the 'LVIA Study Area'. The geographical parameters for this LVIA were determined by desktop studies, survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects and policy guidance or standards, such as:

- Appendix 3, Wind Energy Development Guidelines, DoEHLG, 2006 (hereafter referred to as the WEDGs) (including reference to the draft WEDGs DoHPLG, 2019)
- The Guidelines for Landscape and Visual Impact Assessment 3rd Edition – GLVIA3 (LI & IEMA, 2013)
- 'Notes and Clarifications on Aspects of GLVIA3: Landscape Institute Technical Guidance Note 2024-01' (hereafter, LI TGN 24-01) published by LI (2024).

The distance at which a ZTV is set from a wind farm development usually defines the parameters of the LVIA Study Area. The LVIA Study Area is selected in accordance with the parameters suggested by the following guidance.

> *"For blade tips up to 100m in height, a Zone of Theoretical Visibility radius of 15km would be adequate (this is greater than the current standard by some 50% but reflects the technical difficulty of depicting "small and medium" turbines at 20km).*
>
> *For blade tips in excess of 100m, a Zone of Theoretical Visibility radius of 20km would be adequate (this is twice conventional thresholds and reflects greater visibility of higher structures)." ((WEDGs Page 94, DoEHLG, 2006; Page 152, DoHPLG, 2019))*

According to the above guidance a LVIA Study Area of 15km would be suitable for the Proposed Development due to the 21 no. existing turbines having a tip height of 99m. However, considering the turbines are only 1 metre short of 100 metre tip height, the LVIA Study Area has been extended to 20km for the purpose of this EIAR.

Furthermore, as prescribed by best practice guidance and professional experience of the assessment team, the following topic areas have been scoped out of the assessment:

- Effects on landscape and visual receptors that have minimal or no theoretical visibility (as predicted by the ZTV) and/or very distant visibility and are therefore unlikely to be subject to significant effects.
- Effects on designated landscapes beyond a 20 km radius from the existing turbines, from where it is judged that potential significant effects on key characteristics and/or special qualities, or views are judged unlikely to occur.
- Effects on designated Landscape Character Areas beyond a 15 km radius from the existing turbines, where it is judged that potential significant effects on landscape character are unlikely to occur.
- Effects on visual receptors beyond a 20 km radius from the existing turbines, where it is judged that potential significant effects are unlikely to occur.
- Cumulative landscape and visual effects beyond a 20 km radius from the existing turbines, where it is judged that potential significant effects are unlikely to occur.

The tall, vertical nature of the existing turbines makes them the most prominent elements of the Proposed Development from a landscape and visual perspective and have the most potential to give rise to significant landscape and visual effects. The landscape and visual impact of other existing ancillary elements of the Proposed Development such as the roads and substation are addressed within this chapter, however, the existing turbines are of primary focus in this LVIA.

12.2.2 Guidelines

While the legislation and general guidance on Environmental Impact Assessment is set out in Chapter 1 of this EIAR only guidance specifically pertaining to the Landscape and Visual Impact are outlined below.

Ireland signed and ratified the European Landscape Convention (ELC) in 2002, which introduces a pan-European concept which centres on the quality of landscape protection, management and planning. The Department of Arts, Heritage and the Gaeltacht has published a National Landscape Strategy for Ireland in 2015. The Strategy aims to ensure compliance with the ELC and contains six main objectives, which include developing a national Landscape Character Assessment and Developing Landscape Policies.

In 2000, the Department of the Environment and Local Government published 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities', which recommended that all Local Authorities adopt a standardised approach to landscape assessment for incorporation into Development Plans and consideration as part of the planning process. However, this DoEHLG 2000 guidance remains in draft form.

The landscape and visual impact assessment was primarily based on the Guidelines for Landscape and Visual Impact Assessment 3rd Edition (The Landscape Institute/Institute of Environmental Management and Assessment, UK, 2013) – hereafter referred to as the 'GLVIA3 (LI & IEMA, 2013)'. A range of other guidelines also inform the preparation of this landscape and visual impact assessment, which include:

- 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency of Ireland [EPA], 2022)
- Wind Energy Development Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, 2006)
- Draft Revised Wind Energy Development Guidelines for Planning Authorities (Department of Housing, Planning and Local Government, 2019)
- Visual Representation of Wind Farms: Version 2.2 (Scottish Natural Heritage, 2017)
- Siting and Designing Wind Farms in the Landscape, Version 3a (Scottish Natural Heritage, 2017)
- Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments. (Nature Scot, 2021; includes methodology published in 2012)
- Visual Representation of Development Proposals (Landscape Institute Technical Guidance Note 06/19, 2019)
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations (Scottish Natural Heritage, 2015)

12.2.3 Zone of Theoretical Visibility Mapping

Zone of Theoretical Visibility (ZTV) mapping is an important step in the LVIA process. For reasons outlined below, ZTVs are useful mapping tool for LVIA, even when assessing the impact of turbines which are already built and visible within the landscape.

The MKO landscape and visual team have extensive experience ground truthing areas showing no theoretical visibility of turbines on half blade ZTV maps. In this regard, ZTV mapping is a useful tool to indicate where there is no visibility of turbines of a wind farm development (proposed or existing). The ZTV is therefore a useful tool for scoping out receptors from assessment that do not have theoretical visibility of turbines. In the context of the assessments reported in this chapter, where the turbines of the existing Ballywater Wind Farm already exist within the landscape, the ZTV ensures on-site visibility appraisals and identification of sensitive receptors can be focussed to areas where the existing Ballywater Wind Farm are most likely to be visible. The results of site investigations reported later in this chapter also consider the difference in visibility between what exists on the ground compared with what is shown on the ZTV map.

The Zone of Theoretical Visibility (ZTV) represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM), overlaid on a map base. A DTM refers to the way in which a computer represents a piece of topography in three dimensions as a digital model. ZTV maps provide the following information:

- Indicates broad areas where visibility of a wind energy development is most likely to occur.
- How much of the wind energy development is theoretically visible using different coloured bands to represent different numbers of turbines.
- The geographic extent and pattern of visibility.

Production of ZTV maps is usually one of the first steps of an LVIA, helping to inform the selection of the Study Area in which impacts will be considered in more detail and the identification of sensitive vantage points (Visual Representation of Wind Farms, Scottish Natural Heritage, 2017).

12.2.3.1 Limitations of ZTV Mapping

The Scottish Natural Heritage guidelines referred to above acknowledge the following limitations inherent to the use of theoretical visibility mapping:

- The ZTV presents a 'bare ground' scenario, i.e. visibility of the Proposed Development in a landscape without screening structures or vegetation. This includes trees, hedgerows, buildings and small-scale landform or ground surface features. The ZTV also does not take into account the effects of weather and atmospheric conditions, and therefore can be said to represent a 'worst-case' scenario, that is where the wind farm could potentially be seen given no intervening obstructions and favourable weather conditions.
- The ZTV indicates areas from where a wind farm may be visible, but cannot show how it will look, nor indicate the nature or magnitude of visual impacts. The visibility of the turbines will decrease with the distance from which they are viewed, but this is not accounted for in the ZTV. Figure 12-2 below provides an illustration of the differences in view relative to the distance from a turbine.

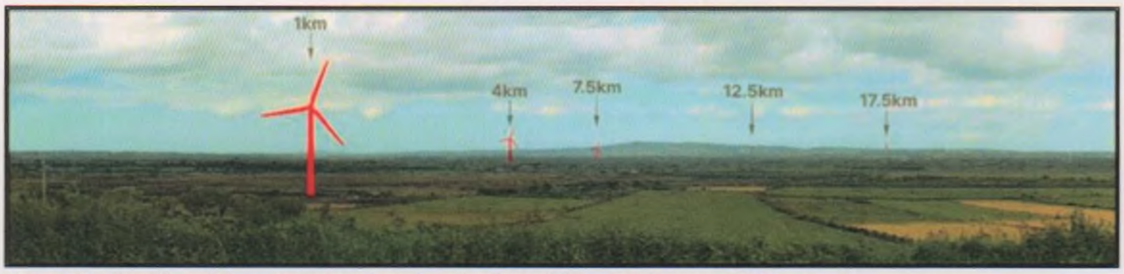


Figure 12-2 The effect of distance on visibility of wind turbines (Illustrative Purposes Only)

- A ZTV is only as accurate as the data on which it is based. It is not easy to test the accuracy of a ZTV in the field, although some verification will occur during the assessment of viewpoints.
- In order to handle large areas of terrain, the DTM data is based on information that does not allow detail to be distinguished below a certain level. There are also differences in the way that the software package 'interpolates' between heights in the calculations made.

12.2.3.2 ZTV Methodology

The ZTV maps presented in the EIAR show theoretical visibility of the existing turbines using the half blade height of the wind turbines as points of reference. The maps also show the theoretical visibility of the proposed wind farm in addition to theoretical visibility of other existing and permitted wind farms in the area. The area covered by the ZTV maps has a radius of 20 kilometres from the outer-most proposed turbines – The LVIA Study Area.

A worst-case or 'bare ground' scenario, i.e. no land-cover. They represent visibility of the proposed wind farm in the absence of all natural and manmade features from the landscape, including vegetation, houses and other buildings. In reality, such features will restrict or limit visibility of the wind turbines, due to the screening effects of vegetation, for example forestry and road-side hedgerows and trees, and buildings, particularly within towns and villages.

Separate colour bands are used on each ZTV map to indicate the number of turbines which will potentially be visible to half blade i.e. only half a blade might be visible over the topography as opposed to seeing a full turbine. The legend on each map shows the number of visible turbines for each corresponding colour, which are as follows:

- Orange: 1-5 No. Turbines Theoretically Visible
- Green: 6-10 No. Turbines Theoretically Visible
- Yellow: 11-15 No. Turbines Theoretically Visible
- Navy: 16-21 No. Turbines Theoretically Visible

12.2.4 Photographic Visualisations

The assessment of potential impacts in this chapter uses photographic and wireline visualisations (not *photomontages as the turbines are existent within landscape views), whereby the potential effects arising as a result of the Proposed Development turbines are assessed from viewpoint locations representative of prominent and sensitive landscape and visual receptors located within the LVIA Study Area. These visualisations are included in Volume 2 of this EIAR – *Photographic Visualisation Booklet.*

*No Photomontages are included or required in the Volume 2 Photographic Visualisation Booklet as no rendering is required into the photographic imagery as the existing turbines already exist within the views. No other permitted or proposed turbines are visible within any of the views and therefore no rendering is required for assessment of cumulative visual effects.

12.2.4.1 Viewpoint Identification

The viewpoints or photo locations were selected following guidance contained in the DoEHLG *'Wind Energy Development Guidelines for Planning Authorities'* (2006), the *'Guidelines for Landscape and Visual Impact Assessment'* (2013) and in the *'Visual Representation of Wind Farms'* (Scottish Natural Heritage, 2017). The selection of photo locations is designed to give a representative range of views of the Proposed Development.

'Viewpoints' are locations where photographic imagery was captured for the visualisation booklet. 6 No. viewpoints were chosen for assessment following visibility appraisals and capture of imagery from key visual receptors during a site visit. Section 12.5 – Visual Baseline included a mapping exercise to identify the following sensitive visual receptors in the LVIA Study Area

- Designated Scenic Routes and Scenic Views
- Settlements
- Recreational Routes and Tourist Destinations
    - Waymarked Walking Routes
    - Cycle Routes

- Scenic Drives
- Tourist Routes
- Viewing Points (e.g. marked on OSi Maps)
- Transport Routes

6 No. viewpoints were selected from locations representing key visual receptors where there were relatively open views towards the Proposed Development. In addition, viewpoints were selected in close proximity to the existing turbines, where turbines are likely to be most visible and hence visual effects are likely to be greatest.

Viewpoints were chosen having regard to the SNH Guidance (2017) which advises that a range of views should be shown at a range of distances and aspects, as well as at varying elevations and showing both where the development will be completely visible as well as partially visible.

12.2.4.2 Photographic Visualisation Limitations

Photographs, are subject to a range of limitations, as stated in 'Visual Assessment of Wind Farms' (Scottish Natural Heritage, 2014):

- Visual fields provide a tool for assessment that can be compared with an actual view in the field; they should never be considered as a substitute to visiting a viewpoint in the field.
- Neither photographs nor visualisations can replicate a view as seen in reality by the human eye.
- Visualisations can only represent the view from a single location at a particular time and in particular weather conditions.
- Static visualisations cannot convey the effect of turbine blade movement.

Although the scale, siting and geometry of visualisations are based on technical data, the other qualities of the image are open to judgments. The guidance also notes that interpretation of visualisations also needs to take into account additional information including variable lighting, movement of turbine blades, seasonal differences and the movement of the viewer through the landscape. However, accepting these limitations, the SNH guidelines state that photomontages (and the photographic visualisation equivalents used for this LVIA of an existing wind farm) are useful tools in the Visual Impact Assessment of wind turbines.

Furthermore, with regard to the representation of cumulative visual effects, existing, permitted and proposed turbines can and should also be shown in the visualisations if they are present in the current landscape or in a future receiving environment. The representation of existing turbines relies on photographs taken on site, while permitted and proposed turbines would be modelled, rendered and superimposed into the image (*photomontages). As such there can be a discrepancy in the lighting and sharpness between these two different representations.

*No photomontages were required for the visualisations included in this LVIA as no other permitted or proposed turbines are visible within the fields of view presented from each viewpoint.

12.2.4.3 Presentation of Visualisations in the Photographic Visualisation Booklet

The viewpoints presented in the accompanying Volume 2 Photographic Visualisation Booklet show several panorama views from each viewpoint location. These include:

1. **Overview Sheet** – Viewpoint details include location description, grid reference distance from nearest turbine and technical data in relation to photography. Three maps at varies scales show the viewpoint location. A 120-degree existing view image

(Key Image) without any proposed and permitted turbines. Existing turbines visible in the landscape may appear within the image and the horizontal extent of the 90-degree and 53.5-degree image to be presented in subsequent images is also framed.

2. **Proposed View with at 90°** – Showing a 90-degree panorama view, photographic visualisation with the existing wind farm and all other existing, permitted and proposed wind farms within the viewpoint. A matching wireline image shows the turbines of all proposed, permitted and existing wind farms individually coloured and labelled for ease of identification.
3. **Proposed View with at 53.5°** – Showing a photographic visualisation of the existing turbines and any existing, permitted and proposed turbines in a 53.5-degree horizontal field of view.
4. **Proposed Wireline at 53.5°** - Showing a wireline image of the existing turbines and any existing, permitted and proposed turbines in a 53.5-degree horizontal field of view. The existing turbines and any other existing, permitted and proposed wind farms are individually coloured and labelled for ease of identification.

The viewpoint images contained in the booklet are devised to be viewed at arm's length. Viewpoint 4 within the Photographic Visualisation Booklet shows a proposed view of the existing turbines spread within a 180 ° field of view. To assess this view in accordance with the guidelines set out by the Scottish Natural Heritage (2014), the view was divided into two 90 ° views to be assessed separately through steps 2-4 set out above.

12.2.5 Landscape and Visual Impact Assessment Methodology

12.2.5.1 Identification of Landscape Receptors – Landscape Baseline

The Landscape Baseline, Section 12.4, reviews the policies and objectives of various planning policy documents relating to landscape, planning and the locational siting of wind farms, as they relate to the site of the Proposed Development. The LVIA Study Area is situated in areas of County Wexford. The Landscape Baseline states baseline information about the receiving landscape of the Proposed Development site and its wider setting. The Visual Baseline, Section 12.5, identifies key sensitive visual receptors in the LVIA Study Area where visibility of the Proposed Development is likely to occur and reports upon the nature of this visibility from visual receptors. The visual baseline is informed by ZTV mapping and visibility appraisals conducted during site visits. Receptors with no visibility of the Proposed Development are screened out from assessment in the effects section of this Chapter.

The effects on key sensitive landscape and visual receptors identified in the baseline investigation are assessed in Section 12.7 - Likely or Significant Landscape and Visual Effects using the methodology reported below. The assessment of effects is primarily informed by site visits, ZTV mapping and the assessment of the 6 No. visualisations from representative viewpoints.

12.2.5.2 Assessing Landscape Effects

The methodology uses qualitative methods in order to arrive at an assessment, which is based on the Landscape and Landscape Assessment (2000) Guidelines as well as the GLVIA (2013), and the DoEHLG (2006) Guidelines were also taken into account.

Landscape effects can be described as changes which affect the landscape as a resource. This includes how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects and its landscape character. Landscape effects also relate to changes in the structure of the landscape. Under the GLVIA (2013), the assessment of likely significant effects on landscape receptors includes a judgement on both the sensitivity of the receptor as well as magnitude of the change.

12.2.5.2.1 Assessing Landscape Sensitivity

Landscape Sensitivity, which is described in the GLVIA (2013) as a combination of the landscape's susceptibility to change as well as the value attached to the landscape receptor.

Susceptibility to change can be described as the ability of the landscape receptor (either the overall character, quality of the landscape or a particular landscape feature) to accommodate the Proposed Development without undue consequences for the maintenance of the baseline (existing) landscape and/or the aims of landscape planning policies and strategies. Table 12-1 below presents differing description criteria for susceptibility to change.

Table 12-1 Description criteria for susceptibility to change

Susceptibility of landscape receptor to change	Description and example criteria
High	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a high susceptibility to change considering its inherent characteristics and where the landscape receptor has a low ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, and where such change is not in compliance with planning policies/strategies
Medium	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a medium susceptibility to change considering its inherent characteristics and where the landscape receptor has a moderate ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, with consideration given to planning policies/strategies.
Low	Landscape receptors where the overall character of the landscape receptor or the nature of the individual landscape receptor causes it to have a low susceptibility to change considering its inherent characteristics and where the landscape receptor has a strong ability to accommodate the proposed change without undue consequences for the maintenance of its landscape character, and/or its quality or condition, and/or its particular aesthetic and perceptual aspects, and where such change may be in compliance with planning policies/strategies

Landscape value is a combination of values which are assessed in the landscape baseline, combining any formal landscape designations, and, where there are no designations, judgements based on individual elements of the landscape receptor, for example particular landscape features, notable aesthetic, perceptual or experiential qualities, and combination of these contributors. In addition, it is noted that the GLVIA states that "*there should not be over-reliance on designations as the sole indicator of value*", and the assessments of landscape value undertaken in this report include consideration of various elements that contribute to landscape value of specific receptors, using best practice standards and professional judgement. Where this occurs, landscape value will be judged based on clearly stated criteria. Table 12-2 below presents differing description criteria for landscape value.

Table 12-2 Description criteria for landscape value

Value attached to Landscape elements	Description and example criteria
High	**Landscape receptors forming part of designations (e.g. areas of amenity, scenic routes/views) in the development plan, or at a national or international level, or landscape receptors not designated but where the receptor is judged to be of equivalent value using clearly stated criteria including wildness, naturalness, very strong cultural heritage or natural heritage associations and/or very high recreational value.**
Medium	**Landscape receptors where value is not formally designated but are of value as good examples of high quality, intact landscapes or landscape features and are deemed to be of relatively high scenic quality. Landscapes or landscape receptors that contain some rare elements, include areas or features which are wild or have a sense of naturalness, strong cultural associations or which have recreational value.**
Low	Landscapes that are not formally designated and considered as modified. Areas which do not have particularly scenic qualities, do not include rare elements or landscape features and do not have strongly evident cultural or heritage associations.

In combining the assessment of the landscape value of a landscape receptor with the susceptibility to change of that receptor, it is noted here that a judgement of high landscape value does not necessarily imply that this receptor has a high susceptibility to change, and it is emphasised that this relationship is complex. The combination of these, which determines the landscape sensitivity, is undertaken using professional judgement with the rationale for judgements clearly explained in the description of the assessment of effects or in the baseline study. On this basis landscape receptors have been assigned one of the four following sensitivity ratings:

- Very High
- High
- Medium
- Low

It is noted that sensitivity classifications are generally guided by local and national planning policy, particularly for Landscape Character Areas and County Policy in relation to these, as well as County Wind Energy Policy. However, it is noted that in cases where local variations in landscape receptors merit a smaller scale focused assessment that may differ from the policy this is undertaken using professional judgement and is clearly explained in the main body of the report.

12.2.5.2.2 Assessing Magnitude of Change in the Landscape

The Proposed Development is an existing wind farm and substation which is built, operational and currently visible in the existing landscape. As is evident by the visualisations, the proposed extension of operation of the existing Ballywater Wind Farm amounts to little or no change to the existing views of the existing turbines. The term 'Magnitude of Change' is used in the impact assessment tables included in Section 12.7.3. In the context of this assessment where the turbines already exist in the landscape, the magnitude of the continued impact of the turbines is considered. In order to facilitate the impact assessments, and effectively determine the continued impact of the Ballywater turbines, the magnitude of change was determined by considering the change that would occur in a 'do-nothing scenario' where the turbines would not exist in the landscape.

The magnitude of change in each landscape character area is a combination of the visual presence - size and scale of the change, the extent of the area to be affected, and the duration and reversibility of the effect. The magnitude of change for each landscape character area was assessed using the definitions outlined in Table 12-3 below.

Table 12-3 Magnitude of Landscape Change Assessment Criteria

Magnitude of Change	Description
Substantial	Where a landscape will experience the loss of key landscape features or the introduction of uncharacteristic additions over a large area. The changes to the landscape are prominent and large in scale. The level of change has an effect on the overall landscape character. The effects are likely long term and may be irreversible.
Moderate	A more limited loss of or change to landscape features over a medium extent which will result in some change to landscape features and aesthetics. Could include the addition of some new uncharacteristic features or elements that would lead to the potential for change in landscape character in a localised area or part of a landscape character area. Would include moderate effects on the overall landscape character that do not affect key characteristics. The effects could be long to medium term and/or partially reversible.
Slight	The loss of or change to landscape features of limited extent, or changes to landscape character in smaller areas. Changes would not affect key characteristics. The addition of any new features or elements to the landscape would only result in low-level changes to the overall aesthetics of the landscapes. Changes to the landscape are more evident at a local level and not over a wide geographical area. The effects could potentially be medium to short term and/or reversible.
Negligible	A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short term and/or reversible.

12.2.5.2.3 Landscape Effects Assessment Matrix

Table 12-4 below shows the significance of landscape effects, arrived at by combining the landscape receptor sensitivity and the magnitude of change classifications. Landscape receptor sensitivity is shown in the left-hand first column and magnitude of landscape change is shown in the first row at the top of the table. This table is used as an indicative tool to assist in determining the significance of landscape effects. In different circumstances differing levels of mitigating factors may ultimately result in a different determination of the level of significance. The significance of a landscape effect is based on a balance between the sensitivity of the receptor and the magnitude of effect. The significance of landscape effect is arrived at using a combination of the matrix shown in Table 12-4 and Table 12-5 below.

Table 12-4 Landscape effects significance assessment matrix

	Substantial	Moderate	Slight	Negligible
Very High	Major	Major/Moderate	Moderate	Moderate/Minor
High	Major/Moderate	Moderate	Moderate/Minor	Minor
Medium	Moderate	Moderate/Minor	Minor	Minor/Negligible
Low	Moderate/Minor	Minor	Minor/Negligible	Negligible

The determination of significance uses a seven-point scale, ranging from Major to Negligible. This seven-point scale is translated to the EPA impact assessment classifications of significance, as outlined in Table 12-5 below.

Table 12-5 EPA Impact Assessment Significance Classification for Landscape Effects

Matrix Classification Significance	EPA Significance Classification	EPA (2022) Definition of Significance
Major	Profound	An effect which obliterates sensitive characteristics
Major/Moderate	Very significant	An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment
Moderate	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate/Minor	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
Minor	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Minor/Negligible	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Negligible	Imperceptible	An effect capable of measurement but without significant consequences

12.2.5.3 Assessing Visual Effects

Visual effects relate to changes in views and visual amenity of the surroundings of individuals or groups of people. These may result from changes in content and character of views as a result in changes to the landscape. The assessment of visual effects is based on views shown in photographic visualisations and the potential visibility indicated by the ZTV maps as well as actual visibility on the ground.

It should be noted that in assessing visual effects, there are different types of visual effects:

- **Visual obstruction:** This occurs when there is an impact on a view which blocks the view.
- **Visual intrusion:** This occurs when there is an impact on a view, but which does not block the view.

Due to the nature of the development and the appearance of wind turbines, visual intrusion occurs more frequently than obstruction.

The likely significant effects of the Proposed Development in terms of visual and landscape effects are informed by the ZTV, on-site appraisals and photographic visualisations. The significance of the effect on visual receptors is a combination of the sensitivity of the receptor as well as the magnitude of the change.

12.2.5.3.1 Visual Receptor Sensitivity

Visual Receptor Sensitivity depends on the occupation or activity of the people, as well the extent to which the attention is focused on views and visual amenity, according to the GLVIA Guidelines (2013). Visual receptor sensitivity is assessed as either being Very High, High, Medium, or Low, based on the definition of descriptions and examples set out in Table 12-6 below.

Table 12-6 Visual Receptor Sensitivity Assessment Criteria

Sensitivity of Visual Receptor(s)	Description
Very High	Included in this category are viewers that are primarily focused on views from this particular location, such as visitors to popular destinations identified for their outstanding views. Residents in close proximity who have primary views of the highest scenic quality in the direction of the development.
High	Includes viewers at designated views or landscapes. Viewers such as residents in close proximity to the viewpoint who have primary views that will be in the direction of the development that may not necessarily be of a particularly scenic quality; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes.
Medium	Includes viewers who may have some susceptibility to a change in view. Viewers such as residents in medium proximity but who do not have views focused in the direction of the proposed development or whose views are not of a particularly scenic quality; those from views which are not designated but may have local recreational uses or those travelling along routes or at view which are considered moderately scenic.
Low	Includes viewers engaged in activities where the focus is not on the landscape or view. These including those travelling along a busy route, viewers at work or engaged in sport not related to views or experience of the landscape.

Viewpoints are specific locations which are representative of key visual receptors. The viewpoint assessment tables in Section 12.7.3.2 consider all receptors represented in the determination of the visual receptor sensitivity rating for each viewpoint. This determination takes a balanced approach considering the types, sensitivities, and quantities of visual receptors represented. The sensitivity rating given to each viewpoint in Section 12.7.3.3.2 considers both the susceptibility of the visual receptors represented as well as the value attached to the available views at that particular location.

12.2.5.3.2 Magnitude of Visual Change

The turbines of the Proposed Development already exist in the landscape. Therefore, determining the magnitude of change between a 'Existing' View and 'Proposed' View amounts to no change in scenic amenity and would not effectively describe the current visual impact using standard best practice LVIA methodology ('Receptor Sensitivity' X 'Magnitude of Change'). In order to facilitate the visual impact assessments included in Chapter 12, and effectively determine the visual impact of the existing turbines, the magnitude of change was determined by considering the change that would occur in a 'do-nothing scenario' where the turbines would not be visible in the landscape. A comprehensive description of the visual impact assessment of each photographic visualisation is detailed in the Section 12.7.3.3.2 - Viewpoint Assessment Table.

The magnitude of the visual change resulting at each viewpoint is a combination of scale of the change, the extent of the area to be affected and the duration and reversibility of the effect, determined by reviewing the photographic visualisations and wireline images for each viewpoint. The magnitude of change is determined in accordance with the definitions and descriptions included in Table 12-7 below.

Table 12-7 Magnitude of Visual Change Assessment Criteria

Magnitude of Change	Description
Substantial	Substantial change, where the proposals would result in large-scale, prominent or very prominent change, leading to substantial obstruction of existing view or complete change in character and composition of the baseline though removal of key elements or addition of uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed development is fully or almost fully visible over a wide extent, at close proximity to the viewer. This change could be long term or of a long duration.
Moderate	The change in the view may involve partial obstruction of existing view or partial change in character and composition of the baseline through the introduction of new elements or removal of existing elements. Likely to occur at locations where the development is partially visible over a moderate or medium extent, and which are not in close proximity to the development. Change may be readily noticeable but not substantially different in scale and character from the surroundings and wider setting.
Slight	The proposals would be partially visible or visible at sufficient distance to be perceptible and result in a low level of change in the view and its composition and a low degree of contrast. The character of the view may be altered but will remain similar to the baseline existing situation. This change could be short term or of a short duration.
Negligible	Any change would only be barely distinguishable from the status quo "do-nothing scenario" in the surroundings. The composition and character of the view would be substantially unaltered, approximating to little or no change.

12.2.5.3.3 Visual Effects Assessment Matrix

Table 12-8 below shows the significance of visual effects, arrived at by combining the visual receptor sensitivity and the magnitude of change classifications. Visual receptor sensitivity is shown in the left-hand first column and magnitude of visual change is shown in the first row at the top of the table. This table is used as an indicative tool to assist in determining the significance of visual effects. In different circumstances differing levels of mitigating factors may ultimately result in a different determination of the level of significance (see below). The significance of a visual effect is based on a balance between the sensitivity of the receptor and the magnitude of effect. The significance of visual effect is arrived at using a combination of the matrix shown in Table 12-8 and Table 12-9 below.

Table 12-8 Visual Effects Significance Assessment Matrix

	Substantial	Moderate	Slight	Negligible
Very High	Major	Major/Moderate	Moderate	Moderate/Minor
High	Major/Moderate	Moderate	Moderate/Minor	Minor
Medium	Moderate	Moderate/Minor	Minor	Minor/Negligible
Low	Moderate/Minor	Minor	Minor/Negligible	Negligible

The determination of significance uses a seven-point scale, ranging from Major to Negligible. This seven-point scale is translated to the EPA impact assessment classifications of significance, as outlined in Table 12-9 below.

Table 12-9 EPA Impact Assessment Significance Classification for Visual Effects

Matrix Classification Significance	EPA Significance Classification	EPA (2017) Definition of Significance
Major	Profound	An effect which obliterates sensitive characteristics
Major/Moderate	Very significant	An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment
Moderate	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate/Minor	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
Minor	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Minor/Negligible	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Negligible	Imperceptible	An effect capable of measurement but without significant consequences

12.2.5.3.4 Residual Visual Effect

After determining the significance of the visual effect using the above visual effects assessment matrix and significance graph, mitigating factors are taken into consideration to arrive at the final residual effect. In some cases, mitigating factors merit a reduction in classification.

12.2.5.4 Determination of Residual Landscape and Visual Effects

The matrices and tables above are excellent tools to aid professional judgement in the determination of the significance of an effect. They are useful in that they provide a transparent, objective, structure to the process of balancing sensitivity and magnitude of change. In the context of the determination of visual effects, the formulaic process created by the use of the matrix above provides an indicative initial assessment, which is clearly demonstrated in the Viewpoint Assessment Tables in Section 12.7.3.3.2.

However, over-reliance on the formulaic process, which is heavily influenced by the definitions of sensitivity and magnitude of change contained in Table 12-6 and Table 12-7 above, can lead to a failure to properly account for the full range of circumstances and factors at play in the determination of the significance of a visual effect (see section 3.35, GLVIA, 2013). A wide range of factors, mitigating or otherwise, can factor into such a determination, and it is not possible to capture the complexity involved in balancing all considerations within the necessarily limited definitions contained in these tables. This then naturally results in circumstances whereby the process of the determination of significance using the formulaic method involved with the matrix shown in Table 12-8 can result in misrepresentations of the significance of visual effects. It is only with professional judgement, and narrative descriptions of effect, that such complexity can be integrated into the determination of significance. Therefore, the formulaic methods based upon the matrix presented above is combined with professional judgement in the determination of significance. This is illustrated in Figure 12-3 below where the professional judgment of the competent expert is used to properly determine the significance of an effect taking all considerations into account.

A focus is placed upon the narrative description of effects (see section 3.36, GLVIA, 2013) given the naturally subjective nature of the significance determination process, particularly in relation to visual effects, ensuring that the rationale for the overall judgement is clear (see sections 3.28-3.29, GLVIA, 2013). The comprehensive assessment of viewpoints included in Section 12.7.3.2 aims to provide a transparent and robust determination of residual visual effects utilising the graph in Figure 12-3 below in combination with a clear and logical narrative.

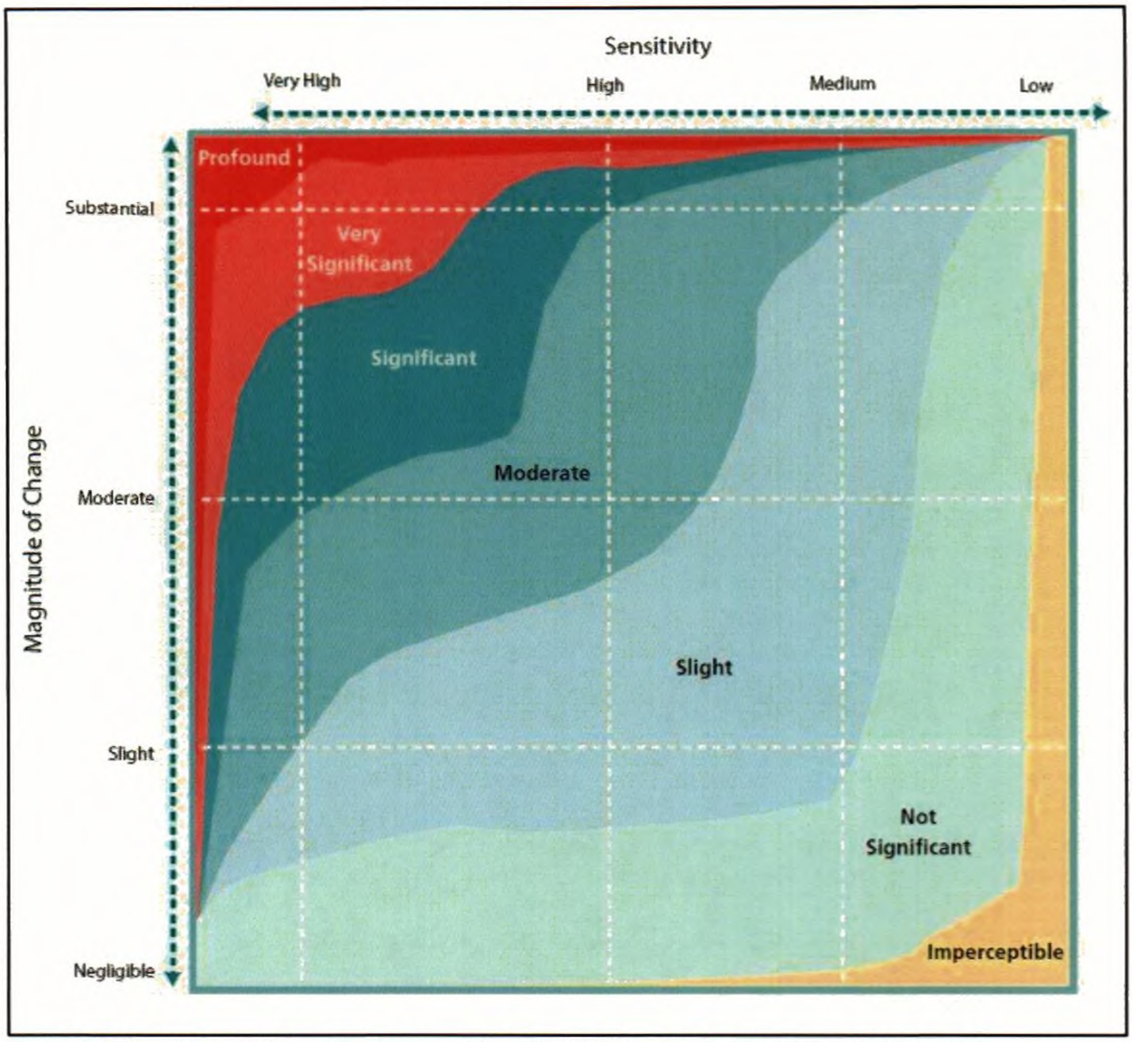


Figure 12-3 Visual Effect Significance Graph (adapted from EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022)

12.2.5.5 Assessing Cumulative Landscape and Visual Effects

12.2.5.5.1 Cumulative Landscape Effects

The Nature Scot 2021 publication *Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments* identifies two principal areas of cumulative landscape effects, on the physical fabric of the landscape and on the landscape character, which state:

- *Cumulative effects on the **physical fabric** of the landscape arise when two or more developments affect landscape components such as woodland, dykes, rural roads or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant – for example, where the last remnants of former shelterbelts are completely removed by two or more developments.*
- *Cumulative effects on **landscape character** arise when two or more developments introduce new features into the landscape. In this way, they can change the landscape character to such an extent that they create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character.*

Potential changes to the physical fabric outlined above are predominantly restricted to the Proposed Development site and the LCAs in which the site is located. Therefore, these landscape receptors will be assessed for cumulative landscape effects on the physical fabric of the landscape arising from the Proposed Development.

Cumulative effects on the landscape character will be assessed in the Landscape Character Areas (LCAs) that have theoretical visibility of the Proposed Development with particular emphasis on the LCA in which the existing turbines will be located. Cumulative landscape effects are included in Landscape Character Assessment Tables in Section 12.7.3.1.1 and summarised in the LVIA Chapter of the EIAR.

12.2.5.5.2 Cumulative Visual Effects

For this assessment, the Nature Scot (2021) definition of cumulative effects as additional changes caused by a proposed development in conjunction with other similar developments, is used, however, this assessment also considers other types of developments. The definition in the DoEHLG Guidelines (2006) defines cumulative impacts in terms of wind farms, as the perceived effect on the landscape of two or more wind energy developments visible from any one place.

The GLVIA (2013) and Nature Scot (2021) guidance also note that cumulative visual effects can be experienced in combination, where two or more developments are visible from one viewpoint, either simultaneously or in succession, as well as sequentially, where a viewer moves to another viewpoint or along a transport or recreational route and sees the same or different developments. These types of cumulative visual effects are considered in the assessment of visual effects in Section 12.7.3.3.2.

The guidance on cumulative effects given in the DoHPLG 2019 '*Draft Revised Wind Energy Development Guidelines*' relating to the Proposed Development site is as follows:

- *"Similarity in the siting and design approach is preferred where a number of wind energy developments are located in the same landscape character area, particularly within the same viewshed. However, an alternative approach where a particular aesthetic effect is sought may be acceptable.*
- *Different wind energy developments can appear as a single collective unit if located near each other.*
- *It is preferable to avoid locating turbines where they can be seen one behind another, when viewed from highly sensitive key viewpoints (for example, viewing points along walking or scenic routes, or from designated views or prospects), as this results in visual stacking and, thus, confusion. This may not be critical, however, where the wind energy development to the rear is in the distant background.*
- *Wind energy developments within relatively close proximity to one another, while in different landscape character contexts, may be so close as to be within the same visual unit and, therefore, should involve the same siting and design approach."*

The SNH 2017 publication *Siting and Designing Wind Farms in the Landscape* states that *'introducing turbines that are not similar in form, design, colour and scale may increase visual complexity and clutter'*.

Therefore, the cumulative assessment will concentrate on the following issues:

- Whether the existing turbines increase the spatial extent of turbines in the view;
- Whether the different wind energy developments can appear as a single collective unit or there is separation;
- Whether 'visual stacking' occurs;
- Whether the contrast of different size and design between different wind developments creates visual clutter.

As cumulative visual effects depend on the aspect from which the turbines will be seen various viewpoints were selected to give a thorough overview of the how the existing turbines will appear in conjunction to turbines already present.

The assessment of cumulative effects was included in the viewpoint assessment tables in Section 12.7.3.3.2.

12.3 Zone of Theoretical Visibility (ZTV) Mapping: Theoretical Visibility of the Ballywater Wind Farm

ZTV mapping is an important step in the LVIA process, in that it clearly shows which areas will have theoretical visibility of the existing turbines and which areas will have no theoretical visibility.

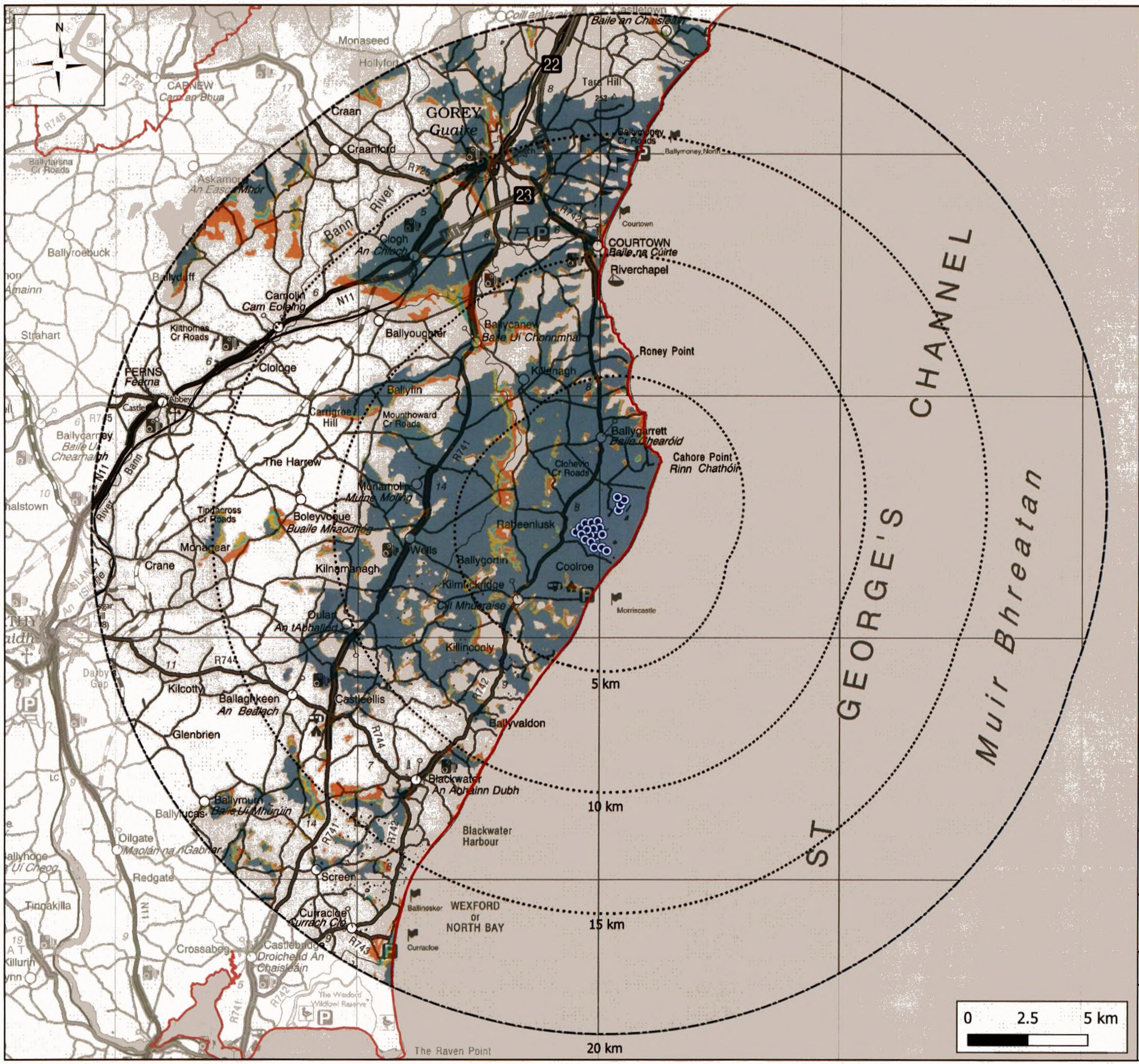
12.3.1 ZTV Versus Actual Visibility

As noted in Section 12.2.3 (ZTV methodology), actual visibility on the ground is substantially less than predicted by the ZTV mapping due to intervening factors such as: on site screening from natural and man-made features, atmospheric weather and/or localised topography. The half blade ZTV map of the existing Ballywater Wind Farm and LVIA Study Area is shown below in Figure 12-4.

Generation of the ZTV utilises large scale topographical data (interpolation across 10 m OSi contour data) and does not account for topographical variation of smaller scale (e.g. < 10 metre). Therefore, in reality, small, localised undulations in topography are likely to further inhibit visibility of the Proposed Development that may not be represented in the ZTV map. Other features of the landscape such as vegetation and man-made elements are also likely to obscure the existing turbines from view from many areas where the ZTV indicates there is full visibility. In this regard, the ZTV is a useful tool to indicate where there is definitely no visibility of the existing Ballywater Wind Farm, therefore receptors located in these areas can be screened out from further assessment.

A half blade ZTV map is shown in Figure 12-4 below. The ZTV map is used within several mapping figures included in this chapter to enable assessment of theoretical visibility of the existing turbines from landscape and visual receptors. Separate colour bands are used on the ZTV map to indicate the number of turbines of which the half blade will potentially be visible. The legend on Figure 12-4 shows the number of visible turbines for each corresponding colour, which are as follows:

- Orange: 1-5 No. Turbines Theoretically Visible
- Green: 6-10 No. Turbines Theoretically Visible
- Yellow: 11-15 No. Turbines Theoretically Visible
- Navy: 16-21 No. Turbines Theoretically Visible



Map Legend

- Existing Turbines
- LVIA Study Area
- County Borders

Half Blade Zone of Theoretical Visibility

- 1-5 No. Turbines Theoretically Visible
- 6-10 No. Turbines Theoretically Visible
- 11-15 No. Turbines Theoretically Visible
- 16-21 No. Turbines Theoretically Visible

Drawing No.

Figure 12-4

Drawing Title

Zone of Theoretical Visibility

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:152,000	230417	07.10.2024	DM	JW

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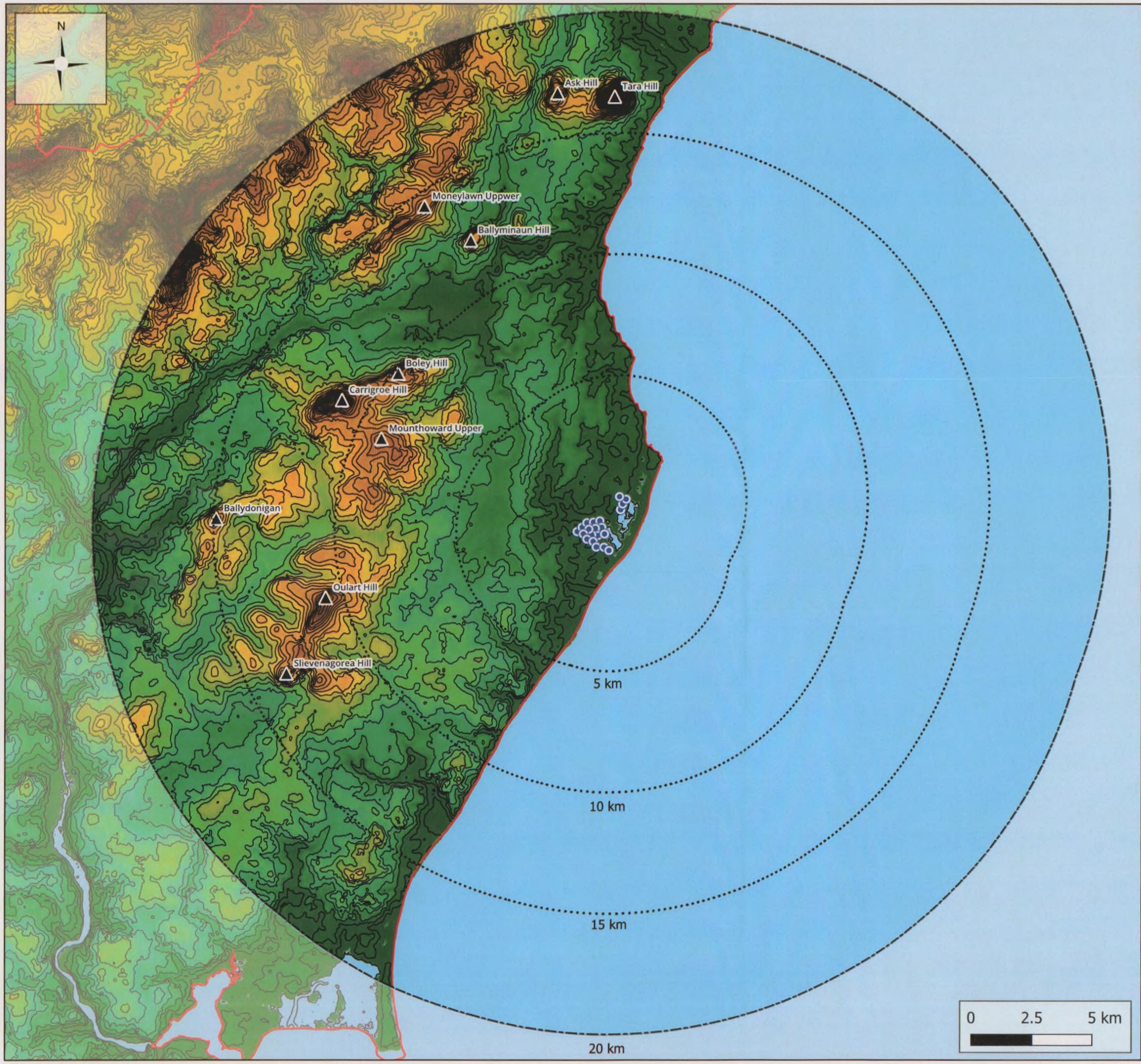

Map Legend

- Existing Turbines
- LVIA Study Area
- County Borders
- Topographical Features
- 10m Contours

Elevation (Above Ordnance Datum)

- 1 meters
- 25 meters
- 50 meters
- 75 meters
- 100 meters
- 150 meters
- 200 meters
- 250 meters

Drawing No.

Figure 12-5

Drawing Title

Physical Landscape Features

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:152,000	230417	07.10.2024	DM	JW

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Figure 12-5 above depicts the elevation gradient and topographical features which exist within the receiving landscape of the LVIA Study Area. These geographical features define the distribution of theoretical visibility of the existing turbines as illustrated in Figure 12-4. As seen in the above figures, the Proposed Development is located on the East coast of Co. Wexford, overlooking the Irish Sea. The existing Ballywater Wind Farm is sited in a low, flat landscape relative to the higher elevated land located to the west of the site as reflected in the Physical Landscape Features map, Figure 12-5 above.

Distribution of Theoretical Visibility within 5km of the Proposed Development site

In Figure 12-4, the ZTV map indicates that there is mostly full theoretical visibility of the existing Ballywater Wind Farm within 5km of the site as a result of the relatively small topographical features and surrounding geography sloping down towards the site. There is a section of slightly elevated undulations to the west of the existing Ballywater Wind Farm, as seen in Figure 12-5, which reduces the number of turbines theoretically visible to mainly between 0 and 5 turbines.

Distribution of Theoretical Visibility beyond 5km of the Proposed Development site

From north to northwest of the Proposed Development, the relatively low undulating topography allow for patches of theoretical visibility in this area. To the west of the existing Ballywater Wind Farm, the combination of hilly terrain around peaks, such as Oulart Hill, Ballydonigan and Slievenagorea Hill, and the River Valley LCU result in a large area of no theoretical visibility beyond 10km. To the south, the undulations beyond 5km of the existing Ballywater Wind Farm gradually reduce theoretical visibility, where only the slight elevations in the topography allow for partial theoretical visibility.

As shown by the ZTV map, there is no theoretical visibility of the existing turbines from a vast proportion of the LVIA Study Area. The ZTV mapping is therefore a useful tool for scoping out assessment of receptors in the areas where there is no theoretical visibility, such as designations identified in the following section – *Landscape Baseline*. As this is an existing wind farm, the assessments in this Chapter are much more focussed on the actual visibility of turbines as they are actually seen on the ground. Results from a visibility appraisal conducted during site visits is included in Section 12.5 – *Visual Baseline*.

12.4 Landscape Baseline

The Landscape Baseline identifies relevant landscape policy and designations pertaining to the Proposed Development and LVIA Study Area in local planning policy, it also reports baseline information about the receiving landscape of the Ballywater site and its wider setting. This is broken down into the following sections:

- **Landscape Designations and Policy Context –** Policy setting pertaining to the location and nature of the site from a landscape perspective based on:
  - Wexford County Development Plan (2022 – 2028)
- **Landscape Character of the Proposed Development Site –** A description of the physical landscape and the characteristics of the site and its immediate surrounding landscape setting, which include the following considerations:
  - Landscape characteristics based upon findings from site visits conducted in December 2023.
  - A review of the Wind Energy Development Guidelines (DoEHLG, 2006; DoHPLG, 2019) and sitting guidance relating to the landscape characteristics of the site.
- **Landscape Character of the Wider Landscape Setting** - A description of landscape in a wider setting including the identification of designated Landscape Character Areas

(called Landscape Character Units in Co. Wexford - LCUs) located within 15km of the existing Ballywater Wind Farm based upon:
- Landscape Character Assessment, Wexford County Development Plan (2022 – 2028).

12.4.1 Landscape Designations and Policy Context – Wexford County Development Plan 2022 – 2028

This subsection reviews the policies and objectives of local planning policy relating to landscape, planning and the locations siting of windfarms, as they relate to the site of the Proposed Development. The entirety of the LVIA Study Area is situated within County Wexford, therefore the landscape policy from Wexford County Council was used as the main source of reference in this section.

The Wexford County Development Plan 2022 – 2028 (WCDP) was consulted to identify relevant landscape designations and policies. Within Volume 1 Chapter 11, *"Landscape and Green Infrastructure"*, the WCDP recognises that the objective of a Landscape Character Assessment is

> *"analyse the character, value and sensitivity of landscapes identified within a particular area. By understanding how different landscapes developed and evolved from both a natural and social perspective, decisions relating to the management and planning of the landscape can be made on an informed basis."*

The *"Landscape Character Assessment"* for Co. Wexford is outlined in Volume 7 of the WCDP 2022 - 2024. Within Chapter 11, the WCDP details the 'Landscape Objectives' of the council, which include:

> **Objective L01** – *"To have regard to the Landscape Character Units and their assigned Landscape Sensitivity, the Draft Landscape and Landscape Assessment-Guidelines for Planning Authorities (2000) and any updated versions of these guidelines published during the lifetime of the Plan."*
>
> **Objective L04 –** *"To require all developments to be appropriately sited, designed and landscaped having regard to their setting in the landscape, ensure that any potential adverse visual impacts are minimised, and that natural features and characteristics of the site are retained."*
>
> **Objective L06** – *"To ensure that developments are not unduly visually obtrusive in the landscape, in particular, in or adjacent to the Upland, River Valley, Coastal or Distinctive Landscape Character Units."*
>
> **Objective 07** – *"To ensure that, where a development will have a negative impact in the Upland, River Valley, Coastal, or Distinctive Landscape Character Unit, an overriding need is demonstrated for that particular development and ensure that careful consideration is given to site selection. The development should be appropriate in scale and be sited, designed and landscaped in a manner which minimises potential adverse impacts on the subject landscape."*
>
> **Objective L11** – *"To protect views worthy of protection, including views to and from the sea, rivers, landscape features, mountains, tourism sites and landmark structures such as bridges and urban settlements from inappropriate development that by virtue of design, scale, character or cumulative impact would block or detract from such views prospect."*
>
> **Objective L14** – *"To adopt a presumption against developments which are located on elevated and exposed sites and where the landscape cannot accommodate such development with appropriate mitigation."*

12.4.1.1 WCDP Landscape Character Assessment

Volume 7 of the WCDP states that a Landscape Character Assessment:

> *"aims to build upon the work carried out during the preparation of previous development plans with the aim of protecting what is valuable in our landscapes while recognising that they are living landscapes which evolve overtime".*

The WCDP designates areas of County Wexford within one landscape classification scale:

> ***Landscape Character Units*** – *"has a distinct, recognisable and consistent pattern of elements that makes it different from its neighbouring landscape. Each LCU has its own distinctive character, based upon patterns of geology, landform, land use, cultural, historical and ecological features."*

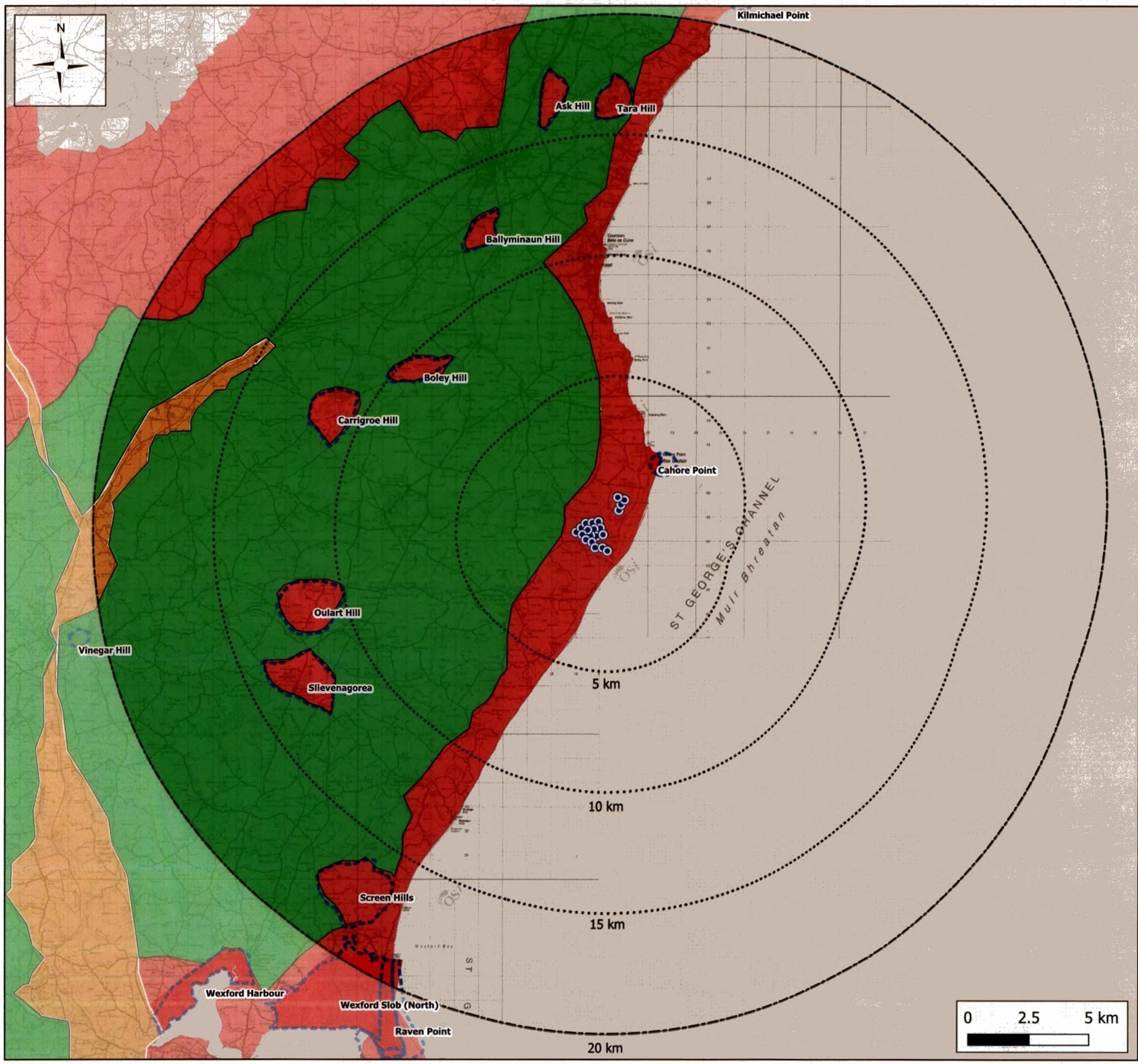
The WCDP recognises 4 general LCUs (Uplands, Lowlands, River Valleys, Coastal) and that there exist a 5^{th} LCU, 'Distinctive Landscape' within each of the 4 general LCUs. According to the WCDP, 'Distinctive Landscapes' are:

> *"different to the main LCU in which they are located. They generally represent features in the landscape and seascape which have visual interest and prominence. Certain landscapes also have particular values which communities or individuals attach to them".*

These distinctive landscapes are further categorised into Hills, Waterbodies, Coastal Promontories and Peninsulas, listed out in Table No. 7-2 under Volume 7 of the WCDP 2022 – 2028.

Three of the general County Wexford LCUs and six Distinctive Landscapes are located within the LVIA Study Area for assessment of landscape character (15km from the existing Ballywater Wind Farm), as shown in Figure 12-7, and are listed below:

- **General LCUs**
  - River Valley
  - Coastal
  - Lowlands
- **Distinctive LCUs**
  - Ballyminaun Hill
  - Boley Hill
  - Carrigroe Hill
  - Oulart Hill
  - Slievenagorea
  - Cahore Point (Coastal & Distinctive)



Map Legend

- Existing Turbines
- LVIA Study Area
- Distinctive Landscape

Landscape Sensitvity (WCDP 2022-2028)

- High
- Low/Medium
- Medium/High

Drawing No.

Figure 12-6

Drawing Title

Landscape Baseline

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:152,000	230417	09.10.2024	DM	JW

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Coastal LCU

The existing Ballywater Wind Farm is situated within the Coastal LCU, as indicated in Figure 12-7 below, which according to Table No. 7-1 of the WCDP is *"generally characterised by long, relatively straight coasts of sand or shingle backed up by low cliffs and sand dune systems."* Furthermore, these coastal areas *"experience greater pressure for tourism and residential development and are very sensitive to development and require protection both in their own right and for the services and economic benefits they bring."*

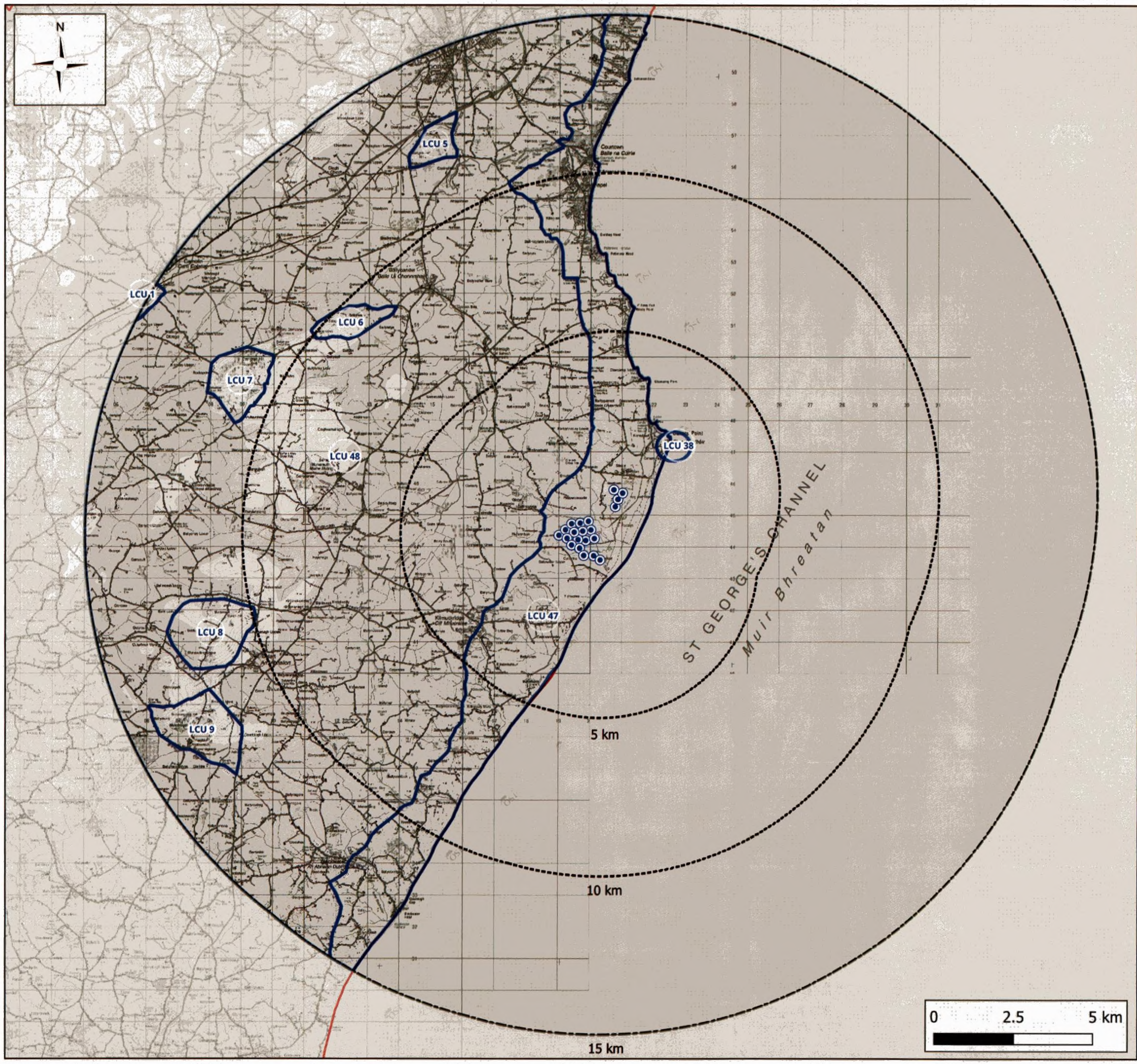
Lowlands LCU

The Lowlands LCU fall within close proximity to the existing Ballywater Wind Farm site and account for a large portion of the LCUs found within the LVIA Study Area. The WCDP describes this LCU as mainly consisting of *"undulating lands"*, where *"lands tend to be characterised by views across larger fields as a result of the generally low well-trimmed hedges."* Furthermore, the WCDP states that this LCU *"generally has characteristics which have a higher capacity to absorb development without it causing significant visual intrusion although, care still needs to be taken on a site by site basis, particularly to minimise the risks of developments being visually intrusive."*

Distinctive LCUs

The Distinctive Landscape Cahore Point falls within close proximity to the Proposed Development site. Cahore Point is described by the WCDP as one of many 'promontories' that run along the north-east coast of Co. Wexford, and that these 'prominent features' *"often enclose sandy bays which are popular with visitors."*

Excluding the Distinctive LCU Cahore Point, the Distinctive Landscapes that fall within the LVIA study area are classified as hills as indicated in Table No. 7-2 in the WCDP 2022-2028, which describes these as having *"significant presence"* which often provide *"broad views across the surrounding landscape"*. Furthermore, *"where public access is possible, hills and ridges are often popular places for recreational activity such as walking, horse riding and cycling."*



Drawing No.	
Figure 12-7	
Drawing Title	Landscape Character Units
Project Title	Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:116,000	230417	08.10.2024	DM	JW

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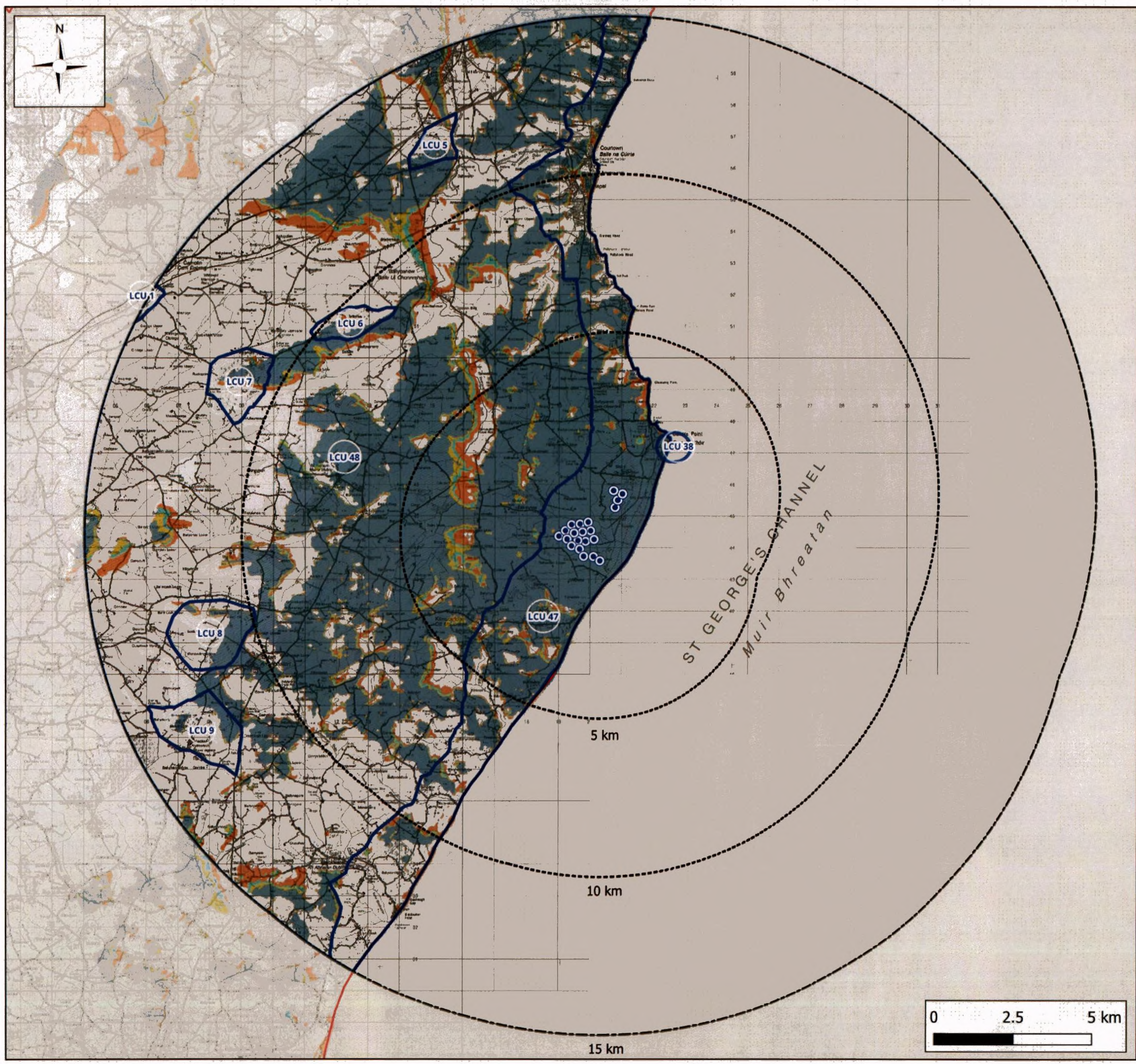

Map Legend

- Existing Turbines
- LVIA Study Area
- County Borders

Landscape Character Units (WCDP 2022-2028) within 15km

- LCU 1 - River Valley
- LCU 5 - Distinctive - Ballyminaun Hill
- LCU 6 - Distinctive - Boley Hill
- LCU 7 - Distinctive - Carrigroe Hill
- LCU 8 - Distinctive - Oulart Hill
- LCU 9 - Distinctive - Slievenagorea
- LCU 38 - Distinctive & Coastal - Cahore Point
- LCU 47 - Coastal
- LCU 48 - Lowlands

Zone of Theoretical Visibility

- 1-5 No. Turbines Theoretically Visible
- 6-10 No. Turbines Theoretically Visible
- 11-15 No. Turbines Theoretically Visible
- 16-21 No. Turbines Theoretically Visible

Drawing No.
Figure 12-8

Drawing Title
Landscape Character Units with ZTV

Project Title
Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:116,000	230417	08.10.2024	DM	JW

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A comprehensive description and assessment of the Coastal LCU and other LCUs scoped in for assessment are discussed below.

12.4.1.2 Landscape Sensitivity

Volume 7 of the WCDP rates sensitivity in the four different LCUs. Of these 4 no. LCUs, only Lowlands is not designated as having a High Sensitivity rating.

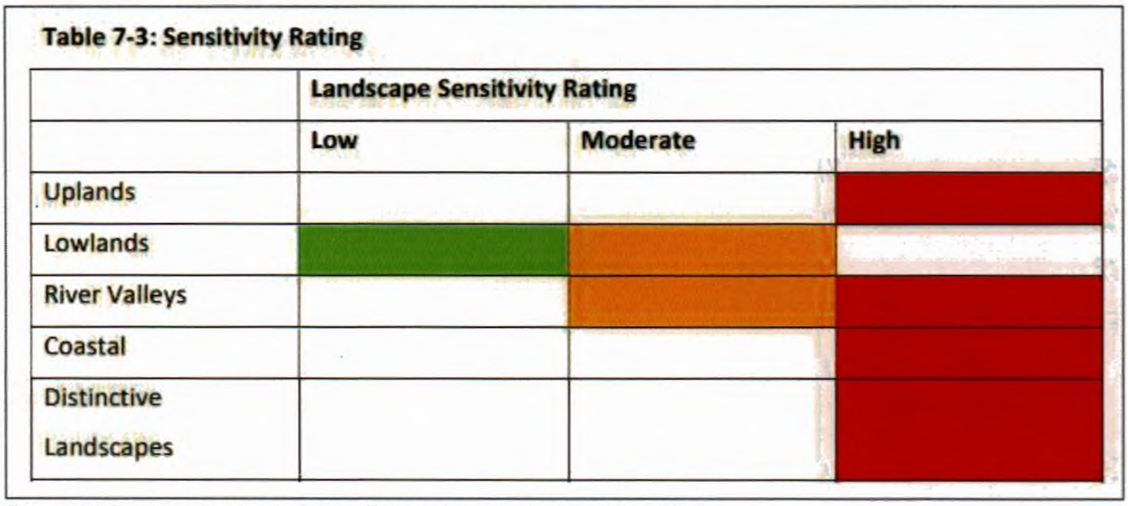


Table 7-3: Sensitivity Rating

	Landscape Sensitivity Rating		
	Low	**Moderate**	**High**
Uplands			
Lowlands			
River Valleys			
Coastal			
Distinctive Landscapes			

Figure 12-9 Sensitivity Ratings for LCUs - Extracted from Volume 7 of the WCDP

The sensitivity ratings for the LCUs in the WCDP are reproduced above. In a regional or national context, it is unrealistic to designate the vast majority of the county as 'High' Sensitivity. The ratings in the table above and the descriptions of the LCUs in the WCDP have been considered to adapt sensitivity ratings to align with the sensitivity classifications and hierarchy used for the assessment process in this LVIA, as detailed in Section 12.2.5.2.1 of this Chapter - Assessing Landscape Sensitivity. Adaption for sensitivity ratings is also cognisant of Wind Energy Development Strategy, within Volume 10 of the WCDP, and also guidance in relation to landscape types set out in the WEDGs. To conduct a balanced and appropriate LVIA, LCU Sensitivity classifications have been assigned as follows in mind of their sensitivity to wind farm development:

- Uplands – Medium Sensitivity
- Lowlands - Low Sensitivity
- River Valleys – Medium Sensitivity
- Medium - Medium Sensitivity
- Distinctive Landscapes - 'High' or 'Very High' Sensitivity depending on which distinctive landscape is represented.

12.4.1.3 Wind Energy Designations

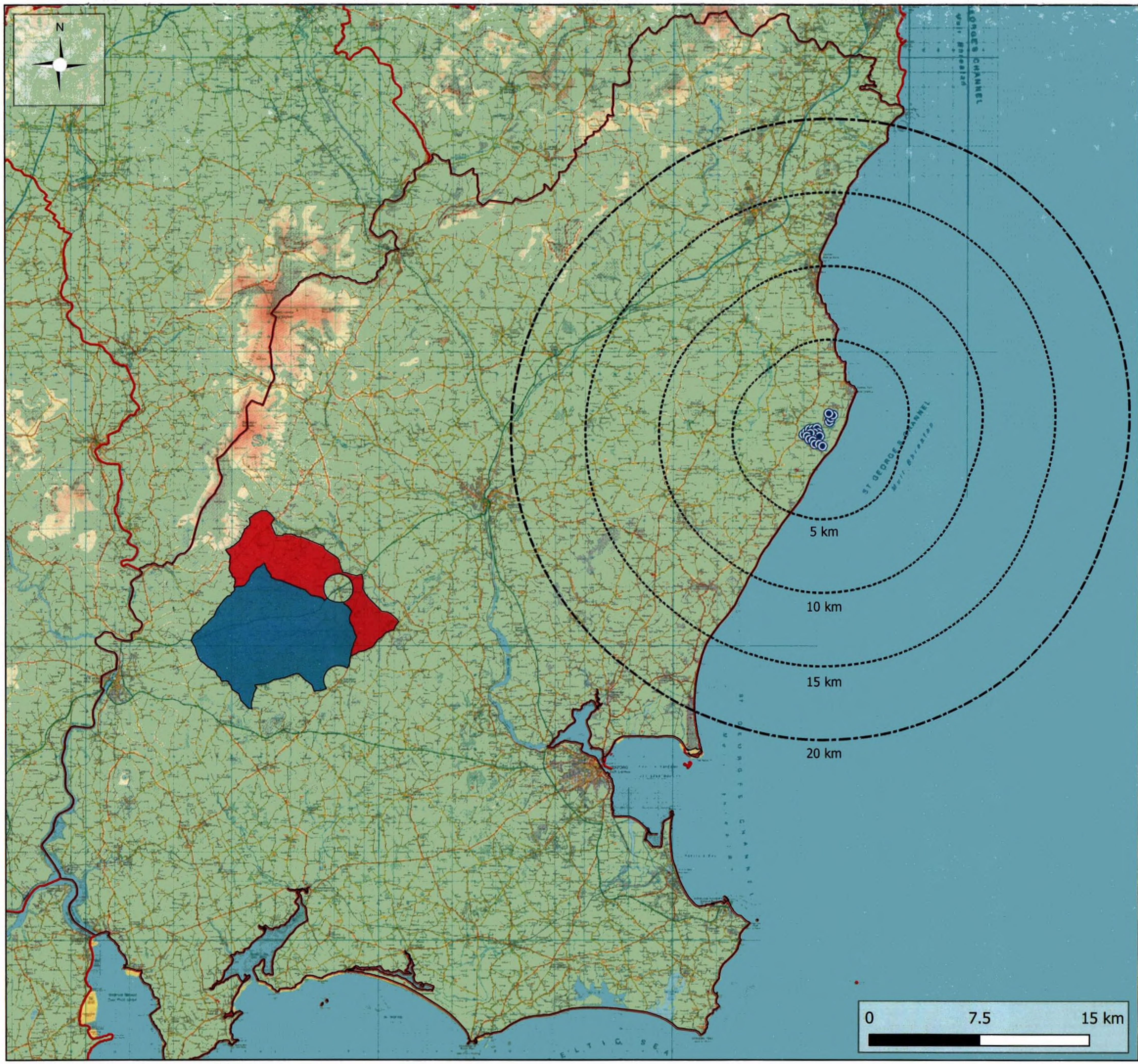
Under the Energy Strategy, Volume 10, of the Wexford County Development Plan, Section 1.2 outlines vision of energy for County Wexford to become *"a more energy secure, low carbon county in line with national energy targets whilst balancing the need to protect the environmental, social and heritage assets of the county".* This is reflected in the 'Strategic Aims of the Energy Strategy', section 1.3 of Volume 10, of the WCDP, where one of its aims is:

> *"To support the attainment of national renewable energy and carbon reduction targets and to position the County as a leader in renewable energy generation and energy efficiency."*

The Wexford County Wind Energy Strategy, shown in Figure 12-10 below, shows that the majority of Co. Wexford is regarded as an area 'Not Normally Permissible' for wind energy development, including the site of the Proposed Development. With regard to installed wind farms, such as the existing Ballywater Wind Farm, Section 5.3 of the Energy Strategy states that wind farms can exist alongside tourism and leisure interests, but that there should be consideration so that *"insensitively sited wind farm developments do not impact negatively on tourism potential"*. It is suggested, that in such cases, recreational facilities *"can be accommodated and facilitated either within or adjacent to wind energy developments"*.

The current Wind Energy Zoning for County Wexford is shown in Map 14 of Volume 10 of the WCDP. The Proposed Development is located in an area currently designated as 'Not Normally Permissible' for wind. It is to be noted that this designation covers a vast proportion of the County – approximately 96%. Only 1.4% of the county is designated as 'Open to Consideration' and 2.6% is designated as 'Acceptable in Principle'. It is assumed that the policy direction in Volume 10 of WCDP relating to the current wind energy zoning in Co. Wexford is generally directed at the introduction of new wind renewable energy development into the landscape. The Proposed Development constitutes an existing wind farm and an existing and established part of the existing landscape, so this assessment has taken the view that the 'Not Normally Permissible' zoning is less relevant in the context of the Proposed Development in the modern day.

The Proposed Development is located on farmland within a coastal landscape, a landscape of high sensitivity, bordering a lowland/farmland landscape of low sensitivity, enabling set back from densely populated areas and receptors of high sensitivity. A more comprehensive description of the landscape of the Proposed Development site is included below in the following Sections.



Map Legend

- Existing Turbines
- LVIA Study Area
- County Borders

Wind Energy Strategy (WCDP 2022-2028)

- Acceptable in Principle
- Not Normally Permissible
- Open for Consideration

Drawing No.

Figure 12-10

Drawing Title

WCDP Wind Energy Strategy

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:250,000	230417	08.10.2024	DM	JW

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12.4.1.4 Co. Wexford Designated Scenic Routes and Protected Views

Section 5.0 Volume 7 of the WCDP (2022–2028) states that it does not designate specific views but recognises that a scenic route may fall into a category such as:

- *"Routes through Upland, Coastal, River Valley and Distinctive Landscapes."*
- *"Trails such as the Eurovelo, Norman Way, Greenways and Wexford Walking Trails where sightseeing visitors are more likely to be concentrated along these routes."*

Furthermore, other scenic views *"might"* include:

- *"Views to the sea and views towards land from the sea and rivers in locations which may host tourism or amenity/journeys arrivals by boat."*
- *"Planned views and vistas such as those associated with planned settlement and heritage properties and gardens."*

As stated, the WCDP 2022-2028 does not designate specific scenic views or routes, hence none are mapped within the planning policy. The visibility appraisals and impact assessments in this LVIA have been cognisant of the categories and criteria listed above that relate to protected scenic amenity in the county. This is also reflected within Section 5.0 Volume 7 of the WCDP (2022–2028) which states:

> *"all landscapes are living and changing, and therefore in principle a development on such a route would not necessarily be prohibited, but development, where permitted, should not hinder or obstruct these views and prospects, should not have significant negative impacts either individually or cumulatively and should be designed and located to minimise their impact."*

12.4.2 Landscape Character of the Proposed Development site

Landscape character refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement, and creates the particular sense of place found in different areas. The identification of landscape character as outlined in the Landscape and Landscape Assessment Guidelines (DoEHLG, 2000) comprises the identification of primarily physical units (areas defined by landform and landcover) and, where appropriate, of visual units.

12.4.2.1 Site Visit Findings

The existing Ballywater Wind Fam site was visited in December 2023 where a preliminary analysis of topography, drainage, landcover and land use was conducted in conjunction with other LVIA surveys. Information gathered during these visits has informed the following site descriptions.

The Proposed Development site is comprised of an existing wind farm comprising two turbine clusters. A group of 17 turbines are located within the southern portion of the site – The 'southern cluster'. Four turbines are located 966m to the north – the 'northern cluster', separated from the southern cluster by the Cahore Polder which is an area of reclaimed wetland inland from a coastal dune complex.

Topography

The landscape surrounding the Proposed Development site comprises of a gently sloping topography downwards towards the coastline. The greatest elevation on the site is inland at the western extent of the Proposed Development site both at the northern and southern cluster. This localised landform slightly enclose the Proposed Development site around the northern and western perimeter of the site, as shown in Figure 12-11. The elevation of the site itself ranges from approximately 2 m to 25 m Above Ordnance Datum (AOD), with the lowest turbine sited at 2.5m (T16) and the highest at 23.5m (T3).

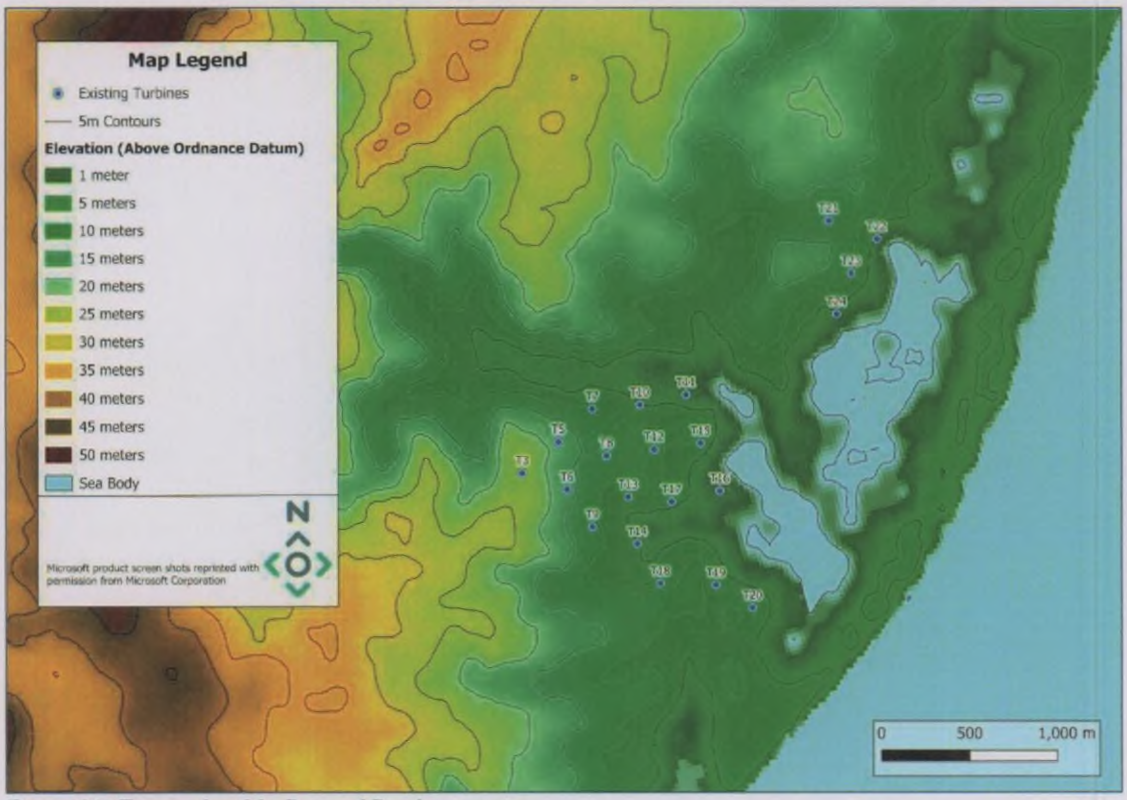


Figure 12-11 Topography of the Proposed Development site

Plate 12-1 Gentle sloping topography towards the coastline of the southern cluster of the existing Ballywater Wind Farm

Drainage

The Proposed Development site is located in a lowland coastal plain. Man-made drainage ditches, such as those seen in Plate 12-2 and Plate 12-3 below, run through parts of the site (see in Figure 12-12 below). The drainage ditches can be seen 141m south of turbine T17, 71m north of turbine T11, and 60m south of T14 where a small bridge extends across it to provide access to agricultural fields and 3 No. turbines. Tall vegetation such as trees and bushes delineate one or both sides of the drainage ditches, with most of the small streams running into the wetland area located immediately east of existing Ballywater Wind Farm, as seen in Plate 12-4 and Plate 12-5. This wetland area consists of a system of polders, freshwater lakes and brackish ponds.

Figure 12-12 Satellite view of the Proposed Development infrastructure and small river bodies within the area

Plate 12-2 Drainage ditch on the existing Ballywater Wind Farm site

Plate 12-3 Drainage ditch on the existing Ballywater Wind Farm site

Plate 12-4 Landcover Northeast of the Proposed Development, comprised of pastures and waterbodies

Plate 12-5 Landcover East of the Proposed Development, comprised of a waterbodies and sand dunes

Landcover and Land Use

Landcover is the term used to describe the combinations of vegetation and land-use that cover the land surface. It comprises the more detailed constituent parts of the landscape and encompasses both natural and man-made features.

The land-use of Proposed Development site is both for agriculture and generating electricity, where the existing Ballywater Wind Farm is part of the agricultural landscape. The turbines are sited on soft undulating slopes, which tend to be fenced fields of pasture for animal grazing or crop production. A large farmyard with large-scale farm infrastructure is situated in the centre of the southern cluster of No. 17 turbines, seen in Plate 12-6 below. Agricultural infrastructure is located at the access point to the north cluster of the No. 4 existing wind turbines, situated northwest beside these turbines, as seen in Plate 12-7 below. Small pockets of trees and hedgerows surround the sites, bordering field boundaries.

Within the EIAR Site Boundary are system of polders, freshwater lakes and brackish ponds located immediately east of the existing Ballywater Wind Farm. Sand dunes line the coastline on the opposite side of these geographical features, as seen in Plate 12-5 above. These Cahore Polders and Dunes have been designated as a SAC and a pNHA. The Cahore Marches, which are also located immediately east of the existing Ballywater Wind Farm are designated as a SPA. These designated geographical features are comprised shorth vegetation, enclosed from the coastline by the sand dunes, as seen in Plate 12-5 above.

The existing Ballywater 110kV Substation and control room are located on an elevated position beside the southern site access road, on the edge of an agricultural field. Visibility of the existing Ballywater 110kV Substation is limited due to the hedgerows along the EIAR Site Boundary. The relatively low elevations of the substation mean that any landscape impact will be limited to within very close proximity.

Plate 12-6 Agricultural infrastructure sited amongst southern cluster of existing Ballywater Wind Farm

Plate 12-7 Agricultural infrastructure situated on access road to the northern cluster of the existing Ballywater Wind Farm

Figure 12-13 Ariel Map of the existing Ballywater 110kV Substation location

Plate 12-8 Existing Ballywater 110kV Substation

Plate 12-9 Existing Ballywater 110kV Substation

12.4.3 Landscape Characterisation in the Wind Energy Development Guidelines (DoEHLG, 2006)

The following section considers both the Wind Energy Development Guidelines (DoEHLG, 2006) and the Draft Revised Wind Energy Development Guidelines (DoHPLG, 2019). These guidelines offer guidance for the siting and design of wind energy developments in various landscape contexts by defining six landscape character types that represent most situations where wind turbines may be proposed. The guidance is intended to be indicative and general and notes that it represents the 'best fit' solutions to likely situations.

The six landscape character types include 'Mountain Moorland', 'Hilly and Flat Farmland', 'Flat Peatland', Transitional Marginal Land', 'Urban/industrial' and 'Coastal' landscape character types. The guidelines note that where a wind energy development is located in one landscape character type but is visible from another, it will be necessary to decide which might more strongly influence the approach adopted for the assessment.

The existing Ballywater Wind Farm is located beside the Wexford coastline characterised by a long sand beach, tall sand dunes, and a small marshland. The area in which the Proposed Development is currently sited within a softly undulating farmland. Within the DoHPLG 2019 guidelines, Section 6.10.6 describes a **'Coastal Zone'** as having:

- "Beaches, dunes, rocks, promontories and/or cliffs.
- High rocky crags may have scrub, heather, bracken and gorse as land cover, whereas flatter areas are more likely to comprise farmland.
- Seashores can also include harbours, hamlets, villages and towns and some of these may have developed into seaside holiday resorts; and
- This landscape type involves openness, nature and recreation and thus may be sensitive. Coastal landscapes identified through sensitivity analysis, as being of rare scenic quality may not be appropriate for wind energy development."

This description of beaches, dunes, and the flat landscape which comprises of farmland describes the type of landscape that the existing Ballywater Wind farm is located within and tends to be surrounded by.

The best practice siting and design guidance given for a 'Coastal Zone' in the Wind Energy Development Guidelines (DoEHLG, 2006) and the Draft Revised Wind Energy Development Guidelines (DoHPLG, 2019) is set out below:

Location

"Wind energy developments should be set back from the sea and clearly located on solid ground. They are suited to low beach shorelines as well as rocky promontories."

Spatial Extent

"This depends on the length of shoreline. In order to achieve simplicity, a wind energy development should not extend beyond one particular kind of shore. Accordingly, it should physically relate to a beach or a rocky promontory but not bridge the two."

Spacing

"Regular turbine spacing would be most appropriate in order to achieve a serenity and composure that reflect those of the sea. A promontory could be used to achieve a dramatic aesthetic effect using graded spacing with the gradual tightening occurring seawards."

Layout

"Wind energy developments should reflect the linearity of the shore by a corresponding linear or staggered linear layout. However, on a headland with a peak or hill, a clustered layout might be used to crown and thus accentuate the feature."

Height

"Turbines can generally be tall, especially close to and parallel to beaches. More caution might be necessary in regard to promontories where the scale of the projecting land mass should be considered. The profile should be even in response to the flatness of the sea."

Cumulative Effect

"Generally along any length of shoreline one wind energy development can be visible in the fore or middle ground. A second one may be acceptable in the far distant background, provided it is only dimly visible under normal atmospheric conditions in order to preserve the spatial, scenic and thematic integrity of the shore. The principle objective is to ensure that multiple wind energy developments are not visible in close proximity from any one seaside location due to their generally sensitive nature."

The existing Ballywater Wind Farm is generally compliant with all of the siting and design guidance quoted above in relation to Coastal Zone in the guidance. When the existing Ballywater Wind Farm and existing Ballywater 110kV Substation became operational in 2005, DoEHLG had not yet published the Wind Energy Development Guidelines (2006) (the Guidelines), which require a minimum setback distance of 500m or 4 x tip height from wind turbines. In the case of the existing Ballywater Wind Farm, there are 8 no. dwellings which exist within the 4x tip height buffer (i.e. 396m) and an additional 25 no. dwellings within 500m of the existing turbines, which are discussed in Section 12.5.1.3 below.

12.4.4 Landscape Character of the Wider Landscape Setting

Landscape character refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects combinations of geology, landform, soils, vegetation, land use and human settlement, and creates the sense of place found in different areas. The landscape surrounding the Proposed Development site is a rural agricultural landscape.

12.4.4.1 Landscape Character Areas

As noted in Section 12.2.1, the LVIA Study Area for assessment of landscape character extends to 15 km from the existing turbines. In the previous section - *Landscape Designations and Policy Context*, 9 No. LCUs were identified within 15 km of the Proposed Development site, in County Wexford. Of these 9 No. LCUs, 6 No. are classed as distinctive landscapes.

12.4.4.1.1 *LCA Preliminary Analysis*

A map showing all LCUs within 15km and the distribution of theoretical visibility of the existing turbines occurring in each LCU is shown in Figure 12-8 above. This is followed by Table 12-10 which discusses the theoretical versus actual visibility of each LCU.

Table 12-10 LCA Preliminary Analysis

Map Ref	LCU	Theoretical Visibility (TV) as indicated by ZTV	Actual Visibility	Scoped in for Assessment
Up to 5 km				
LCU 38	**Cahore Point (Coastal & Distinctive Landscape)**	**Mostly full theoretical visibility, except along coast edge.**	**This LCU encompasses the area of Cahore which includes area of land and marine area around Cahore Point. Majority of the area is visually screened by vegetation and residential clusters. Hence, there is intermittent visibility of the existing Ballywater Wind Farm, with the exception of the south where there is greater potential for views.**	**Yes**
LCU 47	Coastal	Mostly full theoretical visibility within 5km from the site and patchy theoretical visibility past 5km	Treelines and hedgerows provide full or partial visual screening where existing around this LCU. Due to the placement of the existing Ballywater Wind Farm within this LCU and the nature of the topography,	Yes

Map Ref	LCU	Theoretical Visibility (TV) as indicated by ZTV	Actual Visibility	Scoped in for Assessment
			the turbines are mainly visible within the immediate vicinity.	
LCU 48	Lowlands	Mainly full theoretical visibility with 5km from the site. Patchy full theoretical visibility between 5km and 10km, and north up to 15km. Very little to no theoretical visibility beyond 10km to the east and south of the site.	Treelines and hedgerows provide full or partial visual screening where existing around this LCU. Due to the placement of the existing Ballywater Wind Farm beside this LCU, 485 meters to the nearest turbine T3, and the nature of the topography, the turbines are visible when in close proximity.	Yes
5 to 10 km				
LCU 6	Boley Hill (Distinctive Landscape)	Full theoretical visibility along the south of the LCU and the top of the hill.	Low hedgerows in the area of theoretical visibility and greenfield sites with little vegetation allow for clear visibility across the landscape.	Yes
LCU 8	Oulart Hill (Distinctive Landscape)	There is full theoretical visibility in the small section of this LCU that appears within the 5 to 10km radius. Then, beyond the 10km radius, full theoretical visibility exists mainly along the west of this LCU, along the slopes facing the site.	Low hedgerows in the area of theoretical visibility and greenfield sites with little vegetation allow for clear visibility across the landscape.	Yes
10 to 15 km				
LCU 1	River Valley	No theoretical visibility.	No visibility	No
LCU 5	Ballyminaun Hill (Distinctive Landscape)	Full theoretical visibility along the south half of the LCU which includes the top of the hill.	Low hedgerows in the area of theoretical visibility and greenfield sites with little vegetation allow for clear visibility across the landscape.	Yes
LCU 7	Carrigroe Hill (Distinctive Landscape)	Full theoretical visibility of the site from the east of the LCU and along the	Low hedgerows in the area of theoretical visibility and greenfield	Yes

Map Ref	LCU	Theoretical Visibility (TV) as indicated by ZTV	Actual Visibility	Scoped in for Assessment
		south side of this distinctive LCU	sites with little vegetation allow for clear visibility across the landscape.	
LCU 9	**Slievenagorea (Distinctive Landscape)**	**Full theoretical visibility around the hilltop and along the northeast section of the of the LCU.**	**Small coniferous plantations cover areas with full theoretical visibility. Hedgerows and treelines cover limit visibility in the direction of the Proposed Development.**	**No**

12.5 Visual Baseline

The main purpose of establishing the visual baseline is to identify the key visual receptors that should be considered for assessment and discusses the general visibility and visual exposure of the Proposed Development in the wider landscape. The visual baseline exercise uses ZTV mapping as a tool to determine where no on-site visibility appraisals are required. However, as the turbines of the Proposed Development exist within the existing landscape, the focus of this section is to determine the extent to which the existing turbines are visible from visual receptors in the LVIA Study Area as determined from on-site visibility appraisals.

12.5.1 Visibility Appraisal

This section of the LVIA chapter describes the views of the existing Ballywater Wind Farm from the surrounding landscape that are available as determined from multiple site visits conducted in 2023. It also describes the existing views towards the site from the surrounding area, with particular reference to the views from roads, houses, and areas of amenity value.

12.5.1.1 Visual Receptors

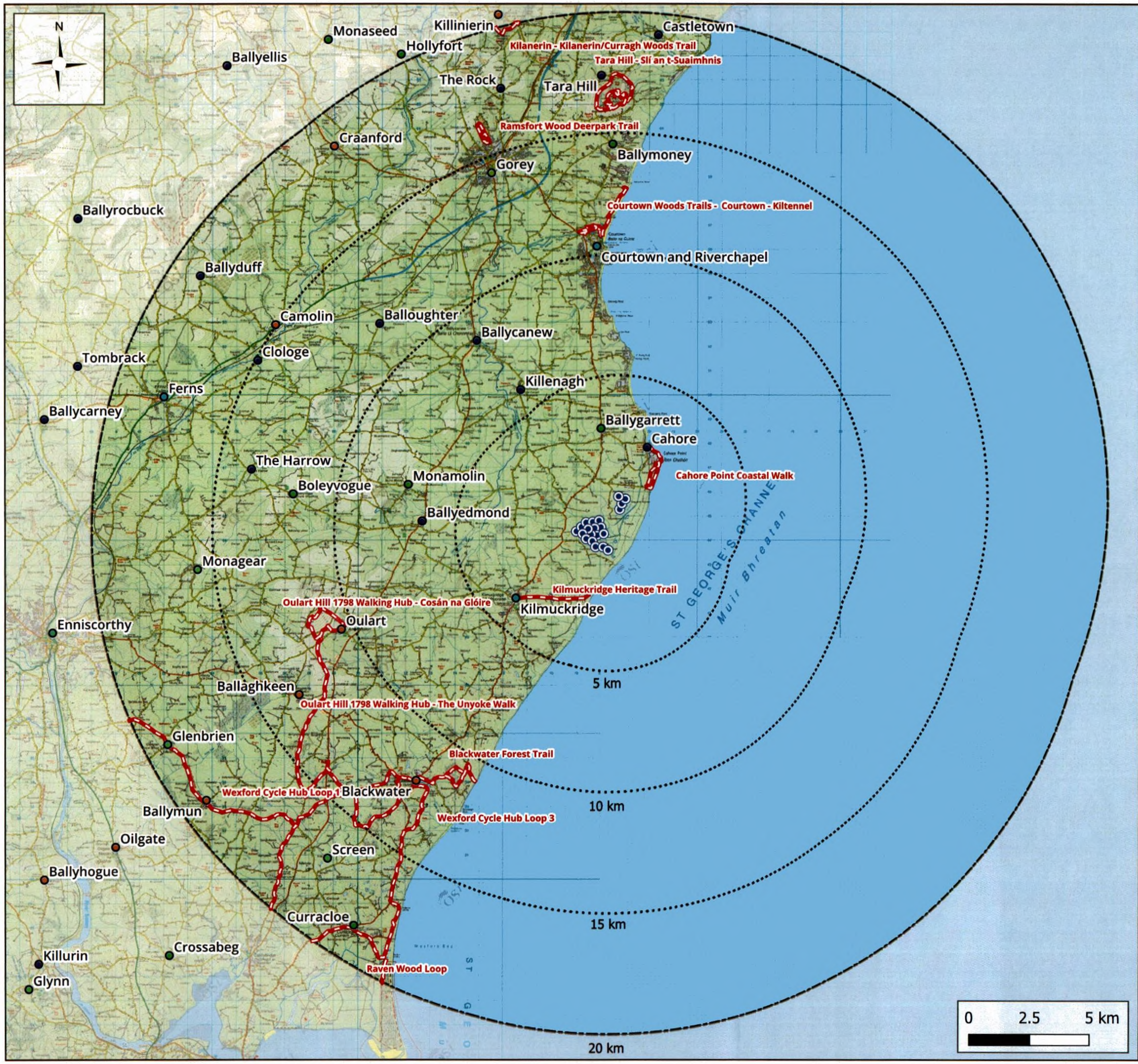
The main purpose of establishing the visual baseline is to identify the key sensitive visual receptors that were assessed on site, where ZTV indicated the existing turbines would be theoretically visible and which receptors should be considered for viewpoint selection. Viewpoints are locations from which visual effects are assessed using photographic visualisations (See Section 12.2). To this end, the following visual receptors have been identified within the LVIA Study Area:

- Settlements
- Residential Receptors in close proximity
- Recreational Routes (Waymarked Walking Routes; Cycle Routes; Scenic Drives; Tourist Routes)
- Recreational, Cultural Heritage and Tourist Destinations
- Transport Routes

Distinctive Landscapes

LCUs identified in Section 12.4.1.1 previously and other Distinctive LCUs identified in the WCDP, such as hills, are associated with visual amenity and recreation, offering “broad views across the surrounding landscape". County Wexford hosts numerous waymarked trails, some of which are located within Distinctive LCUs.

Visual receptors are identified in the visual baseline map, Figure 12-14 below. They're location and theoretical visibility at those locations are indicated by the ZTV map in Figure 12-15. During site visits conducted in December 2023, the likely visibility of the existing turbines was appraised from receptors where the ZTV has indicated theoretical visibility. Visual receptors are scoped out from further assessment when there is either no theoretical visibility of the existing turbines or where on-site appraisal determined the visibility of the existing turbines to be very unlikely or very limited.



Map Legend

- Existing Turbines
- LVIA Study Area
- Waymarked Trails

Settlement Hierarchy (WCDP 2022-2028)

- Key Towns
- Large Towns
- Large Villages
- Rural Nodes
- Service Settlements
- Small Villages Category 1
- Small Villages Category 2
- Strategic Settlements

Drawing No.

Figure 12-14

Drawing Title

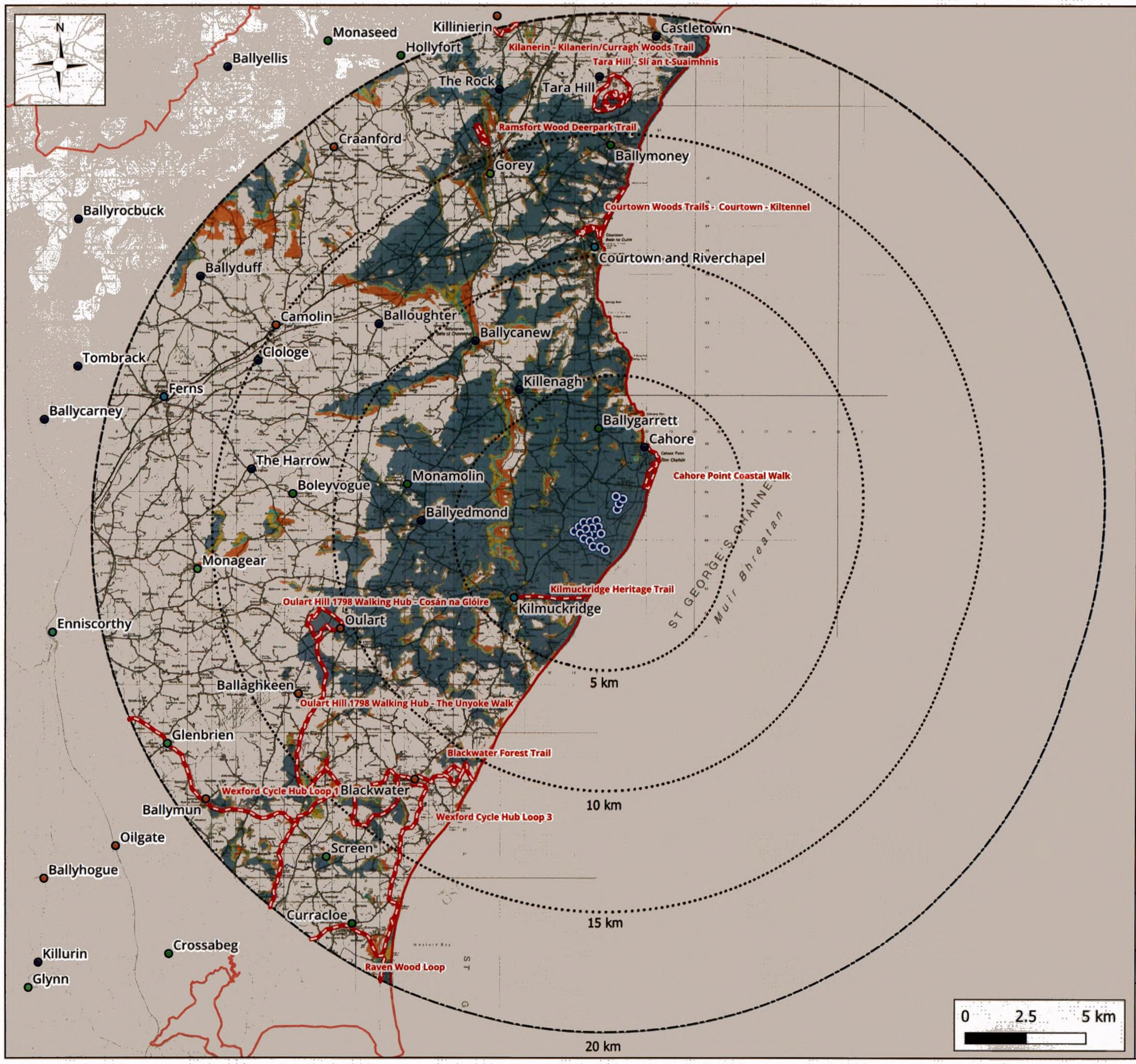
Visual Baseline

Project Title

Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:152,000	230417	08.10.2024	DM	JW

MKO Planning and Environmental Consultants



Map Legend

- Existing Turbines
- LVIA Study Area
- County Borders
- Waymarked Trails

Settlement Hierarchy (WCDP 2022-2028)

- Key Towns
- Large Towns
- Large Villages
- Rural Nodes
- Service Settlements
- Small Villages Category 1
- Small Villages Category 2
- Strategic Settlements

Half Blade ZTV

- 1-5 No. Turbines Theoretically Visible
- 6-10 No. Turbines Theoretically Visible
- 11-15 No. Turbines Theoretically Visible
- 16-21 No. Turbines Theoretically Visible

Drawing No.
Figure 12-15

Drawing Title
Visual Baseline and ZTV

Project Title
Proposed Lifetime Extension of Ballywater Wind Farm - EIAR

Scale	Project No.	Date	Drawn By	Checked By
1:152,000	230417	09.10.2024	DM	JW

MKO Planning and Environmental Consultants

12.5.1.2 Walking Routes and Cycleways

12.5.1.2.1 *Recreational Waymarked Routes*

Recreational routes are sensitive receptors as people are likely to be using them in a recreational capacity where value is likely to be placed upon views and the scenic amenities of the landscape. The term recreational routes encompass the following:

- Waymarked walking routes (Source – Sport Ireland Designated Trails)
- Cycle routes (Source – Sport Ireland Designated Cycle Routes)
- Scenic drives and tourist routes (e.g., the Wild Atlantic Way)

Routes were identified and located within the LVIA Study Area by examination of OSi maps and online sources such as: Sportireland.ie/outdoors/Irelands-trails; Heritagemaps.ie and Activeme.ie. Many routes exist of differing scale and prominence, only recreational routes of County or National importance were included in this LVIA.

In relation to 'Scenic Routes and Protected Views', Section 5.0 of the WCDP states:

> *"This plan does not designate specific routes but notes that scenic routes may fall into a number of categories:*
>
> - Routes through Upland, Coastal, River Valley and Distinctive Landscapes.
> - Trails such as the Eurovelo, Norman Way, Greenways and Wexford Walking Trails where sightseeing visitors are more likely to be concentrated along these routes.
>
> *Other scenic views include might include:*
>
> - Views to the sea and views towards land from the sea and rivers in locations which may host tourism or amenity/journeys arrivals by boat.
> - Planned views and vistas such as those associated with planned settlement and heritage properties and gardens."

With regard to the above statement, the WCDP states:

> *"in principle a development on such a route would not necessarily be prohibited, but development, where permitted, should not hinder or obstruct these views and prospects, should not have significant negative impacts either individually or cumulatively and should be designed and located to minimise their impact."*

There are two walking routes that exist within close proximity to the Proposed Development, the Cahore Point Coastal Walk and the Kilmuckridge Heritage Trail. The Cahore Point Coastal Walk, located approximately 970 meters at its closest to the nearest existing turbine, offers views overlooking the Wexford coastline, and walks along Cahore South beach. The Kilmuckridge Heritage Trail is located just over 2km to the south of the existing Ballywater Wind Farm. The ZTV in Figure 12-15 indicates both waymarked trails mainly have visibility of the Proposed Development.

Beyond 10km there are several waymarked walking and cycle routes located north and southwest of the Proposed Development. Located 10.2km southeast of the Proposed Development are the Oulart Hill 1798 Walking Hub trails, and 10.5km to the south is the Blackwater Forest Trail. Tara Hill Trails, Courtown Woods Trail and Ramsfort Wood Deerpark Trail are located 16km, 10.8 km and 15.5 km north of the Proposed Development, respectively. As indicated by the ZTV in Figure 12-15 above, there is theoretical visibility of the Proposed Development from these trails, however considering distance and vegetative screening actual visibility is significantly reduced. The Wexford Cycle Hub Loops 1 & 3 are located approximately 16.9km and 12.1km to the southeast and south of the Proposed

Development, respectively. The furthest walking trail, the Kilanerin Woods Trail is located 19.7km north of the Proposed Development. These other waymarked routes within the LVIA study area have partial to no visibility along majority of their routes.

12.5.1.2.2 *Settlements*

The WCDP (2022–2028) includes in its core strategy, a settlement hierarchy from the Key Towns of Wexford and Gorey, down to large towns, service settlements, strategic settlements, large villages, small villages, and rural nodes as listed in Table 3-2 and Map 3-2 of the WCDP (2022–2028).

The closest designated settlements to the Proposed Development site are the rural node of Cahore, located 1.8 km northeast of the existing Ballywater Wind Farm at its closest point, the small village of Ballygarrett located 2.5 km north of the existing Ballywater Wind Farm, and the strategic settlement of Kilmuckridge is located 3.1 km southwest at its closest point.

12.5.1.3 Views towards to existing Ballywater Wind Farm

As seen in the ZTV mapping in Figure 12-15, beyond 10km there is no/limited visibility of the existing Ballywater Wind Farm turbines to the west and south, and patches of visibility to the north beyond 5km. Due to the nature of the topography and the screening effect by vegetation and development, the only longer ranging views towards the existing Ballywater Wind Farm are from elevated vantage points atop topographical features (beyond 9km from the existing site). Most visibility occurs within close proximity (5km) of the existing Ballywater Wind Farm.

The on-site existing Ballywater 110kV Substation has relatively low elevations, as seen in Plate 12-8 and Plate 12-9 above and is located along the entrance road to the site. Hedgerows and treelines south and immediately west of the substation screen visibility of the substation in these directions. There is a distance of approximately 365m between the entrance of the Proposed Development southern cluster and substation. Roadside vegetation around the entrance provides visual screening from receptors along the R742. Further north along the R742 Regional Road, lower roadside vegetation provides partial screening of views towards the existing Ballywater 110kV Substation.

The grid connection that connects the existing Ballywater 110kV Substation to the Crane 110kV Substation runs underground along existing roads and is not visible.

Kilmuckridge Heritage Trail

The Kilmuckridge Heritage Trail is located to the south of the Proposed Development. For most of this trail there is limited visibility of the existing Ballywater Wind Farm due to the presence of trees, hedgerows, and residential buildings along the route. Plate 12-10 shows how the existing Ballywater Wind Farm appear from an unobstructed section of the trail. From this viewpoint the turbines are seen along the background and seem to follow a staggered linear layout and gradually attenuate towards the direction of the coastline.

Plate 12-10 View from Kilmuckridge Heritage Trail, 2.92km south of the Proposed Development site

Cahore Point Coastal Walk

The Cahore Point Coastal Walk is located to the north of the Proposed Development. There is partial visibility of the existing Ballywater Wind Farm along part of this trail with the presence of trees and other vegetation along the route providing screening. Plate 12-11 shows how the existing Ballywater Wind Farm appear from an unobstructed, elevated section of the trail. From this viewpoint, the section of the trail located along the beach can be seen, where sand dunes provide screening of views towards the existing Ballywater Wind Farm. The presence of these sand dunes along the coastline provides similar levels of screening of the existing turbines.

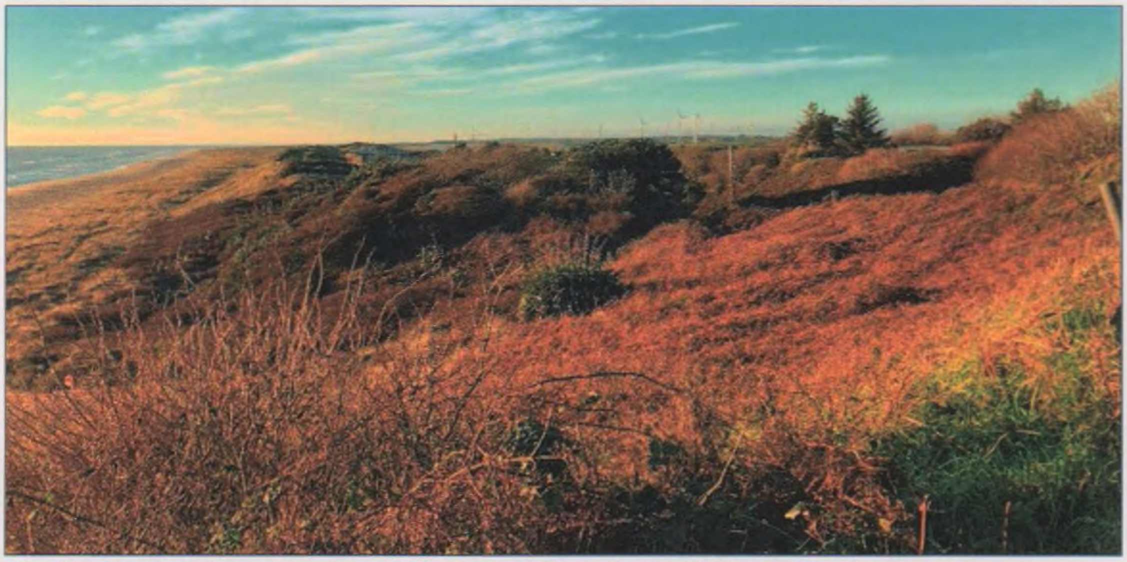


Plate 12-11 View from Cahore Point Coastal Walking trail, 1.92km northeast of the Proposed Development site

A part of this trail passes through the sand dunes south of Cahore and is the nearest part of the trail to the Proposed Development. Plate 12-12 below represents a view from these sand dunes.

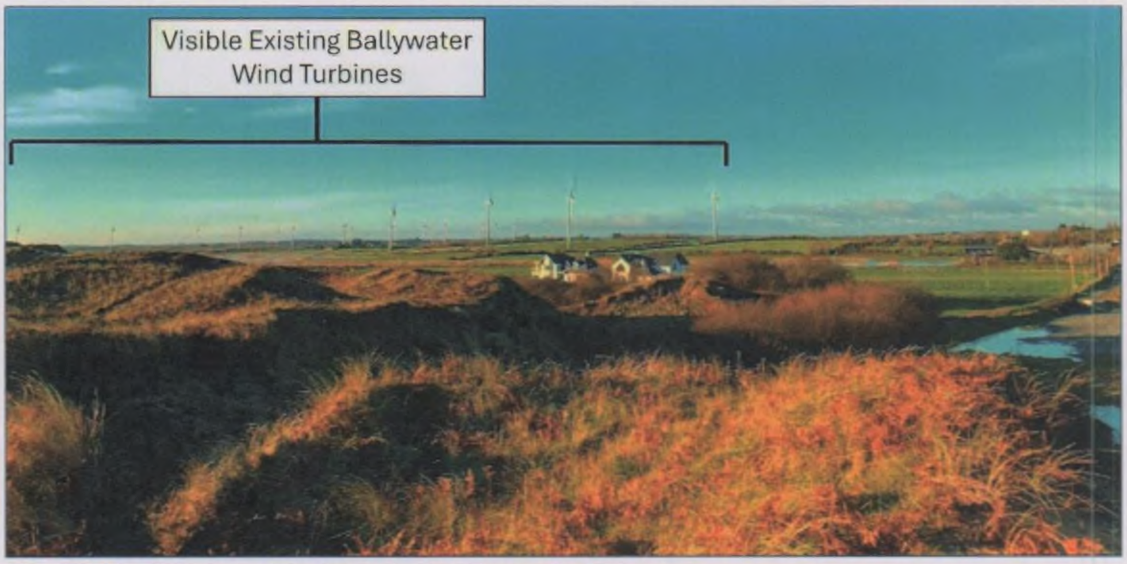


Plate 12-12 View looking west from the top of a Sand Dune south of Cahore

R742 Regional Road

The R742 Regional Road runs adjacent to the west of the Proposed Development site, 0.5km at its closest point. Trees and hedgerows along this route limit the visibility of the existing turbines, although there are gaps of low vegetation that allow visibility of the existing Ballywater Wind Farm along the stretch of the R742 between the townland of Clonevin and the Proposed Development southern cluster entrance. Plate 12-13 and Plate 12-14 show what the existing Ballywater Wind Farm look like from an unobstructed section of the road. Vegetation along this route tend to be mainly comprised of deciduous trees and hedges, where partial visibility of the turbines may be more common throughout periods of the year.

Plate 12-13 View east from the R742 near Clonevin Church, 1.3km northwest from the Proposed Development site

Plate 12-14 View south along the R742 near Clonevin Church

Ballinoulart Bay Beach Access Point

Plate 12-15 shows views of the existing Ballywater Wind Farm from the access area to Ballinoulart Bay Beach. This view in this image is unobstructed, however vegetation can be seen along the fence which reflects the boundary along the access route to this location. This area provides access to the recreational and scenic amenity of Ballinoulart Bay Beach, which is has a ridgeline of sand dunes providing some screening of the Proposed Development as described above for Plate 12-11. From this viewpoint, the turbines follow a staggered linear layout.

Plate 12-15 View west from Ballinoulart Bay Beach access point, 0.54km southeast from the Proposed Development site

Oulart Hill & Tulach a' tSolais Monument

Tulach a' tSolais monument is located on Oulart Hill, located approximately 11.37km northeast of the Proposed Development. Plate 12-16 represents a view from the Tulach a' tSolais Monument towards the direction of the existing Ballywater Wind Farm. This image shows a small density of deciduous trees in front of the monument which prohibit visibility of the existing Ballywater Wind Farm. A small trail that connects this monument to a small car park runs along the top of Oulart Hill and has a treeline running along the east side of this trail, i.e. the direction of the Proposed Development, with an open view looking out west from this trail. Plate 12-17 is a view at a location along this trail towards the existing Ballywater Wind Farm. The existing Ballywater Wind Farm can be seen in the distant background at the coast, beyond the hedgerow in the centre of the image. This view does not represent views of the Proposed Development from other hill locations, outlined in Table 12-10, however it does provide a relative view of how the Proposed Development may look like from similar elevated topographical features elsewhere in the LVIA Study Area which tend to be located at similar distances as indicated by the Landscape Baseline map in Figure 12-6.

Plate 12-16 View beside Tulach a' tSolais Monument at Oulart Hill, 11.37km southwest of the Proposed Development site

Plate 12-17 View from path on Oulart Hill, 11.05km southwest of the Proposed Development site

Settlements

Cahore

Plate 12-18 below shows a south-westerly view from the Cahore Beach carpark, near Cahore Pier, approximately 2.4km from the nearest existing turbine. The area of Cahore located on a small, elevated vantage point and is populated with residential dwellings. Some vegetation surrounding dwellings provide partial screening of views towards the Proposed Development. Dwellings located in the south of Cahore have more open views of the rural landscape and the Proposed Development, as seen in

Plate 12-19 below. Within the view of Plate 12-19, the turbines seem to be clustered in the left centre-background with T19 and T20 more isolated in the left hand-side of the image.

Plate 12-18 View southwest from Cahore North Beach car park

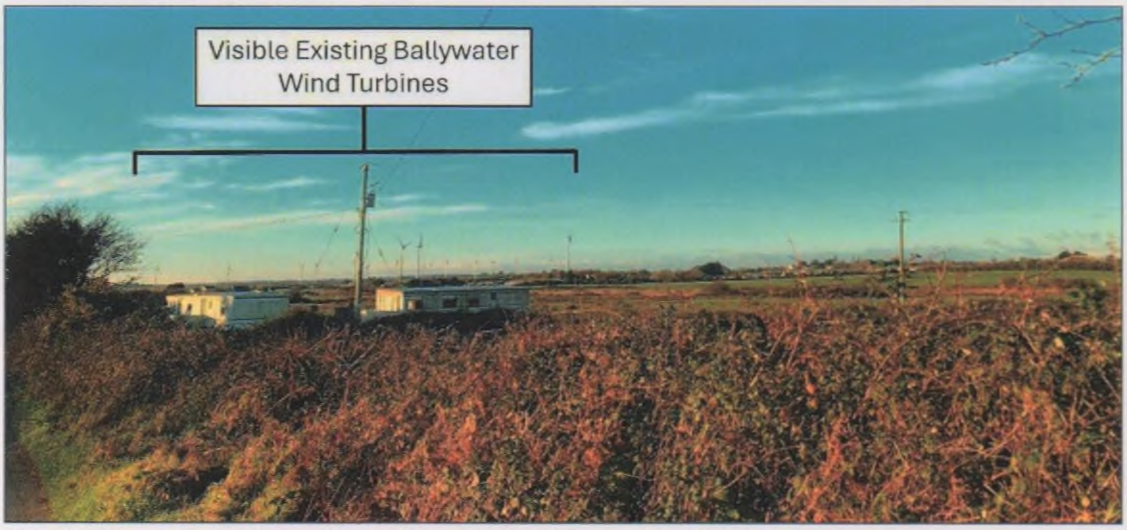


Plate 12-19 View south from Cahore Road in the townland of Cahore

Ballygarrett

Ballygarrett is located approximately 2.89km north from the nearest existing turbine. Plate 12-20 shows a southerly view from the main street of Ballygarrett, where trees and vegetation around the town limit long ranging views. The nacelles and blades of a small number of the existing turbines are visible in the distant background behind the treeline.

Plate 12-20 View south from Ballygarrett

Kilmuckridge

Kilmuckridge is located approximately 3.7km south from the nearest existing turbine. There is no theoretical visibility of the Proposed Development from the centre of this strategic settlement. Where there is theoretical visibility, treelines in the surrounding fields provide partial screening in the direction of the Proposed Development. Plate 12-10 (shown previously), located approximately 1km east of Kilmuckridge along the Kilmuckridge Heritage Trail, illustrates an unobstructed view of the Proposed Development from this direction.

Residents in close proximity to the Proposed Development

There are approx. 223 no. residential dwellings within 1.5km of the Proposed Development, 3 of these points are representative of caravan parks. In the case of the existing Ballywater Wind Farm, there are 8 no. dwellings which exist within the 4x tip height buffer (i.e. 396m) and an additional 25 no. dwellings within 500m of the existing turbines. When the existing Ballywater Wind Farm became operational in 2005, the DoEHLG had not yet published the Wind Energy Development Guidelines (2006) (the Guidelines), which require a minimum setback distance of 500m or 4 x tip height from existing turbines.

During site visits in December 2023, visibility appraisals determined that residential receptors within 500m of the turbines had the greatest potential for significant visual effects. There are also a number of residential receptors along the Cahore Road north of the Proposed Development spanning east to west that have potential for significant visual effects. In the wider landscape surrounding the existing turbines, there are small clusters of residential properties along roads and a smaller number of dwellings sporadically dotted throughout the landscape. Some residential receptors located in close proximity to the site have views of the existing turbines and are likely to have the greatest visual effects arising as a result of the Proposed Development. VP2, VP3, VP4, VP5 and VP6 represent residential properties located in close proximity to the Proposed Development and were selected for inclusion in the Photographic Visualisation Booklet and are comprehensively assessed in the viewpoint assessment tables in Section 12.7.3.3.2.

Residential receptors located immediately west of the north cluster of Ballywater turbines are surrounded by treelines and hedgerows which provide partial screening of the Proposed Development; however, the close proximity of these dwellings and the height of the turbines mean that the nacelle and blades are visible be visible above the vegetation.

Residential receptors along the local road between Ballinoulart Bay Beach and the R742 regional road have predominantly open views in the direction Proposed Development, where some roadside vegetation and some vegetation within their respective gardens provide partial screening.

12.5.2 Views from within Ballywater Wind Farm

The existing Ballywater Wind Farm is the most prominent feature within the site. Plate 12-21 below shows a view of the existing turbines surround by mainly open agricultural land. Due to the relatively flat landscape, long range views of some topographical features can be seen rising in the distant background.

Plate 12-21 View looking west within the existing turbines in southern Proposed Development site

Plate 12-22 View looking west over the soft undulating, open agricultural land of the southern cluster of existing turbines

The R742 regional road runs parallel to the existing Ballywater Wind Farm, with access to the southern site beginning here. Plate 12-23 below shows a view, from beside the location of the substation, of this access road in the direction of the access point. Vegetation and deciduous trees can be seen over the ridgeline, lining the R742.

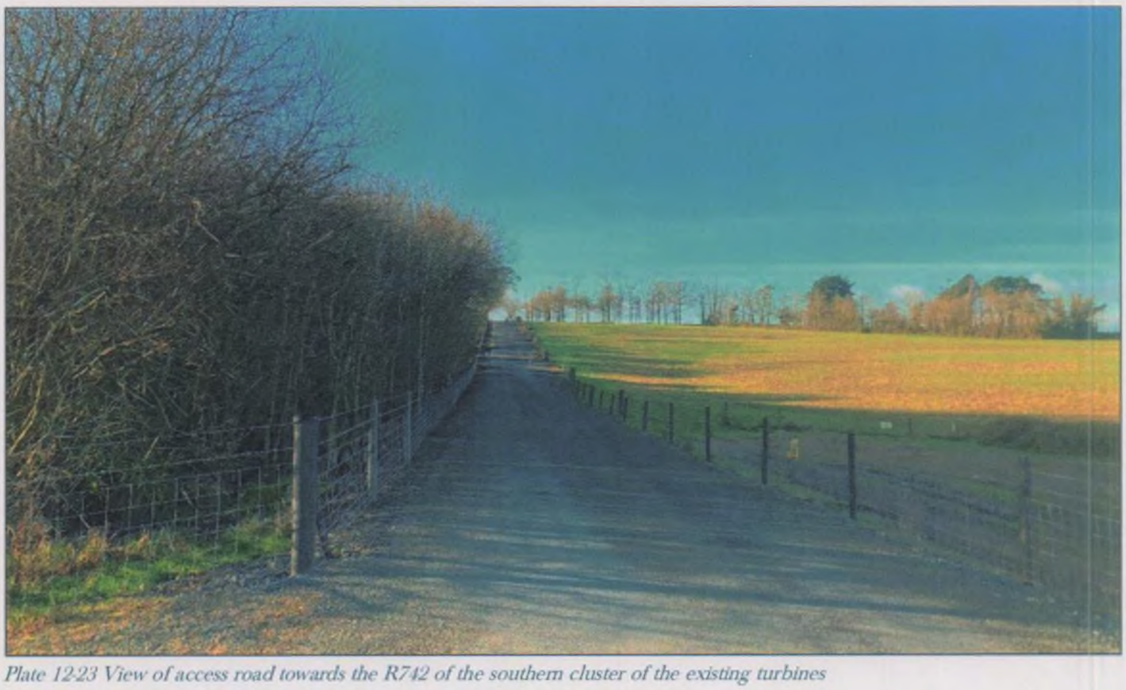


Plate 12-23 View of access road towards the R742 of the southern cluster of the existing turbines

12.6 Cumulative Baseline

In terms of cumulative landscape and visual effects, other wind energy projects are of primary focus, as only these would be described as very tall vertical elements in the landscape with the potential to give rise to significant cumulative effects. Cumulative wind developments were identified by searching past planning applications lodged through the various planning authorities (Wexford County Council and An Bord Pleanála online planning portals). The information identified in the initial planning search was then used to verify, by means of a desk-based study and ground-truthing, whether the permitted wind energy developments had been constructed.

The search determined there are no other permitted or proposed windfarms within the 20km LVIA Study Area. The list of existing, wind turbines presented within the search area to 20km are listed in Table 12-11 below.

Table 12-11 Cumulative Baseline: other wind farms within 20km of the existing Ballywater Wind Farm

Wind Farm	Status	No. of Turbines	Hub and Blade Dimensions
Up to 15km			
Gorey Business Park	**Existing Operational**	**1**	**Tip Height 39.2 metres, Rotor Diameter 15m**
15 to 20km			
Ballyduff	**Existing Operational**	**2**	**Tip Height 110m; Rotor Diameter 71m**

There are 2 no. existing windfarms within the 20km study area, the Ballyduff Windfarm and the singular Gorey Business Park Wind turbine. The Ballyduff windfarm is comprised of 2 no. turbines of tip height 110m and rotor diameter 71m and located 19.9km from the nearest existing turbine. The singular Gorey Business Park wind turbine is located approximately 14.1km from the Proposed Development and has a tip height of 39.2m. It is noted that there is a proposed offshore wind farm, Arklow Bank 2, located approximately 21km northeast at its closest point from the existing Ballywater Wind Farm. Considering the coastal location of the Proposed Development and offshore location of the Proposed Arklow Bank 2 Offshore Wind Farm, in combination visibility has been considered and is discussed below.

12.6.1 Cumulative Visibility Appraisal – Intervisibility and potential for In Combination Effects

The Gorey Business Park singular turbine in less than 50m tip height and located beyond 5km from the Proposed Development. Visibility appraisals determined that by its relatively small height and separation distance in combination visual effects are not likely to occur with this turbine, hence no significant cumulative effects are likely to arise. The Ballyduff Windfarm is existing and located at the edge of the LVIA Study Area (19.9 km to the northwest) and given the natural visual screening by the landscape and vegetation, no significant cumulative effects are likely to arise.

The Proposed Arklow Bank 2 Offshore Wind Farm is located beyond 20km from the Proposed Development outside of the LVIA Study Area. The visual envelope of the existing Ballywater Wind Farm is very limited due to visual screening via local topography and vegetation, as discussed in Section 12.5.1.3 above and Section 12.7.3.2 below. There are very few instances where in combination visual effects will occur between the Proposed Arklow Bank 2 Offshore Wind Farm and the Proposed

Development, excepting from very elevated vantage points inland of both developments. Considering the large separation distances between the developments (21km between Proposed Arklow Bank 2 Offshore Wind Farm and the existing Ballywater Wind Farm) and the further set back of elevated vantage points (an additional 11km), no significant cumulative visual effects are likely to arise between these two developments in a future receiving environment.

12.7 Likely or Significant Landscape and Visual Effects

12.7.1 'Do-Nothing' Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm once the current planning permission expires in June 2025. The site roads will be left in situ, as appropriate, to facilitate on-going access to agricultural holdings.

12.7.2 Construction Phase Effects

No construction activities or alterations to the Project are proposed beyond routine maintenance during the operational phase of the Project.

12.7.3 Operational Phase Effects

As part of the Project, the existing 110kV Underground Grid Connection from Ballywater 110kV substation to Crane 110kV substation (the 'grid connection') exists predominantly underground, where no landscape or visual effects arise. Therefore, the Proposed Development, in particular the existing Ballywater Wind Farm, is the main focus of Landscape and Visual Effects which is assessed in the Operational Phase Effects.

12.7.3.1 Landscape Effects

The infrastructure of the Proposed Development (the existing Ballywater Wind Farm and Ballywater 110kV Substation) is directly located on agricultural lands considered to be of **'Low'** sensitivity. The direct magnitude of change on the **'Low'** sensitivity areas of the site is deemed to be **'Moderate'** resulting in Medium-Term **'Slight'** landscape effects.

Within the EIAR Site Boundary are the Cahore marches SPA and the Cahore Polder and Dunes SAC and pNHA. These landscape features are deemed to be of '**High**' Sensitivity, they have not been materially altered by the existing Ballywater Wind Farm, however, the wind farm effects their setting and character. The magnitude of change on these higher sensitivity landscape receptors (Dunes, Polder, marches is considered **'Slight'**, therefore resulting in Medium-Term **'Moderate'** landscape effects.

The following sections report how continued operation of the existing Ballywater Wind Farm impacts the character of the landscape and specific landscape receptors.

12.7.3.1.1 *Landscape Character Assessment Table*

There were 9 No. WCDP Landscape Character Units identified within the LVIA Study Area for Landscape Character (within 15 km from the existing turbines), see Section 12.4.1.1 previously. Within the LCA Preliminary Analysis, Section 12.4.4.1.1, 7 No. of these LCUs were identified as having potential visibility of the existing turbines. The individual assessments for each of these LCUs are presented in Table 12-12 below. The assessment criteria and grading scales which aided the assessment of landscape effects are detailed in Section 12.2.5

Table 12-12 LCU Assessment Table

LCU 47 – Coastal	
Distance from site to Nearest/Furthest Area of LCU	The existing turbines are located within this LCU. This LCU stretches along the coast of County Wexford, meaning that this LCU extends 21.9km north of the nearest existing turbine, T21, and 58.4km southwest of the nearest existing turbine, T3.
LCU Key Characteristics (*County Wexford Landscape Character Assessment 2022-2028*)	› *"long, relatively straight coasts of sand or shingle backed up by low cliffs and sand dune systems.* › *Within this coastal landscape are the more distinctive land and seascapes of Wexford Harbour, Wexford Slobs and Cahore Polders and Dunes.* › *The south coast also has long beaches and dune systems.* › *Views to the Saltee and Keeragh Islands draw the eye in this landscape.* › *There are a number of distinctive features within this unit"*
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. This LCU is defined as having a variety of distinctive landscapes and seascapes. While majority of the significant features in this LCU are of features found on the coastline, more inland features, such as lakes, polders slobs, are also deemed as distinct features. Table 7 of Volume 10 within the WCDP, states that the capacity of this landscape for wind farm development is "Low capacity due to the scenic, tourism and recreation value of this area combined with a number of small settlements, high concentrations of one-off houses and a significant number of nature conservation sites". Therefore, taking into account these designations, this LCU is determined to have a **High** Sensitivity to wind farm development. **It is to be noted that the Proposed Development planning application was submitted in February 2001, prior to the adoption of the County Wexford Development Plan (2001-2006) in June 2001 and the designation of the 'Coastal Development Policy Area 1' which recognised the 'High' Sensitivity within this LCU.*
Visibility of the Proposed Development within the LCU	Within 5km of the Proposed Development, the ZTV within this LCU shows predominately full theoretical visibility. However, there are small patches areas where there is no theoretical visibility, or limited theoretical visibility, in the north and south of this LCU within 5km. Between 5km and 10km there is a mix of full and no visibility. There is a similar pattern of theoretical visibility to the beyond 10km to the north, compared to the large area of no theoretical visibility to the south of this LCU. Vegetation along roadsides takes advantage of the relatively flat landscape and gentle slopes to screen views in the direction of the existing turbines. Viewpoints 2, 3, 4 & 6 are located within this LCU.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.

Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing, permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Moderate:** "*A more limited loss of or change to landscape features over a medium extent which will result in some change to landscape features and aesthetics. Could include the addition of some new uncharacteristic features or elements that would lead to the potential for change in landscape character in a localised area or part of a landscape character area. Would include moderate effects on the overall landscape character that do not affect key characteristics. The effects could be long to medium term and/or partially reversible.*"
Significance of Effect	**High x Moderate = Moderate = Significant (EPA, 2022)** *"An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment."*
Mitigating Factors	› The Proposed Development does not adversely affect the nature of the Cahore Polders and are set back a reasonable distance from the sand dunes. › The sand dune systems that line coastline limit views of the Proposed Development from the sandy beaches. › Whilst the Proposed Development is located at the coast, it has limited visual exposure along the vast proportion of this long and linear LCU and only impacts the setting of sensitive characteristics in a highly localised portion of the LCU. In this regard, it is not deemed to significantly impact this LCU. › The Proposed Development planning application was submitted in February 2001, prior to the adoption of the County Wexford Development Plan (2001-2006) in June 2001 and the designation of the 'Coastal Development Policy Area 1' which recognised the 'High' Sensitivity within this LCU. Planning permission was subsequently granted in October of 2001.
Residual Effect	**Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends."*

LCU 49 – Lowlands	
Distance from site to Nearest/Furthest Area of LCU	The existing turbines are located 485m from the closest point of this LCU. The Lowlands LCU covers the largest area in County Wexford, with its furthest point being located 56.4km southwest of the nearest existing turbine, T3.
LCU Key Characteristics (*County Wexford*	› *"Predominantly fertile lands with higher levels of population and intensive agriculture.* › *Slope and topography occur in a shallow/gradual transition.*

Landscape Character Assessment 2022-2028)	› *Extensive views across large fields.* › *Number of prominent hills which provide more enclosure and 'punctuation' within the overall landscape."*
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "Low/Moderate" as designated in Table 7-3 within Volume 7 of the WCDP. The hills and ridges present in this LCU mean that the visibility of the existing turbines is limited and these features of the LCU provide a higher capacity to absorb development. Table 7 of Volume 10 within the WCDP, states the capacity of this landscape for wind farm development is "High capacity outside of the exclusion zones for settlements and the natural heritage designations". Therefore, taking into account these designations, as well as the absence of sensitive receptors in the landscape, this LCU is determined to have a **Low** Sensitivity to wind farm development.
Visibility of the Proposed Development within the LCU	Within 5km of the Proposed Development, the ZTV within this LCU shows predominately full theoretical visibility. Between 5km and 10km there is a mix of full and no visibility. Beyond 10km there is predominantly no theoretical visibility, with the exception of areas north of the Proposed Development. The relatively flat topography of this LCU in combination with screening effect of mature and roadside vegetation reduces actual visibility where theoretical visibility is indicated. Hence, within this LCU actual visibility of the Proposed Development tends to be within close proximity. Viewpoint 5 is located within this LCU.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing, permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Negligible:** *"A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short term and/or reversible."*
Significance of Effect	**Low x Negligible = Negligible = Imperceptible (EPA, 2022)** *"An effect capable of measurement but without significant consequences"*
Mitigating Factors	› Actual on the ground visibility of the existing turbines is generally concentrated in locations in closer proximity to the existing turbines, with large areas of this LCA having no actual visibility of the turbines, or where turbines appear as very small elements within the backgrounds of views from elevated points. › As noted in the LCU Descriptions (WCDP) the landscape "*has characteristics which provide it with a higher capacity to absorb*

	development without causing significant visual intrusion." which limits visibility across the landscape, reducing the spatial extent of the area within this LCU where the existing turbines will be visible.
Residual Effect	**Imperceptible (EPA, 2022)** *"An effect capable of measurement but without significant consequences"*

LCU 38– Cahore Point	
Distance from site to Nearest/Furthest Area of LCU	The Proposed Development is located 1.69km from this distinctive LCU at its closest point. The furthest point of this LCU is 2.35km from the nearest existing turbine, T22.
LCU Key Characteristics (*County Wexford Landscape Character Assessment 2022-2028*)	› *Cahore Point is considered as a Distinctive Coastal Landscape.* › *Located in the north of County Wexford it is considered one of the "prominent features in the coastal land/seascape. The promontories often enclose sandy bays which are popular with visitors."* › Cahore point has waymarked walking routes that loop around this elevated promontory, offering views towards the sea and the coastline extending north and south from this vantage point.
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. Volume 10 of the WCDP designates wind energy developments as *Not Normally Permissible* within this LCU and the capacity for wind energy developments is *"Low capacity due to the scenic, tourism and recreation value, geological, archaeological or nature conservation interests"*. This LCU is defined as being a distinctive landscape and seascape due to the visual interest and prominence surrounding it. Its elevated position on the coastline means that this LCU is sensitive to development which may impact views towards or from it. Taking these into account the designation this LCU is determined to have a **High** Sensitivity to wind farm development.
Visibility of the Proposed Development within the LCU	There is predominantly full theoretical visibility of the Proposed Development within this LCU. Areas located below the cliffs and sand dunes of Cahore Point are susceptible to either little or no theoretical visibility. In reality, vegetation and residential properties within this LCU obstruct views towards the existing turbines, restricting most visibility of the turbines along the south sections of the LCU. Viewpoint 1 is located within this LCU.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.

Cumulative Landscape Effects	There are no other existing, permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Slight**: *"The loss of or change to landscape features of limited extent, or changes to landscape character in smaller areas. Changes would not affect key characteristics. The addition of any new features or elements to the landscape would only result in low-level changes to the overall aesthetics of the landscapes. Changes to the landscape are more evident at a local level and not over a wide geographical area. The effects could potentially be medium to short term and/or reversible."*
Significance of Effect	**High x Slight = Moderate/Minor = Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends."*
Mitigating Factors	› Vegetation, such as hedgerows and tall deciduous trees limits actual visibility of the Proposed Development. › Views from this Distinctive LCU are directed out towards the sea and along the sand dune systems that line coastline limit views of the Proposed Development from the beach.
Residual Effect	**Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*

LCU 8 – Oulart Hill	
Distance from site to Nearest/Furthest Area of LCU	The Proposed Development is located 9.9km from this Distinctive LCU at its closest point. The furthest point of this LCU is 12.75km from the nearest existing turbine, T3.
LCU Key Characteristics (***County Wexford Landscape Character Assessment 2022-2028***)	› Oulart Hill is considered as a Distinctive Hill Landscape. › These types of LCUs are said to usually have "broad views across the surrounding landscape". › Located in the east of County Wexford, Oulart Hill is considered to be *"important and prominent"* within the lowland landscape. › Oulart Hill is also noted to have *"historical resonance"*, with the 'Tulach a'tSolais monument' located at the summit.
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. Volume 10 of the WCDP designates wind energy developments as *Not Normally Permissible* within this LCU and the capacity for wind energy developments is *"Low capacity due to the scenic, tourism and recreation value, geological, archaeological or nature conservation interests"*. This LCU is defined as being a distinctive landscape due to the visual interest and prominence surrounding it. Its topographical characteristics within the relatively flat lowland LCU means that this distinctive LCU is sensitive to development which may impact views towards or from it. Taking these into account the designation this LCU is determined to have a **High** Sensitivity to development.

Visibility of the Proposed Development within the LCU	There is full theoretical visibility of the Proposed Development on the east face, ridgeline, and a portion of the north side of this distinctive LCU. There is no theoretical visibility on the west or south areas of Oulart Hill due to its topographical nature. Vegetation along roadsides and along the ridgeline obstruct views towards the Proposed Development, restricting most visibility of the turbines on Oulart Hill, see Plate 12-16 and description in the Visibility Appraisal previously.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing, permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Negligible:** *"A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short-term and/or reversible."*
Significance of Effect	**High x Negligible = Minor = Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*
Mitigating Factors	› Vegetation, such as hedgerows and tall deciduous trees limits actual visibility of the Proposed Development. › Views from this Distinctive LCU are of the surrounding landscape, however the vegetation growth along the top of Oulart Hill especially in proximity to the Tulach a'tSolais monument reduce the impact of Proposed Development on this Distinctive LCUs setting and direct views west.
Residual Effect	**Not Significant (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment but without significant consequences."*

LCU 6 – Boley Hill	
Distance from site to Nearest/Furthest Area of LCU	The Proposed Development is located 8.9km from this Distinctive LCU at its closest point. The furthest point of this LCU is 10.2km from the nearest existing turbine, T7.
LCU Key Characteristics (*County Wexford Landscape Character Assessment 2022-2028*)	› Boley Hill is considered as a Distinctive Hill Landscape. › These types of LCUs are said to usually have "broad views across the surrounding landscape".

Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. Volume 10 of the WCDP designates wind energy developments as *Not Normally Permissible* within this LCU and the capacity for wind energy developments is *"Low capacity due to the scenic, tourism and recreation value, geological, archaeological or nature conservation interests"*. This LCU is defined as being a distinctive landscape due to the visual interest and prominence surrounding it. Its topographical characteristics within the relatively flat lowland LCU means that this distinctive LCU is sensitive to development which may impact views towards or from it. Taking these into account the designation this LCU is determined to have a **High** Sensitivity to development.
Visibility of the Proposed Development within the LCU	There is full theoretical visibility of the Proposed Development along the southeast face of this Distinctive LCU. There is no theoretical visibility on the north half of Boley Hill due to its topographical nature. Low roadside vegetation allow visibility in the direction of the Proposed Development.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Negligible:** *"A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short-term and/or reversible."*
Significance of Effect	**High x Negligible = Minor = Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*
Mitigating Factors	› Where views are available from this Distinctive LCU, they are of the surrounding landscape, where the Proposed Development is at an acceptable set-back distance and is seen as a minor element of the landscape.
Residual Effect	**Not Significant (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment but without significant consequences."*

LCU 7 – Carrigroe Hill	
Distance from site to Nearest/Furthest Area of LCU	The Proposed Development is located 10.35km from this Distinctive LCU at its closest point. The furthest point of this LCU is 12.25km from the nearest existing turbine, T3.
LCU Key Characteristics (*County Wexford Landscape Character Assessment 2022-2028*)	› Carrigroe Hill is considered as a Distinctive Hill Landscape. › These types of LCUs are said to usually have "broad views across the surrounding landscape".
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. Volume 10 of the WCDP designates wind energy developments as *Not Normally Permissible* within this LCU and the capacity for wind energy developments is *"Low capacity due to the scenic, tourism and recreation value, geological, archaeological or nature conservation interests"*. This LCU is defined as being a distinctive landscape due to the visual interest and prominence surrounding it. Its topographical characteristics within the relatively flat lowland LCU means that this distinctive LCU is sensitive to development which may impact views towards or from it. Taking these into account the designation this LCU is determined to have a **High** Sensitivity to development.
Visibility of the Proposed Development within the LCU	There is full theoretical visibility of the Proposed Development along a portion of the northeast face of this Distinctive LCU. There is no theoretical visibility on the north, west or south of Carrigroe Hill due to its topographical nature. Low roadside vegetation along a local road along the northeast of Carrigroe Hill allows visibility in the direction of the Proposed Development.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.
Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Negligible:** *"A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short-term and/or reversible."*
Significance of Effect	**High x Negligible = Minor = Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*

Mitigating Factors	› Where views are available from this Distinctive LCU, they are of the surrounding landscape, where the Proposed Development is at an acceptable set-back distance and is seen as a minor element of the landscape.
Residual Effect	**Not Significant (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment but without significant consequences."*

LCU 5 – Ballyminaun Hill	
Distance from site to Nearest/Furthest Area of LCU	The Proposed Development is located 11.6km from this Distinctive LCU at its closest point. The furthest point of this LCU is 12.9km from the nearest existing turbine, T21.
LCU Key Characteristics (*County Wexford Landscape Character Assessment 2022-2028*)	› Ballyminaun Hill is considered as a Distinctive Hill Landscape. › These types of LCUs are said to usually have *"broad views across the surrounding landscape"*.
Landscape Sensitivity to Wind Farm Development	The overall landscape sensitivity of the LCU is "High" as designated in Table 7-3 within Volume 7 of the WCDP. Volume 10 of the WCDP designates wind energy developments as *Not Normally Permissible* within this LCU and the capacity for wind energy developments is *"Low capacity due to the scenic, tourism and recreation value, geological, archaeological or nature conservation interests"*. This LCU is defined as being a distinctive landscape due to the visual interest and prominence surrounding it. Its topographical characteristics within the relatively flat lowland LCU means that this distinctive LCU is sensitive to development which may impact views towards or from it. Taking these into account the designation this LCU is determined to have a **High** Sensitivity to development.
Visibility of the Proposed Development within the LCU	There is full theoretical visibility of the Proposed Development along the southern face of this Distinctive LCU. There is no theoretical visibility on the north, west or south of Ballyminaun Hill due to its topographical nature. Low roadside vegetation along a local road along the south of Ballyminaun Hill allows visibility in the direction of the Proposed Development.
Do-Nothing Scenario	In a Do-Nothing Scenario, 21 No. Turbines of the existing Ballywater Wind Farm will be decommissioned when their planning permission expired in 2025. In a Do-Nothing Scenario, these turbines will not be visible within this LCU, reducing the number of turbines effecting the landscape of this LCU.
Cumulative Context	There are no proposed, permitted or existing windfarms within this LCU.
Cumulative Landscape Effects	There are no other existing permitted or proposed turbines within this LCU meaning that the Proposed Development does not contribute towards cumulative effects.

Magnitude of Change (Definition from Section 12.2.5.2 of this report	**Negligible:** *"A change affecting smaller areas of landscape character including the loss of some landscape elements or the addition of features or elements which are either of low value or hardly noticeable. The effects could be short-term and/or reversible."*
Significance of Effect	**High x Negligible = Minor = Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*
Mitigating Factors	› **Where views are available from this Distinctive LCU, they are of the surrounding landscape, where the Proposed Development is at an acceptable set-back distance and is seen as a minor element of the landscape.**
Residual Effect	**Not Significant (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment but without significant consequences."*

Discussion of Landscape Effects on LCUs

As demonstrated in the Landscape Character Assessment tables above, no significant landscape effects are likely to occur in any of the LCUs within the LVIA Study Area. The existing Ballywater Wind Farm is located in the Coastal LCU, which was found to be of **'High'** sensitivity and where the magnitude of change was deemed to be **'Moderate'**. The residual effects on landscape character within this LCU were determined to be **'Moderate'** as a result of the Proposed Development, considering the set-back from sensitive elements and localised effects. The Lowlands LCU, found to be of **'Low'** sensitivity, falls within close proximity to the Proposed Development, where the magnitude of change was deemed to be **'Negligible'**. The relatively flat topography and mature vegetation within this LCU reduce the overall impact of the Proposed Development. The residual effects on landscape character within this LCU were determined to be **'Imperceptible'**.

Cahore Point is a Distinctive Coastal LCU which is in close proximity to the existing Ballywater Wind Farm. The set back of the existing turbines from the coast, the elevated position of this LCU on the coast and visual screening due to vegetation greatly reduce visibility of the existing turbines from Cahore Point, determining a residual landscape effect of **'Slight'**. The Distinctive Landscape of Oulart Hill is located at a greater distance from the Proposed Development, and vegetation on this hill provides adequate visual screening which reduce the potential effects of the Proposed Development on this Distinctive Landscape, determining a residual landscape effect of **'Not Significant'**. Due to distance and visual screening from vegetation throughout the landscape, actual visibility from locations within other Distinctive Hill Landscape Character Units will be limited and are deemed to have No Significant effect as a result of the Proposed Development. The landscape effects are occurring at present on the Distinctive Landscapes within the LVIA Study Area and none will arise as a result of the extension of operation of the existing Ballywater Wind Farm.

12.7.3.3 Visual Effects

12.7.3.3.1 *Selection of Viewpoints*

Photographic visualisations were used to aid the assessment of the visual effects arising as a result of the existing Ballywater Wind Farm from 6 No. viewpoint locations, which are presented in EIAR Volume 2: Photographic Visualisations Booklet. These 6 No. viewpoint locations are shown in Figure 12-16 below. The locations chosen for viewpoints follow a detailed and extensive process including review of baseline information, site visits and high-quality photo taking at multiple locations within the LVIA Study Area. Many locations, which based on a desktop review had the potential for views of the existing turbines, had complete intervening screening or were screened to such an extent that the completion of photographic visualisations was not considered useful in terms of the assessment process i.e. little or no visibility towards the existing turbines.

Map Legend

- Existing Turbines
- County Borders
- Photographic Visualisation Viewpoint Locations

Drawing No.	Figure 12-16			
Drawing Title	Photographic Visualisation Viewpoint Locations			
Project Title	Proposed Lifetime Extension of Ballywater Wind Farm - EIAR			
Scale: 1:17,625	Project No.: 230417	Date: 09.10.2024	Drawn By: DM	Checked By: JW

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12.7.3.3.2 Viewpoint Assessment Table

6 No. viewpoint locations were selected for production of visualisations and assessment of visual effects. The location specific details of the viewpoints and the receptors they represent are described in Table 12-13 below and their locations are illustrated in Figure 12-16 above.

It is not possible to present every view and every location by means of viewpoints. The choice of viewpoint locations is influenced by both the views available and the type of viewer. Care was taken to provide a range of views from various geographic perspectives (distance, orientation and elevation).

The following tables assess visual effects arising as a result of the Proposed Development from the 6 No. Viewpoints. The methodology used for the assessment of visual effects is reported in Section 12.2– *LVIA Methodology*. The tables below determine the sensitivity of visual receptors represented by the viewpoint, balanced with the magnitude of the change (impact) on the view to determine the significance of effects. Mitigating factors are then taken into consideration to arrive at a residual visual effect. Residual visual effects are graded upon an 'impact assessment classification of significance' scale, as defined by the Environmental Protection Agency of Ireland (EPA, 2022).

The Proposed Development contains an existing wind farm which is built, operational and is currently visible in the existing landscape. As is evident by the visualisations, the Proposed Lifetime Extension of Ballywater Wind Farm amounts to little or no change to the current views of the existing turbines. As detailed in the methodology, the term 'Magnitude of Change' is used in the impact assessment tables below. In the context of this assessment where the turbines already exist in the landscape, the magnitude of the continued impact of the turbines is considered. In order to facilitate the visual impact assessments, and effectively determine the continued visual impact of the existing turbines, the magnitude of change was determined by considering the change that would occur in a 'do-nothing scenario' where the turbines would not be visible in the landscape.

The wireline visualisations in the Volume 2 Booklet are useful visual aids for the identification of other wind energy developments in the landscape and discussion of cumulative visual effects reported in the tables below.

Table 12-13 Viewpoint Assessment Table

Viewpoint 1 – Cahore Point			
Viewpoint Description and Details	› View from the Cahore Point Coastal Walking trail in the townland of Cahore. › Approximately 1.93 km north of existing turbine T22. › Grid Reference: E 722,308 N 647,104 › No. of turbines visible: 21/21		
LCA and Sensitivity	LCU 38 – Cahore Point – **High**	**Visual Receptor(s) and Sensitivity**	Tourism – **High** Residents - **Medium**
'Current View' Description	An elevated view overlooking a coastal zone and a relatively flat lowland landscape. The coastal zone is comprised of a sandy shoreline and a tall ridgeline of sand dunes covered in a soft coastal vegetation. The views inland is dominated by thick vegetation, tall shrubs and some overhead power and/or telecommunication lines in the foreground. The existing wind energy development influences the view of the horizon looking inland, with a gradual increase of turbine density panning right in the image.		

Viewpoint 1 – Cahore Point	
Do - Nothing Scenario	**In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 21 No. turbines will not be visible from this viewpoint.**
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, 21 No. of the existing turbines are visible along the horizon in the right half of the image. Majority of the turbines (T3, T5 – T20) occur in the background and whilst T21 – T24 are closer, T21 is partially screened by trees, meaning T22, T23, and T24 are more prominent in the view.
Cumulative Effects	No other existing, permitted, or proposed turbines are visible from this viewpoint.
Sensitivity of Visual Receptor(s) (Definition – from Section 12.2.5.3)	**High:** *"Includes viewers at designated views or landscapes. Viewers such as residents in close proximity to the viewpoint who have primary views that will be in the direction of the development that may not necessarily be of a particularly scenic quality; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes."* The view is located on a waymarked trail overlooking a coastal landscape, in an area with a medium density of residences. On balance, this viewpoint is deemed to be of High Sensitivity.
Magnitude of Change (Definition from Section 12.2.5.3)	**Slight:** *"The proposals would be partially visible or visible at sufficient distance to be perceptible and result in a low level of change in the view and its composition and a low degree of contrast. The character of the view may be altered but will remain similar to the baseline existing situation. This change could be short term or of a short duration."*
Significance of Effect	**High x Slight = Moderate/Minor = Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends"*
Mitigation Factors	› The existing turbines are set-back from the coastline, where the focus of the most scenic attributes of this view is set. › All existing turbines are well absorbed within a relatively small horizontal extent of the view and do not significantly impact the key scenic sensitivities of this area such as views of the ocean and the coast. › › › This viewpoint is located on an elevated vantage point and does not necessarily represent the visibility of the turbines from many other areas of the walking trail and the beach, where the intervening dune complex screens visibility of the turbines from areas of lower elevation.
Residual Effect (incl. mitigating factors)	**Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities"*

Viewpoint 2 – Bog and Warren			
Viewpoint Description and Details	› View from a local road bordering the townlands of Bog and Warren and Cahore, near Old Bawn Beach. › Approximately 0.9 km northeast of existing turbine T22. › Grid Reference: E 721,705 N 646,235 › No. of existing turbines visible: 21/21		
LCA and Sensitivity	LCU 47 – Coastal – **High**	**Visual Receptor(s) and Sensitivity**	Motorists – **Low** Residents - **High**
'Current View' Description	The image presents a view overlooking relatively flat, open landscape, characterised by agricultural fields. A residential building exists in the left foreground of the image, with overhead powerlines existing immediately in front of the view. The existing Ballywater Wind Farm is clearly visible sitting within this open agricultural landscape. The wind farm is centred in this image, where they influence the view of the skyline.		
Do - Nothing Scenario	In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 21 No. turbines will not be visible from this viewpoint.		
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, 21 No. of the existing turbines are visible above the horizon in the centre of the image. Majority of the turbines (T3, T5 – T20) seem irregularly spaced in the background. Turbines T21 – T24 are in closest proximity to this viewpoint and are therefore the largest and most visually prominent features of the Proposed Development.		
Cumulative Effects	No other existing, permitted, or proposed turbines are visible from this viewpoint.		
Sensitivity of Visual Receptor(s) (Definition from Section 12.2.5.3)	**Moderate:** *"Includes viewers who may have some susceptibility to a change in view. Viewers such as residents in medium proximity but who do not have views focused in the direction of the proposed development or whose views are not of a particularly scenic quality; those from views which are not designated but may have local recreational uses or those travelling along routes or at view which are considered moderately scenic."* The view is located on a local road with access to Old Bawn Beach. There is medium density of residences located near this particular view, with some having views in the direction of the Proposed Development. On balance, this viewpoint is deemed to be of Medium Sensitivity.		
Magnitude of Change (Definition from Section 12.2.5.3)	**Moderate:** *"The change in the view may involve partial obstruction of existing view or partial change in character and composition of the baseline through the introduction of new elements or removal of existing elements. Likely to occur at locations where the development is partially visible over a moderate or medium extent, and which are not in close proximity to the development. Change may be readily noticeable but not substantially different in scale and character from the surroundings and wider setting."*		

Viewpoint 2 – Bog and Warren	
Significance of Effect	**Medium x Moderate = Moderate/Minor = Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends"*
Mitigation Factors	› The coast is not visible from this location and the existing turbines do not interrupt any sensitive or unique landscape views across this relatively flat landscape of agricultural land › The location of this viewpoint is on a route to access the more scenic amenities of Old Bawn beach and the Cahore Point Coastal Walking Trail. › The southern cluster is well set back from this viewpoint. › All turbines are well accommodated in a relatively small horizontal extent of views.
Residual Effect (incl. mitigating factors)	**Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends"*

Viewpoint 3 – Stable			
Viewpoint Description and Details	› View from a local road bordering the townlands of Newtown and Stable, near Old Bawn Caravan Park. › Approximately 0.53 km north of existing turbine T21. › Grid Reference: E 720,853 N 646, 338 › No. of existing turbines visible: 4/21		
LCA and Sensitivity	LCU 47 – Coastal – **High**	**Visual Receptor(s) and Sensitivity**	Motorists – **Low** Residents - **High**
'Current View' Description	The image presents a view of a tall hedgerow which obscures views of the wider landscape, leaving a view of only the skyline. 4 No. turbines of the existing Ballywater Wind Farm are visible. These turbines are located nearest this viewpoint location, T21, T22 and T23 are mainly visible, while only the nacelle and blades of T24 are mainly visible. The proximity to these turbines results in the skyline being greatly influenced by the Proposed Development.		
Do - Nothing Scenario	In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 4 No. turbines in this image will not be visible from this viewpoint.		
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, 4 No. of the existing turbines (T21 – T24) are visible above the horizon in the centre of the image. The remaining turbines (T3, T5 – T20) are screened from view by the hedgerow.		
Cumulative Effects	No other existing, permitted, or proposed turbines are visible from this viewpoint.		

Viewpoint 3 – Stable	
Sensitivity of Visual Receptor(s) (Definition from Section 12.2.5.3)	**Medium:** *"Includes viewers who may have some susceptibility to a change in view. Viewers such as residents in medium proximity but who do not have views focused in the direction of the proposed development or whose views are not of a particularly scenic quality; those from views which are not designated but may have local recreational uses or those travelling along routes or at view which are considered moderately scenic."* The view is located on a local road with access to Old Bawn Beach. There is medium density of residences located near this particular view, with some having views in the direction of the Proposed Development. On balance, this viewpoint is deemed to be of Medium Sensitivity.
Magnitude of Change (Definition from Section 12.2.5.3)	**Moderate:** *"The change in the view may involve partial obstruction of existing view or partial change in character and composition of the baseline through the introduction of new elements or removal of existing elements. Likely to occur at locations where the development is partially visible over a moderate or medium extent, and which are not in close proximity to the development. Change may be readily noticeable but not substantially different in scale and character from the surroundings and wider setting."*
Significance of Effect	**Medium x Moderate = Moderate/Minor = Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends"*
Mitigation Factors	› The tall hedgerows provide screening so that only the closer north cluster of turbines are visible. › The location of this viewpoint is on a route with access to the more scenic amenities of Old Bawn beach and the Cahore Point Coastal Walking Trail. › Whilst the existing turbines of the northern cluster are visible from receptors in this area, mature vegetation will limit visibility from ground level areas such as gardens and ground level windows. However visual effects will occur from upper storey windows.
Residual Effect (incl. mitigating factors)	**Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends."*

Viewpoint 4 – Oldtown	
Viewpoint Description and Details	› View from a local road in the townland of Oldtown, that provides local access to residents. › Approximately 0.41 km west of existing turbine T21, and approximately 0.98km north of existing turbine T11. › Grid Reference: E 720,278 N 645,746 › No. of existing turbines visible: 18/21 › Two separate fields of view are presented for this viewpoint in the Visualisation Booklet. Both a 90° and 53.5° extent are provided to show the impact of the separate turbine clusters which are located in

Viewpoint 4 – Oldtown			
	differing fields of view. The northern cluster to the east, and then the southern cluster to the south-west.		
LCA and Sensitivity	LCU 47 – Coastal – **High**	**Visual Receptor(s) and Sensitivity**	Motorists – **Low** Residents - **High**
'Current View' Description	The image presents a view of a tall hedgerows along the east side of a local road (lefthand side of the image), and an open view along the west side of the road (righthand side of the road) offering a relatively long view over greenfield sites and treelines. A power lines is visible overhead running along the road towards residential buildings, one of which is visible in the lefthand side of the 53.5° south-west view. A treeline dominates the skyline in the centre of the 180° view (the key image). This viewpoint is located centrally relative to the existing Ballywater Wind Farm, 4 No. turbines (north cluster) are located in the east facing view and 17 No. turbines are located in the southwest facing view. 3 No. of the existing turbines are clearly visible in the east facing view, while T24 is partially visible through the deciduous trees. In the south-west facing view, 14 No. exiting turbines are clearly visible and T16 is partially visible through the treeline.		
Do - Nothing Scenario	In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 19 No. turbines will not be visible from this viewpoint.		
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, 17 No. of the existing turbines are clearly visible above the skyline. In the south-west facing view, 14 No. turbines are visible and seem irregularly spaced. Several of these existing turbines are visible sitting within the open agricultural landscape, others are seen rising behind a cluster of deciduous and coniferous trees. T16 is seen mainly screened in the left-hand side of the 53.5° southwest facing view. In the east view, the top halves of existing turbines T21, T22 and T23 are fully visible over the hedgerow, while T24 is partially visible behind the bare deciduous tree line.		
Cumulative Effects	No other existing, permitted, or proposed turbines are visible from this viewpoint.		
Sensitivity of Visual Receptor(s) (Definition from Section 12.2.5.3)	**High:** *"Includes viewers at designated views or landscapes. Viewers such as residents in close proximity to the viewpoint who have primary views that will be in the direction of the proposed turbines that may not necessarily be of a particular scenic quality; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes."* The view is located on a local access road for residents. There is low density of residences located near this particular viewpoint, with primary views of the Proposed Development. As this viewpoint is located very close to and has a wide view of the Proposed Development, this view is deemed to be of High sensitivity.		
Magnitude of Change (Definition from Section 12.2.5.3)	**Substantial:** *"Substantial change, where the proposals would result in large-scale, prominent or very prominent change, leading to substantial obstruction of existing view or complete change in character and*		

Viewpoint 4 – Oldtown	
	composition of the baseline though removal of key elements or addition of uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed development is fully or almost fully visible over a wide extent, at close proximity to the viewer. This change could be long term or of a long duration."
Significance of Effect	**High x Substantial = Major/Moderate = Very Significant (EPA, 2022)** *"An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment."*
Mitigation Factors	› **Tall hedgerows and treelines provide screening of some of the Proposed Development.** › **This is one of the only locations on the public road network adjacent to these residents where there are clear views of both turbine clusters.** › **In general, most residents represented by this viewpoint will not have open visibility of both turbine clusters due to the nature of mature boundary vegetation and pockets of woodland in the area.** › **Significant visual effects only occur for a very small number of residents in this area. Only the few residents located at elevated vantage points with limited vegetation screening surrounding their properties will have views of the existing turbines in separate directions (two clusters) and clear views of the four turbines of the northern cluster which are most prominent due to proximity.**
Residual Effect (incl. mitigating factors)	**Significant (EPA, 2022)** *"An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment."*

Viewpoint 5 – Clonganny			
Viewpoint Description and Details	› View from a local road just off the R742 in the townland of Clonganny. › Approximately 1.25 km west of existing turbine T7. › Grid Reference: E 718,407 N 645,604 › No. of existing turbines visible: 12/21		
LCA and Sensitivity	LCU 48 – Lowlands – **Low**	**Visual Receptor(s) and Sensitivity**	Motorists – **Medium** Residents - **Medium**
'Current View' Description	The image presents an east-facing view on a local road towards a T-junction onto the R742. A deciduous treeline lines the south facing side of the local road (righthand side of the image) and runs along the R742. Residential buildings are present along the lefthand side of the image, primarily facing perpendicular to the existing Ballywater Wind Farm. Power lines are visible running overhead on the R742. This viewpoint is located to the west of the existing Ballywater Wind Farm. 11 No. turbines are visible; however, 4 No. of the turbines are mostly screened by the bare deciduous trees.		

Viewpoint 5 – Clonganny	
Do - Nothing Scenario	**In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 11 No. turbines will not be visible from this viewpoint.**
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, the nacelles and blades of 7 No. of the existing turbines are partially visible above the treeline. The visible turbines are seen in a relatively narrow horizontal extent of the view. Most of the existing turbines are well screened by the deciduous trees and visibility is likely to be far less in summer months when trees are full of foliage.
Cumulative Effects	**No other existing, permitted, or proposed turbines are visible from this viewpoint.**
Sensitivity of Visual Receptor(s) (Definition from Section 12.2.5.3)	**Medium:** *""Includes viewers who may have some susceptibility to a change in view. Viewers such as residents in medium proximity but who do not have views focused in the direction of the proposed development or whose views are not of a particularly scenic quality; those from views which are not designated but may have local recreational uses or those travelling along routes or at view which are considered moderately scenic."* The view is located on a local road with residential buildings existing parallel to the road, hence the primary views of these residences are not directed towards the Proposed Development. There is low density of residences located near this particular viewpoint. This viewpoint is not located near any designated recreational sites and is near a main transport route. On balance, this viewpoint is deemed to be of Medium Sensitivity.
Magnitude of Change (Definition from Section 12.2.5.3)	**Slight:** ***"The proposals would be partially visible or visible at sufficient distance to be perceptible and result in a low level of change in the view and its composition and a low degree of contrast. The character of the view may be altered but will remain similar to the baseline existing situation. This change could be short term or of a short duration."***
Significance of Effect	**Medium x Slight = Minor = Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*
Mitigation Factors	**› Tall deciduous treeline provides visual screening, obscuring most of the Proposed Development from view.** **› As shown in the proposed view, many of the residential properties are oriented so that the gable end of the houses are directed towards the existing turbines, and they are therefore not seen within primary residential visual amenity – front and back windows.**
Residual Effect (incl. mitigating factors)	**Slight (EPA, 2022)** *"An effect which causes noticeable changes in the character of the environment without affecting its sensitivities."*

Viewpoint 6 – Ballinoulart			
Viewpoint Description and Details	› View from a local road in the townland of Ballinoulart, in front of residential buildings, providing access to Ballinoulart Bay Beach. › Approximately 0.35 km south of existing turbine T20. › Grid Reference: E 720,058 N 643,326. › No. of existing turbines visible: 21/21		
LCA and Sensitivity	LCU 47 – Coastal – **High**	**Visual Receptor(s) and Sensitivity**	Tourism – **Low** Residents - **High**
'Current View' Description	The image presents a view overlooking relatively flat, open landscape, characterised by agricultural fields. Various hedgerows and deciduous vegetation are seen predominantly in the righthand side of the image and further in the centre of the image, seemingly around the bases of some of the existing turbines. The large agricultural infrastructure located within the existing Ballywater Wind Farm is visible. In the far distant background, topographical features rise in the horizon. From this viewpoint, the whole of existing Ballywater Wind Farm is visible at a wide angle of view, sitting within this open agricultural landscape. The northern cluster of turbines (T21 – T24) are at a greater distance away and are visible through the treeline along the righthand side if this image.		
Do - Nothing Scenario	In a "Do-Nothing" scenario, 21 No. turbines of the existing Ballywater Wind Farm will be decommissioned. Hence, the 21 No. turbines will not be visible from this viewpoint.		
Proposed View Description (focus on description of the existing turbines)	From this viewpoint location, 21 No. of the existing turbines are visible irregularly spaced. Turbines T21 – T24 are visible in the background to the righthand side behind the treeline in the foreground. T20 appears separated furthest to the righthand side in this viewpoint. The turbines do not obstruct views of the distant topographical features.		
Cumulative Effects	The Raheenleagh Wind Farm is just discernible in the far distance on the side of a hill; however this development is located outside the 20km LVIA Study Area and is not considered in this impact assessment as no significant cumulative effects are likely to arise. No other existing, permitted, or proposed turbines are visible from this viewpoint.		
Sensitivity of Visual Receptor(s) (Definition from Section 12.2.5.3)	**High:** *"Includes viewers at designated views or landscapes. Viewers such as residents in close proximity to the viewpoint who have primary views that will be in the direction of the proposed turbines that may not necessarily be of a particular scenic quality; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes."* The view is located on a local road with access to Ballinoulart Bay Beach. There is low density of residences located near this viewpoint, with some having open views in the direction of the Proposed Development. On balance, this viewpoint is deemed to be of High Sensitivity.		
Magnitude of Change (Definition from Section 12.2.5.3)	**Substantial:** *"Substantial change, where the proposals would result in large-scale, prominent or very prominent change, leading to substantial obstruction of existing view or complete change in character and composition of the baseline though removal of key elements or addition of*		

Viewpoint 6 – Ballinoulart	
	uncharacteristic elements which may or may not be visually discordant. This includes viewpoints where the proposed development is fully or almost fully visible over a wide extent, at close proximity to the viewer. This change could be long term or of a long duration."
Significance of Effect	**High x Substantial = Major/Moderate = Very Significant (EPA, 2022)** *"An effect, which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment."*
Mitigation Factors	› **Although existing in a wide extent of this viewpoint, the existing turbines do not significantly impact the key scenic sensitivities of this area across this relatively flat agricultural landscape and offer open views of distant topographical features.** › **The location of this viewpoint is on a route to access the more scenic amenities of Ballinoulart Bay Beach.** › **The northern cluster is well set back from this viewpoint.** › **In general, most residents represented by this viewpoint will not have open visibility of the Proposed Development due to the nature of mature boundary vegetation in the area.**
Residual Effect (incl. mitigating factors)	**Moderate (EPA, 2022)** *"An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends"*

The significance of the residual visual effect was not considered to be 'Profound' or 'Very Significant' at any of the 6 viewpoint locations. A residual visual effect of '**Significant**' was deemed to arise at Viewpoint 4. In this case a residual visual effect of '**Significant**' is due to the proximity of a small number of residential receptors (<500m from the Proposed Development) and the potential for views of the two clusters of turbines in different directions. A residual effect of '**Moderate**' was deemed to arise at four of the six viewpoints, and Viewpoint 5 was assessed as having '**Slight**' residual visual effects.

12.7.3.4 Summary of Visibility Appraisal

In summary, there is a general mix of visibility of the Proposed Development. The Proposed Development is largely screened from view due to vegetation and topography surrounding the site. When they are visible, they appear staggered, as per Section 6.9.6 of the WEDGs (DoEHLG, 2006). Views of the existing turbines will be intermittent as a result of the undulating terrain and vegetation in the landscape. As discussed in relation to Oulart Hill, beyond 5km of the site the existing turbines occupy a limited horizontal and vertical extent within views. As identified throughout this LVIA, the greatest potential for significant visual effects is upon residential visual amenity, and less so on other sensitive visual receptors such as recreational amenities and protected scenic amenity.

Figure 12-17 Residential Visual Amenity

Residential Amenity

As noted above in 12.5.1.3 and seen in Figure 12-17 the area southwest of the site is sparsely settled, while there are small densities of residential dwellings north and northwest of the site. There are 33 houses within 500m of the turbines, and 8 of these fall within 396m, or 4 times the tip height, of the wind turbines, of which one of the houses are associated with the Proposed Development. Majority of these residential developments have vegetation which partially screen views towards the existing Ballywater Wind Farm.

All 6 photographic visualisations were captured within 5km of the Site. As detailed throughout this chapter, the existing turbines are only likely to be visible from locations within 5km of the Proposed Development site, beyond 5km visibility will be less due to topography and vegetation screening. The existing turbines are to be potentially visible from areas of high elevation in the wider LVIA Study Area.

Photographic Visualisations are just one of the tools employed during the LVIA that was conducted in order to inform the assessment of landscape and visual effects. It would be a disproportionate measure to include an individual photographic visualisation from every residential dwelling and this is not required to conduct a thorough and robust assessment of landscape and visual effects. In line with the guidance laid out in the GLVIA (2013), the viewpoints selected for the LVIA conducted were informed by a range of factors including the "ZTV analysis, by fieldwork, and by desk research" (para 6.18, GLVIA 2013). Furthermore, the GLVIA (2013) states that representative viewpoints are "selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot all be included individually and where the significant effects are unlikely to differ" (para 6.19 GLVIA, 2013). It is submitted that the viewpoints used in the conduct of the LVIA particularly in close proximity to the existing turbines are sufficient to represent the residential receptors within the LVIA Study Area, including the "distribution of population" (para 6.18, GLVIA 2013).

The greatest effects on residential visual amenity will occur in relation to a small number of receptors located within 500m of the existing turbines. VP4 was captured within 500m of the existing turbines in close proximity to several residential dwellings. This viewpoint was given a 'High' sensitivity on account of the residents in close proximity to the site. The magnitude of change was deemed to be 'Substantial' due to the horizontal and vertical extent at which the existing turbines are viewed. Most residents represented by this viewpoint will not have open visibility of both turbine clusters due to the nature of mature boundary vegetation and pockets of woodland in the area. A few residents located at elevated vantage points with limited vegetation screening surrounding their properties will have views of the existing turbines in separate directions (two clusters). Overall, this viewpoint is deemed to have a 'Significant' Medium-Term residual visual effect.

The residential receptors around the townlands of Stable and Newtown, immediately north of the Proposed Development, were represented by VP3. This viewpoint was given a 'Medium' sensitivity on account of screening from vegetation and the view not being of particular scenic quality. The magnitude of change was deemed to be 'Moderate' given the vertical extent of the existing turbines in the north cluster when they are visible. The location of this viewpoint is on a route with access to the more scenic amenities of Old Bawn beach and the Cahore Point Coastal Walking Trail. Furthermore, visibility of the Proposed Development tends to be limited to receptors on upper storeys, due to screening from vegetation within gardens and along the road. Overall, this viewpoint is deemed to have 'Moderate' Medium-Term residual visual effects.

The residential receptors west of the Proposed Development, around the townland of Clonganny, were represented by VP5. This viewpoint was given a 'Medium' sensitivity on account of screening from vegetation and the view not being of particular scenic quality. The magnitude of change was deemed to be 'Slight' given the visibility of the existing turbines above the treeline. Many of the residential properties are oriented so that the gable end of the houses is directed towards the existing turbines, and they are therefore not seen within primary residential visual amenity. Overall, this viewpoint was deemed to have 'Slight' Medium-Term residual visual effects.

The residential receptors along the local road between the R742 and Ballinoulart Bay Beach, south of the Proposed Development, were represented by VP6. This viewpoint was given a 'High' sensitivity on account of residential receptors in close proximity to the Proposed Development, with some having open views in the direction of the Proposed Development. The magnitude of change was deemed to be 'Substantial' given the horizontal and vertical extent of the existing turbines. Most residents represented by this viewpoint will not have open visibility of the Proposed Development due to the nature of mature boundary vegetation in the area. The location of this viewpoint is on a route with access to the more scenic amenities of Ballinoulart Bay Beach. Overall, this viewpoint was deemed to have 'Moderate' medium-term residual visual effects.

Grid Connection

The existing grid connection electrical cabling that connects the existing Ballywater 110kV Substation and the Crane 110kV Substation is located underground; therefore, no visual effects will arise from this element.

12.7.4 Decommissioning Phase

Decommissioning of the existing wind farm and existing substation is required to be carried out in June 2025, i.e. 20 years from the grant of permission for 21 no. of the turbines and substation, under the current planning permission. The Proposed Development would extend the operation of the existing wind farm for a further 10 years, thereby postponing decommissioning until 2035.

Condition no. 17 of the existing planning permission for Ballywater Wind Farm states:

> *"On full or partial decommissioning of the wind farm, or in the event that the wind farm ceases operation for a period of more than one year, the turbines and their associated apparatus (including foundation and access roads) shall be dismantled. All decommissioned*

structures shall be removed within three months of decommissioning and the entire site shall be restored to its original state within 6 months."

It is considered that this condition is not appropriate, as returning the site to its original condition would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. A more environmentally sensitive Decommissioning Plan is presented in Appendix 4-4 of this EIAR.

The landscape and visual effects during decommissioning are anticipated to be of a similar nature as those occurring during the construction 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.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration.

It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going access to agricultural holdings. If it were confirmed that the roads were not required in future for any other purpose, they could be removed where required, however, this is not envisaged at this time. It is proposed to leave underground cables in place where they are below a level likely to be impacted by typical agricultural works.

Removal of the turbines and ancillary infrastructure from Ballywater Wind Farm site will result in a Short-term, Slight, Negative visual effect. A Decommissioning Plan has been prepared and included as Appendix 4-4 of this EIAR, which will be agreed with the local authority before any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

12.8 Conclusion

It is important to re-iterate that the existing Ballywater Wind Farm is an existing facility and this EIAR is being prepared in support of a planning application to extend the operational lifespan of the Proposed Development beyond 2025, by a further 10 years.

This chapter assesses the likely significant landscape and visual impacts arising as a result of extending the operational lifespan of the existing Ballywater Wind Farm and Ballywater 110kV Substation. Although all elements of the Project are assessed, the chapter focusses upon the turbines and substation, as they are deemed to be the essential aspects of the proposal under assessment from a landscape and visual perspective (see Section 12.2.1 above). The Chapter describes the baseline landscape and assesses the direct effects on the landscape of the site, as well as effects on landscape character and the impact on sensitive landscape receptors and Landscape Character Units (LCUs). Visibility of the existing turbines was assessed from receptors within a study area extending 20km from the existing turbines; and visual effects were determined from information gathered during multiple site visits as well as other tools such as ZTV mapping and photographic visualisations.

On-site visibility appraisals, ZTV mapping, and visual assessments from viewpoint locations determined that there is limited visibility of the existing turbines beyond 5km, where elevated topographical points of the Distinctive LCUs have visibility of the Proposed Development. The location of the existing turbines within a relatively flat landscape with highly vegetated working fields surrounding the site, largely restricts visual exposure in the wider landscape setting. Visibility of the existing turbines beyond the immediate landscape setting of the Proposed Development site is limited to localised areas of high elevation where open views across the flat and highly vegetated landscape are available from elevated vantage points, which is in general not a common occurrence in the LVIA Study Area.

The site is located in a relatively flat landscape with gentle undulations and is predominantly comprised of and surrounded by agricultural land. The Proposed Development is deemed to have 'Slight' Medium-Term landscape effects on these lands in which is located. The Proposed Development does not materially alter the Cahore marches SPA or Cahore Polder and Dunes SAC and pNHA, therefore resulting in Medium-Term 'Slight' landscape effects. The existing Ballywater Wind Farm is located in the Coastal LCU, which was deemed to have 'Moderate' residual landscape effects as a result of the Proposed Development. The Distinctive Coastal LCU of Cahore Point is deemed to have a 'Slight' residual effect on landscape character as a result of the Proposed Development given that the limited impact on its sensitivities. The residual effect on the landscape character of the Distinctive Hill LCUs were deemed to be 'Not Significant' due to the relative distance from the Proposed Development and visual screening by vegetation where present. The residual effects on the Lowlands LCU landscape character are deemed to be **'Imperceptible'** as a result of the Proposed Development due to the limited visibility of the existing Ballywater Wind Farm.

Visual effects arising as a result of the Proposed Development are localised and have the greatest impact on residential receptors. Receptors around Viewpoint 4 are deemed to have 'Significant' Medium-Term residual visual effects on account of a few residential receptors having views of the existing Ballywater Wind Farm in separate directions. Receptors represented by Viewpoints 2, 3 and 6 are deemed to have 'Moderate' Medium-Term residual visual effects as a result of the Proposed Development. These viewpoints are located on roads that provide access to more scenic amenities, and where some residential receptors have limited visibility of the existing Ballywater Wind Farm due to mature boundary vegetation. Receptors at VP5 are deemed to have 'Sight' Medium-Term residual visual effects as a result of the Proposed Development, as the existing Ballywater Wind Farm has limited impact on their visual amenity. Viewpoint 1 represents views from the scenic amenity of Cahore Point, where it was found that the existing Ballywater Wind Farm has limited effects on its scenic sensitivities, resulting in 'Slight' Medium-Term residual visual effects.

13. MATERIAL ASSETS

13.1 Introduction

Material Assets are defined in the *Advice Notes for Preparing Environmental Impact Statements* (EPA, Draft, 2015) as "resources that are valued and that are intrinsic to certain places." The *Guidelines of the Information to be Contained within Environmental Impact Assessment Reports* (EPA, 2022) state that "Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure." Material assets may be either of human or natural origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 11 of this Environmental Impact Assessment Report (EIAR). Economic assets of natural heritage include non-renewable resources such as minerals and soils, and renewable resources such as wind and water. These assets are addressed in Chapter 7: Land, Soils and Geology, Chapter 8: Hydrology and Hydrogeology, Chapter 9: Air Quality and Climate. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5: Population and Human Health.

This chapter of the EIAR addresses the likely significant effects of the Project on transportation infrastructure (Section 13.3) and on telecommunications and aviation (Section 13.4), which are economic assets of human origin. This chapter of the EIAR has been prepared in accordance with the requirements of the EIA legislation and guidance outlined in Chapter 1: Introduction.

13.2 Statement of Authority

This section of the EIAR has been prepared by Emily Lynch and Robert Kennedy and reviewed by Seán Creedon all of MKO. Emily is an Environmental Scientist with an Honours Degree in Environmental Science from the National University of Ireland, Galway in 2022, and has been working as an Environmental Scientist since then. Since beginning her work with MKO, Emily has been working as part of a multi-disciplinary team conducting tasks such as report writing, shadow flicker assessments, project management, and QGIS mapping. Emily's particular strengths lie in report writing and project management and communication. Emily has been involved in the preparation of Environmental Impact Assessment Screening Reports, Strategic Environmental Assessment Pre-Screening Reports, Planning and Environmental Reports, and Environmental Impact Assessment Reports for a wide range of projects, but mostly focusing on large-scale onshore renewable energy developments. In her role as an Environmental Scientist, Emily has been charged with co-ordinating large multidisciplinary teams in order to assist in the production of robust Environmental Impact Assessment Reports accompanying Planning Applications for various large-scale developments.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

13.2.1 Guidance and Legislation

This section of the EIAR has been completed in accordance with the guidance set out in Chapter 1: Introduction. The assessment uses standard terminology to describe the likely significant effects associated with the Project. Further information on the classification of effects used in this assessment is presented in Section 1.7.2 in Chapter 1.

13.2.1.1 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.7 of Chapter 2 of the EIAR. The relevant consultee responses are detailed below. The scoping consultation request was issued to relevant bodies in September 2023, with a further update being issued in November 2023. Telecoms operators were contacted during January 2024, with a further update being issued in February 2024. Copies of all scoping responses are presented in Appendix 2-1 of this EIAR.

Traffic Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to the scoping request on 2nd October 2023 to state that best practice transport and traffic assessments should be implemented.

Comisiùn na Meàn

Comisiùn na Meàn responded to the telecoms scoping response on 26th September to state that it does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, they are not aware of any issues arising from existing windfarms impacting existing FM networks. Also, the existing windfarm is not located close to any existing or planned FM transmission sites.

Commission for the Regulation of Utilities

At the time of preparing this report the Commission for the Regulation of Utilities (CRU) had not responded to the scoping requests issued in September 2023 and January 2024.

Eirgrid

At the time of preparing this report Eirgrid had not responded to the scoping requests issued in September 2023 and November 2024.

ESB

Electricity Supply Board (ESB) responded to the telecoms scoping request on 16th January 2024 to confirm that there is no existing or planned links that would be affected by this windfarm.

Irish Aviation Authority

An email response was received from the Irish Aviation Authority on 7th December 2023 stating that their Aerodromes Division do not require any measures to be incorporated within the Project, or presented within the EIAR.

13.3 Traffic and Transport

The purpose of this section is to assess the effects on roads and traffic of the Project.

For the development of new wind farms, the construction phase is the critical period with respect to the traffic effects experienced on the surrounding road network, in terms of both the additional traffic volumes that will be generated on the road network, and the geometric requirements of the abnormally large loads associated with the wind turbine plant.

However, since the Project does not involve any construction work, any potential traffic and transport effects are limited to the operational and decommissioning phases of the Project.

13.3.1 Receiving Environment

13.3.1.1 Site Location

The existing Ballywater Wind Farm and Ballywater 110kV Substation are located approximately 4km northeast of Kilmuckridge Village and 12km south of Courtown, Co. Wexford. The Project is situated in the townlands of Ballinoulart, Ballywater Lower, Cullentra, Newtown, Oldtown, Templederry, Killannaduff, Raheenlusk, Ballinvunnia, Barnaree, Coolatrindle, Corbally, Boira North, Craan, Greenhall, Ballinvally, Kilpatrick, Ballyrea, Ballyedmond, Ballyshane, Ballynamire, Ballymurragh, Clone West, Raheendarrig, Tomnaboley Lower, Tomnaboley Upper, Tobergal, Knocknaskeagh, Myaugh, Ballydonigan, Tinnacross, Oulartard, Crane. The existing wind farm and substation are located within pastural agricultural lands. The turbines are currently grouped into two clusters, with the smaller of this cluster located to the northeast of the site and comprising of 4 no. turbines. The larger cluster in the southwest, comprises of 17 no. turbines, as well as the onsite substation, which is located to the west of this cluster. The existing Underground Grid Connection is predominantly located underground in the local road network, with a short section adjacent to the existing wind farm and substation site running through third-party land.

A site location map is provided in Figure 1-1 of Chapter 1: Introduction.

13.3.1.2 Site Access and Current Traffic Requirements

There are two access points to the existing Ballywater Wind Farm and Ballywater 110kV Substation for traffic, such as maintenance vehicles. One of the existing entrances is for access to the southern turbine cluster, i.e. turbines T03, T05-T20, and the onsite substation. This entrance is located on the R742 Regional Road, which runs in a north-south direction to the west-southwestern border of the Proposed Development site. Alternatively, the northern turbine cluster, T21-T24, can be accessed via Cahore Local Road, which runs west-east in direction on the northern border of the Proposed Development. The existing site access locations are shown in Figure 13-1. The individual turbines are accessed via the onsite network of existing wind farm access roads. The Underground Grid Connection is located predominantly within the public road corridor.

As the existing Ballywater Wind Farm and Ballywater 110kV Substation are currently operational, with no changes to either proposed, there is no construction phase associated with the proposed lifetime extension of the existing wind farm and substation, or the continued operation of the Underground Grid Connection. Therefore, there will be no new construction traffic generated by the continued operation of the Project.

During the operational phase, the existing wind farm and substation will continue to be remotely monitored. The maintenance contractor for Ballywater Windfarm will be responsible for ensuring each turbine is well maintained. Each turbine is subject to a yearly maintenance schedule which includes yearly master maintenance and visual blade inspections. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes. The use of a crane on site may be required but this is only for major component repairs/change. All site roads and public roads are suitable for this access if required and no modifications are required. Typically, maintenance traffic will consist of four-wheel drive LGVs. The wind farm manager will continue to attend the site regularly (in recent years this has averaged approximately 8 no. visits per year) to perform inspections and oversee maintenance works. The onsite substation and site tracks will also require periodic maintenance. The existing Ballywater 110kV Substation will continue to be operational 24 hours per day, 7 days a week throughout the year. Substations can be operated remotely and manually. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link. It is estimated that daily visits of one maintenance team will be made to the site for authorised persons and vehicles to undertake minor routine maintenance and inspection, if and when required. The level of activity required for the maintenance of the both the existing Ballywater Wind Farm and existing Ballywater 110kV Substation infrastructure is minimal.

Further information regarding maintenance trips and procedures can be found in Section 4.6.2 of Chapter 4: Description of the Project.

The impact on the network of these trips during the operational stage is discussed in Section 13.3.2.3 below.

Map Legend

- EIAR Site Boundary
- Site Access Points

N

Drawing Title	Site Location and Access
Project Title	Proposed Lifetime Extension of Ballywater Wind Farm
Drawn By: CF	Checked By: RK
Project No.: 230417	Drawing No.: Figure 13-1
Scale: 1:90,000	Date: 2024-10-18

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13.3.2 Likely and Significant Effects and Associated Mitigation Measures

13.3.2.1 'Do-Nothing' Scenario

Under the Do-Nothing Scenario, the operational life of the Existing Ballywater Wind Farm and Ballywater 110kV Substation would not be extended beyond 2025, the wind farm and substation would be decommissioned, and the site restored to its use as pastural agricultural land following the expiration of the current planning permission. The Underground Grid Connection would remain in situ, however the opportunity to continue to supply renewable energy and electrical supply to the national grid via this cable would be lost. Should this occur, the impact on traffic and transport would be slight, negative and short term in duration, arising from the implementation of the decommissioning plan from the original application (Pl. Ref. 2001/0458). This plan details the removal of all turbine and substation infrastructure from site. Cranes and heavy plant vehicles will be required onsite to disassemble each turbine tower, the substation and associated infrastructure. Excavators and HGVs will be required to dismantle the foundations and internal roads and transport the resulting material offsite for disposal or recovery. There will be associated decommissioning worker traffic movements to the site as well. While the volume of material (steel, concrete and turbine components) in terms of traffic movements that will be required to be remove this material from the site has not yet been determined at this stage, the impact in terms of traffic volumes will be significantly less than during the original construction phase.

13.3.2.2 Construction Phase

As has been detailed in Chapter 1 and Chapter 4 of this EIAR, no construction or groundworks are required as part of the Project, as the proposal seeks to extend the operational life of the existing wind farm and substation and associated onsite infrastructure. Therefore, there is no potential for construction phase related impacts on traffic or transport.

13.3.2.3 Operational Phase

During the operational phase of the Project, the majority of maintenance works on the site will be completed by a two-person team travelling in a light goods vehicle. Maintenance crews will be required onsite to complete major component replacement on a sporadic basis, e.g. turbine component changes or onsite control building maintenance.

Typically, there are no more than two trips per day to the site made by car or light goods vehicle. The direct effect on the surrounding road network will be imperceptible neutral and medium-term given the very low volume of daily trips to the site.

Further information on maintenance procedures on the Project site is detailed in Section 4.6.2 of Chapter 4 of this EIAR.

Mitigation Measures

Due to very low volumes of traffic forecast to be generated during this stage, no mitigation measures are required.

Residual Impacts

The continued operation of the Project will have **Medium-Term, Imperceptible, Neutral Effects** on traffic and transportation during the operational phase of the Project, as no changes to the existing infrastructure are proposed.

Significance of the Effects

Based on the assessment above, there will be **No Significant Effects** on traffic and transport as a result of the operational phase of the Project.

13.3.2.4 Decommissioning Phase

It is proposed to extend the lifetime of the existing wind farm and substation by 10 years, thereby amending the required decommissioning date from 2025 to 2035. The potential impacts associated with future decommissioning of the Project at that time will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.7 of this report. A Decommissioning Plan is also presented in Appendix 4-4 of this EIAR.

If the Existing Ballywater Wind Farm and Ballywater 110kV substation is decommissioned as proposed in 2035, cranes and heavy plant vehicles will be required onsite to disassemble the existing above-ground turbine structures. Turbine infrastructure including turbine towers, nacelles and rotor components will be separated and removed offsite for re-use or recycling. Ballywater Wind Farm Ltd. has made a commitment not to send turbine blades to a landfill or incineration facility. Instead, the Applicant is committed to recycling the wind turbine components, insofar as possible. The exact approach for recycling the turbines has yet to be determined as it will be 10 years from now, however recycling will be carried out in accordance with best practice at that time.

It is proposed to leave the turbine foundations, hardstanding areas and site cabling (connecting the turbines to the onsite substation) in place underground and to cover them with earth and reseed as appropriate. Leaving the turbine foundations and hardstanding areas in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisance such as noise, dust and/or vibration. It is proposed to leave access roads in-situ, as these are in use by the participating landowners to access their lands. Underground cables within the wind farm site are laid in trenches with no ducting at a depth of more than 2m, and will be left in situ in order to avoid unnecessary effects on soils. While the actual number of loads that will be required to be removed from the windfarm and substation components from the site when the Project is decommissioned has not been determined at this stage, the impact in terms of traffic volumes will be significantly less than during the original construction stage.

13.3.2.4.1 *Project Trip Generation – During Decommissioning*

Table 13-1 below outlines an estimate of trip generations for the decommissioning of the Project, including delivery of crane, plant, refuelling and delivery of soil. Table 13-2 then estimates the trip generations for the removal of the 21 no. turbines following decommissioning of the wind farm. For the purpose of this assessment, it is assumed that this is a theoretically precautionary scenario, where there is no potential for turbine blades to be cut onsite and assumes that delivery of soil for covering hardstanding areas, foundations, etc. is opted for, rather than sourcing soil onsite.

Traffic volumes are discussed in terms of Passenger Car equivalent Units (PCUs), where each vehicle is expressed in terms of its demand on the network relative to the equivalent number of cars. For example, a large articulated (Artic) HGV was given a factor of 2.3 passenger car units (as per TII Project Appraisal Guidelines for National Roads Unit 5.2), while one of the extended HGVs transporting the large turbine components was assigned a value of 10.

Table 13-1 Estimated trip generation for decommissioning phase

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Delivery of plant	5	Large Artic	2.3	11.5	0.2	0.4
Cranes for site	1	Large Artic	2.3	2.3	1	2
Additional Crane Materials Delivery	3	Large Artic	2.3	6.9	0.33	0.66
Refuelling for plant	5	Large Artic	2.3	11.5	0.20	0.40
Removal of plant	5	Large Artic	2.3	11.5	0.2	0.4
Removal of substation	3	Large Artic	2.3	6.9	0.33	0.66
Delivery of Soil*	32	Large Artic	2.3	73.6	0.03	0.06
Total Truck Loads	**54**					
*For this table, the worst-case scenario is assumed. Therefore, delivery of soil is opted for rather than sourcing soil onsite						

Table 13-2 Estimated trip generation for the removal of the 21 no. turbines following decommissioning of the wind farm

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	21	1	7	1	7	Extended Artic
Blades	21	3	21	1	21	Extended Artic
Towers	21	4	28	1	28	Extended Artic
Transformer	21	1	7	1	7	Large Artic
Blade hub	21	1	7	1	7	Large Artic
Base and other deliveries	21	1	7	1	7	Large Artic
Total Truck Loads					**77**	

An estimated worst-case scenario of 131 truckloads is the required trip generation in the Decommissioning Phase. The decommissioning phase will take approximately 3-6 months to complete from commencing the removal of turbines to the final reinstatement of the site. At this time, it is not possible to determine exactly when decommissioning will take place.

Mitigation Measures

As noted in the Scottish Natural Heritage (SNH) report *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013), reinstatement proposals for a wind farm are typically made far in advance, so within the proposed 10-year extension of operation of the site, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore "best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".

Prior to decommissioning following the proposed 10 year lifetime extension of the existing wind farm and substation, an updated Decommissioning Plan, including material recycling/disposal and a Traffic Management Plan, will be developed to minimise impacts to the local road network. The updated decommissioning plan will be prepared in consultation with the local authority, and the final documentation will be agreed with the local authority in advance of decommissioning.

Residual Impact

As stated above, in the event that the existing wind farm and substation are decommissioned in 2035, an updated Decommissioning Plan will be prepared and implemented in order to minimise the residual impacts. The decommissioning phase of the Project will likely result in a residual impact to other road users that is a **Short Term, Slight, Negative Effect**.

Significance of the Effects

Based on the assessment above, there will be **No Significant Direct or Indirect Effects** on traffic and transport as a result of the decommissioning phase of the Project.

13.3.2.5 Cumulative Effects

The potential cumulative impact and associated effects between the Project and the projects described in Section 2.9 in Chapter 2 of this EIAR, hereafter referred to as the 'other projects', have been considered in terms of traffic and transport.

There is no construction phase impacts associated with the Project.

Operational phase impacts on traffic and transport are imperceptible and therefore there are no significant cumulative effects in relation to traffic and transport associated with the extended operational phase of the Project in combination with other projects.

For the purpose of traffic and transport related cumulative impacts associated with the decommissioning of the Project, the cumulative planning search as set out in Appendix 2-3 was reduced to a radius of 5km from the existing wind farm and substation. Following this, it was considered that there were no developments located within this 5km radius that had the potential to overlap with the decommissioning phase of the Project, and therefore there are **No Significant Cumulative Effects** in relation to traffic and transport associated with the decommissioning phase of the Project in combination with other projects.

13.4 Telecommunications and Aviation

13.4.1 Introduction

This section of the EIAR assesses the likely significant effects of the Project on telecommunications and aviation. Section 13.4 describes the way in which wind turbines can potentially interfere with telecommunications signals or aviation activities. Likely significant effects are assessed, and mitigation measures proposed in Section 13.4.6.

13.4.2 Background

13.4.3 Broadcast Communications

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 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.

13.4.4 Domestic Receivers

Depending on local topography, a domestic receiver may receive broadcast signals from more than one location. The strength of the signal varies with distance from the transmitter, and the receiver's antenna is generally always directed towards the most local, and usually the strongest, broadcasting station.

There are two types of potential electromagnetic interference to domestic receivers, depending on the location of the receiver in relation to a wind farm. 'Shadowed' houses are located directly behind a wind farm, relative to the location from where the signal is being received. In this case, the main signal passes through the wind farm and the rotating blades can create a degree of signal scattering. In the case of viewers located beside the wind farm (relative to the broadcast signal direction), the effects are likely to be due to periodic reflections from the blade, giving rise to a delayed signal.

In both cases, i.e., shadowed houses located behind the wind farm and those located to the side of it, the effects of electromagnetic interference may depend to some degree on the wind direction, since the plane of rotation of the rotor will affect both the line-of-sight blockage to viewers located behind the wind farm and the degree of reflection to receivers located to the side.

13.4.5 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example tower-to-tower microwave communication links, and airborne and ground radar systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach. These effects are generally easily dealt with by detailed micro-siting of turbines in order to avoid alignment with signal paths or by the use of repeater relay links out of line with the wind farm.

13.4.6 Likely Significant Effects and Associated Mitigation Measures

13.4.6.1 'Do Nothing' Scenario

The Do-Nothing alternative to extending the lifetime of the Project would be to decommission the wind farm and substation once the current planning permission expires in 2025. Should this occur, the impact on telecommunications would be neutral in the context of this EIAR.

13.4.6.2 Construction Phase

As the Project is currently operational, and no changes to the existing infrastructure are proposed, there is no construction phase associated with the proposed extension of life of the existing wind farm and substation. There will therefore be no direct effects on telecommunications or aviation as a result of any construction works.

13.4.6.3 Operational Phase

13.4.6.3.1 *Telecommunications*

Pre-Mitigation Impact

The existing Ballywater Wind Farm and Ballywater 110kV Substation have been operational since 2005. To date, Ballywater Windfarm Ltd. are not aware of any complaints from telecommunications service providers regarding interference to service associated with the existing wind farm.

In an email dated 26th September 2023 from the Coimisiún na Meán stated in relation to the Project "...we are not aware of any issues from existing windfarms into existing FM networks," and that the Project is "not located close to any existing or planned FM transmission sites."

Scoping responses were received from 2RN, Ajisko Ltd., BAI, ComReg, Defence Forces, Enet, Eir, ESB Telecommunications, Imagine, Irish Rail, Ivertec, Radio Services, Three Ireland, Uisce Eireann, Virgin Media and Vodafone during the period of January to August 2024, affirming that the turbines will have no negative effect on their transmission links. Vodafone identified that there was one link operating in the area, but subsequently in a follow up email confirmed that the Project has not interfered with this link.

Currently, no telecoms operators have highlighted issues regarding the Project. Copies of all scoping responses received are presented in Appendix 2-1 of this EIAR.

Mitigation Measures

In the event of further scoping responses being received from the EIA consultees or from other telecommunication service providers, the comments of the consultees and any proposed mitigation measures will be considered in the continued operation of the Project, subject to a grant of planning permission.

Residual Impact

The continued operation of the Project will have **No Residual Effects** on the telecommunications signals of any other operator, as no changes to the existing infrastructure are proposed.

Significance of Effects

There will be **No Significant Direct or Indirect Effects** on telecommunications from the Project.

13.4.6.3.2 *Aviation*

Pre-Mitigation Impact

A scoping response was received from the Irish Aviation Authority (IAA) on 7th December 2023 regarding their position on the Project. In their response, IAA stated that "Based on the information provided, IAA's Aerodromes Division has no requirements for incorporation into the Environmental Scoping Assessment report". The Department of Defence issued a scoping response on 16th January 2024 regarding telecommunications services in proximity with the Project which stated that "I can affirm that the Air Corps currently does not utilise any links within the specified area of interest, and there are no forthcoming plans to build links in that area."

Additionally, the Project has been in operation since 2005 and no aviation issues have arisen in that time. No changes to the existing wind farm infrastructure or turbine dimensions are proposed.

Mitigation Measures

The developer will coordinate with the IAA directly should a grant of permission be issued, to ensure that the development remains in compliance with all IAA requirements including lighting requirements. Any further details will be agreed with the Department of Defence, Air Corps and the IAA. The coordinates and elevations for the existing turbines has been supplied to the IAA, as is standard practice for all wind farm developments.

Residual Impact

The Project will have **No Residual Impact** on aviation as all lighting and other requirements will continue to be met by the Applicant.

Significance of Effects

There will be **No Significant Direct or Indirect Effects** on aviation operations due to the Project.

13.4.6.4 Cumulative Effects

The potential cumulative impacts and associated effects between the Project and the other projects described in Section 2.9 of this EIAR, hereafter referred to as the other projects, have been considered in terms of aviation and telecommunications.

During the development of any large project that has the potential to have effects on telecoms or aviation, the Developer is responsible for engaging with all relevant telecoms operators and aviation authorities to ensure that the proposals will not interfere with television or radio signals by acting as a physical barrier. In the event of any potential impact, the developer for each individual project is responsible that the necessary mitigation measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

The Project has been in operation since 2005 and no changes to the existing wind farm and substation infrastructure, or the Underground Grid Connection, are proposed. Therefore, no impacts on telecommunications and aviation are anticipated. There will be **No Significant Cumulative Effects** in relation to telecommunications and aviation associated with the Project in combination with other projects.

14. MAJOR ACCIDENTS AND NATURAL DISASTERS

14.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the likely significant effects on the environment arising from the vulnerability of the proposed lifetime extension of the existing Ballywater Wind Farm and Ballywater 110kV Substation (the 'Proposed Development as detailed in Chapter 4), together with the existing Underground Grid Connection that connects the electricity generated by the wind farm to the National Grid at Crane 110kV electrical substation in Co. Wexford (the 'Project' as detailed in Chapter 4 of this EIAR) to risks of major accidents and/or natural disasters. It has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA) in *'Guidelines on Information to be contained in Environmental Impact Assessment Reports'* (EPA, 2022) and the European Commission in relation to Environmental Impact Assessment of Projects (Directive 2011/92/EU), namely *'Guidance on the Preparation of the Environmental Impact Assessment Report'* (2017).

The assessment of the vulnerability of the Project to major accidents and natural disasters is carried out in compliance with the EIA Directive, as amended, which states the need to assess:

> *"The expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or natural disasters, are likely to have significant adverse effects on the environment".*

The objective of this assessment is to ensure that the appropriate precautionary actions are taken for those projects, which *"because of their vulnerability to major accidents and/or natural disasters, are likely to have significant adverse effects on the environment".*

Based on the requirements of the EIA Directive, this chapter seeks to determine:

- The relevant major accidents and/or natural disasters, if any, that the Project could be vulnerable to;
- The potential for these major accidents and/or natural disasters to result in likely significant adverse environmental effect(s); and
- The measures that are in place, or need to be in place, to prevent or mitigate the likely significant adverse effects of such events on the environment.

14.2 Statement of Authority

This section of the EIAR has been prepared by Emily Lynch and Keelin Bourke and reviewed by Robert Kennedy and Sean Creedon, both of MKO. Emily is an Environmental Scientist with nearly 2 years' experience in private consultancy. Emily graduated from the National University of Ireland, Galway in 2022 with a B.Sc. in Environmental Science. Since beginning her work with MKO, Emily has been working as part of a large, multidisciplinary team in order to complete complex Environmental Impact Assessment Reports (EIARs) for largescale onshore wind energy developments, as well as other large renewable developments.

Keelin is an Environmental Scientist with MKO, with over 1 years' experience in private consultancy, having joined the company in September 2023. Keelin holds a BSc (Hons) in Environmental Science from University College Cork and an MSc (Dist) in Environmental Engineering from Trinity College Dublin. Prior to taking up her position with MKO, Keelin worked as an Environmental Health and Safey Officer in an EPA licensed Waste Transfer Facility in Cork City. Keelin's current key strengths and areas of expertise are in environmental surveying, report writing and environmental mapping.

Since joining MKO, Keelin has become a member of the MKO Environmental Renewables Team and has been involved in preparing and managing Environmental Impact Assessments and in leading large multi-disciplinary teams in order to produce robust Environmental Impact Assessment Reports for large-scale onshore and offshore wind energy developments.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

14.3 Assessment Methodology

The following sources of information and literature pertinent to the area were used in the preparation of this section of the EIAR:

- Census of Ireland[1] 2016 and 2024
- Regional Spatial and Economic Strategy (RSES), published by the Southers Regional Assembly on 31st January 2020[2]
- Wexford County Development Plan 2022 – 2028[3]
- Wexford County Council website[4] (accessed September 2024)
- Fáilte Ireland[5] (accessed September 2024)

Major accidents natural disasters are hazards which have the potential to affect the Project and consequently have potential impacts on the environment. These include accidents during operation or decommissioning of the existing wind farm and substation caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or natural disasters considers all factors defined in the EIA Directive that have been considered in this EIAR, i.e. population and human health, biodiversity, land, soils, water, air and climate, material assets, cultural heritage and the landscape.

[1] *Central Statistics Office Ireland (2023). Census of Ireland Results 2016 & 2024. Available at:* https://www.cso.ie/en/census/
[2] *Southern Regional Assembly (2020) Regional Spatial and Economic Strategic (RSES) for the Southern Region*
[3] *Wexford County Council (2022) Wexford County Development Plan (2022-2028). Available at:* https://consult.wexfordcoco.ie/en/consultation/wexford-county-development-plan-2022-2028
[4] *Wexford County Council website. Available at:* https://www.wexfordcoco.ie/
[5] *Fáilte Ireland website. Available at:* https://www.failteireland.ie/

14.3.1 Legislative Context

14.3.1.1 Legislation

As assessment of the following key items was undertaken in accordance with the EIA Directive (as amended):

- The vulnerability of the proposed project to potential accidents and disasters
- The proposed project's potential to cause major accidents or disasters, which pose a risk to the environment.

The information relevant to major accidents and/or disasters to be included in the EIAR is set out in paragraph 8 of Annex IV of the EIA Directive, as follows:

> *"(8) A description of the expected significant adverse effects of the project on the environment deriving the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies".*

14.3.2 Guidance Documents

The following guidance documents have been consulted in the preparation of this section:

- Environmental Protection Agency (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports
- Health Service Executive Ireland (2019) Interim HSE Emergency Management Area 5 Major Emergency Plan: Covering Geographical Areas of Counties Carlow, Kilkenny, South Tipperary, Waterford and Wexford;
- Department of Defence (2020) A National Risk Assessment for Ireland
- Wexford County Council (2016) Major Emergency Plan
- European Commission. (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of Environmental Impact Assessment Reports
- Environmental Protection Agency (2014) Guidance on Assessing and Costing Environmental Liabilities
- Department of Environment, Heritage and Local Government (2010) A Guide to Risk Assessment in Major Emergency Management

14.3.3 Categorisation of the Baseline Environment

A desk study has been completed to establish the baseline environment for which the proposed risk assessment is being carried out. This will influence both the likelihood and the impact of a major accident or natural disaster. Local and regional context has been established prior to undertaking the risk assessment to develop an understanding of the vulnerability and resilience of the area to emergency situations.

Further detail on the baseline environment is provided in Section 14.4.4.1 below.

14.3.4 Impact Assessment Methodology

14.3.4.1 Introduction

A wind farm is not a recognised source of pollution and is therefore not subject to Industrial Emissions Directive regulations or any other Environmental Protection Agency environmental regulatory consent. Should a major accident or natural disaster occur, the potential sources of pollution onsite during the construction, operational, and decommissioning phases of a wind farm and substation are limited and of low environmental risk. There are no construction or groundworks proposed as part of the Project.

Sources of pollution with the potential to cause significant environmental impacts and associated negative effects such as bulk storage of hydrocarbons or chemicals, storage of waste, management of flammable material, etc. are limited, and therefore there is an inherently low level of environmental risk associated with major accident or natural disasters impacting the Project and causing environmental damage.

Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to issues such as flooding and fires. These are described in the sections below. In general, the overall vulnerability of wind farms in Ireland to risks of major accidents and natural disasters is considered low.

The Project is also located on pastural and arable farmland, with no underlying peat soils being present, and along the public road network. There is, therefore, no potential for peat slides and low potential for landslides. Any risks associated with flooding, impacts on infrastructure, accidents, etc. are addressed in the sections below.

Current EIA practice already includes an assessment of some potential accidents and disaster scenarios, such as pollution incidents to ground and surface-watercourses, as well as assessment of flooding events and peat instability. These are described in the relevant EIAR assessment chapters where applicable (Refer to Chapters 5 to 13 for further details).

This assessment is focused on an understanding that the Project will be operated in line with the methodologies and measures prescribed in this EIAR.

14.3.4.2 Site-Specific Risk Assessment Methodology

A site-specific risk assessment identifies and quantifies risks, focusing on unplanned, but possible and plausible events occurring during the operation and decommissioning of the Project. The approach to identifying and quantifying risks associated with the Project by means of a site-specific risk assessment is derived from the EPA document '*Guidance on Assessing and Costing Environmental Liabilities*'[6]. The following steps were taken as part of the site-specific risk assessment:

- Risk identification
- Risk classification, likelihood and consequence, and
- Risk evaluation

14.3.4.2.1 *Risk Identification*

Risks have been reviewed through the identification of reasonably foreseeable risks in consultation with the relevant contributors to this EIAR (refer to *Statements of Authority* in Chapters 5 to 16 of this

[6] *Environmental Protection Agency (2014). Guidance on Assessing and Costing Environmental Liabilities. Available at: https://www.epa.ie/publications/compliance-enforcement/licensees/reporting/financial-provisions/EPA_OEE-Guidance-and-Assessing-WEB.pdf*

EIAR). The identification of risks has focused on non-standard but plausible incidents that could occur at or as a result of the Project during operation or decommissioning.

In accordance with European Commission EIAR Guidance, risks are identified in respect of the Projects':

1. Potential to cause accidents and/or disasters
2. Vulnerability to potential disasters/accidents

14.3.4.2.2 *Risk Classification*

Classification of Likelihood

After identifying the potential risks, the likelihood of occurrence of each risk has been assessed. An analysis of safety procedures and proposed environment controls was considered when estimating likelihood of identified potential risks occurring. Table 14-1 defines the likelihood ratings that have been applied. The approach adopted has assumed a 'risk likelihood' where one or more aspects of the likelihood description are met.

Table 14-1 Classification of Likelihood (source DoEHLG 2010)

Ranking	Likelihood	Description
1	Extremely Unlikely	May occur only in exceptional circumstances; once every 500 or more years
2	Very Unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communities; and / or little opportunity, reason or means to occur; may occur once every 100-500 years.
3	Unlikely	May occur at some time; and /or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisation's worldwide; some opportunity, reason or means to occur; may occur once per 10-100 years.
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence and will probably occur once per 1-10 years
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probably occur more than once a year.

Classification of Consequence

The consequence rating assigned to each risk has assumed that all proposed mitigation measures and/or safety procedures have failed to prevent the major accident and/or disaster. Further, the HSE Emergency Management: Area 5 Interim Emergency Plan 2019, if implemented as intended, will work to reduce the consequence if any major accident or disaster. The consequence of the impact if the event occurs has been assigned as described in Table 14-2.

The consequence of a risk to/from the Project has been determined where one or more aspects of the consequence description are met, i.e., risks that have no consequence have been excluded from the assessment.

Table 14-2 Classification of Impact (Source DoEHLG, 2010)

Ranking	Likelihood	Impact	Description
1	Minor	Life, Health, Welfare Environment Infrastructure Social	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment. No contamination, localised effects <€0.5M Minor localised disruption to community services or infrastructure (<6 hours).
2	Limited	Life, Health, Welfare Environment Infrastructure Social	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements. Simple contamination, localised effects of short duration €0.5-3M Normal community functioning with some inconvenience.
3	Serious	Life, Health, Welfare Environment Infrastructure Social	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support. Simple contamination, widespread effects or extended duration €3-10M Community only partially functioning, some services available.
4	Very Serious	Life, Health, Welfare Environment	5 to 50 fatalities, up to 100 serious injuries, up to 2000 evacuated

		Infrastructure Social	Heavy contamination, localised effects or extended duration €10-25M Community functioning poorly, minimal services available
5	Catastrophic	Life, Health, Welfare Environment Infrastructure Social	Large numbers of people impacted with significant numbers of fatalities (>50), injuries in the hundreds, more than 2000 evacuated. Very heavy contamination, widespread effects of extended duration. >€25M Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

Risk Evaluation

Once classified, the likelihood and consequence ratings have been multiplied to establish a 'risk score' to support the evaluation of risks by the means of a risk matrix. The risk matrix sourced from the DoEHLG Guide to Risk Assessment in Major Emergency Management (and as outlined in Table 14-3) indicates the critical nature of each risk. The risk matrix has therefore been applied to evaluate each of the risks associated with the Project. The risk matrix is colour coded to provide a broad indication of the critical nature of each risk:

- *The red zone represents 'high risk scenarios';*
- *The amber zone represents 'medium risk scenarios', and*
- *The green zone represents 'low risk scenarios'.*

Table 14-3 Classification of Risk (source DoEHLG, 2010)

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Serious	5.Catastrophic
Likelihood Rating	5.Very Likely					
	4. Likely					
	3. Unlikely					
	2. Very Unlikely					
	1. Extremely Unlikely					

14.4 Project Hazard Analysis

14.4.1 Baseline Conditions

The functional area of Wexford County Council falls under the South East Major Emergency Region. The Major Emergency Plan prepared by Wexford County Council (2019) outlines the following potential major emergency scenarios in the county:

- Natural
  - Flooding/ Severe Weather;
  - Landslide/ Mine Collapse/ Rock slide;
  - Forest fires;
  - Earthquake/ Tsunami/ Volcano.
- Transportation
  - Aviation incident;
  - Rail incident;
  - Road incident;
  - Ship and Port incident;
  - Water rescue.
- Technological
  - Industrial incidents;
  - Seveso sites;
  - Loss of utilities/Infrastructure;
  - Building collapse;
  - Water contamination/pollution.
- Civil
  - Overcrowding;
  - Epidemics/pandemics;
  - Terrorism/Conventional Explosive, Chemical, Biological, Radiological or Nuclear (CBRN).

14.4.1.1 Natural

The topography of the site does not vary widely in elevation. The existing Ballywater Wind Farm and Ballywater 110kV Substation are located in a low-lying area and has surface water features within the EIAR site boundary due to the proximity of the coastline. There is low potential for significant natural disasters to occur at the existing wind farm and substation site. As there are no groundworks proposed as part of the Project, the risk of landslide or rockslide are also considered to be low. There are no mine shafts or forestry present within the Project site, leading to no possibility of forest fire or mine collapse within the EIAR site boundary. Due to the raised turbine foundations, the risk of coastal flooding on the site, in particular due to climate change, is minimised on the Proposed Development site. Earthquake, tsunami and volcanic eruptions are not considered to be a risk to the Project either, due to its location (c. 0.2km from the nearest coastline), and the lack of tectonic activity ever recorded in the area. Any natural disasters associated with the Project are therefore deemed very unlikely.

14.4.1.2 Transportation

The Project will utilise the existing road network for maintenance and decommissioning activities. There will be no major traffic disruptions as there are no construction works proposed. Traffic associated with the operational and decommissioning stages of the Project is addressed in Chapter 13 of this EIAR and is not expected to give rise to any significant impacts. Any transportation incidents associated with the Project are therefore deemed to be very unlikely.

14.4.1.3 Technological

As the Project is located in a rural area, the risk of any industrial incidents interacting with the existing Ballywater Wind Farm, the existing Ballywater 110kV Substation, and the Underground Grid Connection are low. 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 offsite of the accident. Ballywater Wind Farm is not regulated 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.

In addition to this, the nearest SEVESO site to the Project is located c. 31km southwest in New Ross, Co. Wexford. The risk of building collapse, water contamination or pollution are deemed to be very unlikely.

14.4.1.4 Civil

As the Project is located in a rural area, civil concerns such as overcrowding, epidemics, pandemics or terrorism are deemed to be very unlikely to interact with the Project.

14.5 Risk Assessment

This section outlines the possible risks associated with the Project for the operational and decommissioning phases.

The risks have been assessed in accordance with the relevant classifications as outlined in Table 14-1 and 14-2.

As outlined in Section 14.3.4.2.2, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster i.e. pre-mitigation.

14.5.1 Likely Significant Effects

14.5.1.1 Do-Nothing Scenario

Under the 'Do-Nothing' scenario, the existing wind farm and substation will be decommissioned in 2025 when the current permissions expire. As part of the decommissioning stage, the existing turbines and substation would be dismantled, and the site reinstated to its original condition; please see Section 4.7 in Chapter 4 of this EIAR for further details regarding decommissioning.

In implementing the 'Do-Nothing' alternative however, i.e. decommissioning the existing wind farm and substation in 2025, the opportunity to continue utilising the existing renewable energy infrastructure would be lost. So too would the opportunity for the wind farm to continue contributing to Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas (GHG) emissions. The existing Ballywater Wind Farm is capable of suppling approximately 18,411 households with electricity every year based on the calculated electricity as produced by the Proposed Development (see Section 4.3.3.5 in Chapter 4 of this EIAR for calculations). The opportunity to continue to provide maintenance-related employment, local authority development contributions, rates and investment in the local area would also be lost.

As per the original grants of permission for the existing wind farm and substation, under the 'Do-Nothing' scenario, decommissioning of the Proposed Development would involve the restoration of the site to its original state prior to development. Decommissioning activities have evolved since the original planning applications were submitted, and a Decommissioning Plan has been prepared to account for such updates and is included in Appendix 4-4 of this EIAR. The removal of wind farm and substation infrastructure such as turbine foundations under the 'Do Nothing' scenario is not considered to be the most environmentally prudent option. In order to remove this infrastructure, a significant volume of reinforced concrete, over 180m^3, would have to be removed from the ground. This could result in significant environmental nuisance such as noise, dust and/or vibration, pollution of surface waters and/or groundwaters and soils, traffic, and negative impacts on sensitive habitats within the vicinity of the Project. Increased traffic volumes due to the generation of significant additional construction and demolition (C&D) waste volumes due to the removal of foundations and access roads and significant volumes of soil movement within and to the site during the decommissioning process under current planning conditions would increase the risk of traffic and contamination incidents on site.

In addition, the removal of the access roads has the potential to create significant noise and dust issues as well as pollution of surface waters and additional traffic. As the access roads are also currently used for agricultural activities around the wind farm infrastructure, a further consequence would be the installation of farm tracks around the site to mitigate for the loss of the access roads.

A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of extending the lifetime of the existing wind farm and substation at this site are presented in Table 3-1 of Chapter 3: Site Selection and Alternatives of this EIAR.

14.5.1.2 Assessment of Effects During Construction

The existing Ballywater Wind Farm and Ballywater 110kV Substation are currently operational, and it is proposed to extend their operational phase for an additional 10 years. No construction activities will occur as part of the proposed extension of duration to the operational life of the existing wind farm and substation.

14.5.1.3 Assessment of Effects During Operation

Six risks specific to the continuation of the operation of the Project have been identified and presented in Table 14-4.

Table 14-4 Risk Register - Operational Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
A	**Contamination** Discharge or spillage of fuel or chemical solvents into watercourse or percolated to groundwater	A vehicular incident on the public road involving fuel or chemical solvent transportation in the operational phase. Spill or leak of oil during operational maintenance.
B	**Severe Weather** Risk to operational activity on site, blade or turbine damage	Extreme weather – periods of heavy rainfall, taking into account climate change and strong winds.
Potential to cause accidents and / or disasters		

C	**Industrial Accident - Fire / Gas Explosion**	Equipment or infrastructure failure; Electrical problems; and Employee negligence.
D	**Collapse/ damage to structures**	Earthquakes; and Vehicular collisions with wind farm structures due to driver negligence on site roads and on public roads.
E	**Traffic Incident** Collisions onsite and offsite with vehicles involved in operation of Project	Driver negligence or failure of vehicular operations on site roads and on public roads. Traffic Management not implemented
F	**Loss of Critical Infrastructure**	Electrical fault at wind farm substation bay

14.5.1.4 Assessment of Effects During Decommissioning

Four risks specific to the decommissioning of the Project have been identified and are presented in Table 14-5.

Table 14-5 Risk Register - Decommissioning Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
G	**Severe Weather** Risk to decommissioning activity on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
H	**Flooding of site** High levels of surface water on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
Potential to cause accidents and / or disasters.		
I	**Traffic Incident** Collisions onsite and offsite with vehicles involved in decommissioning of Project	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented

	Contamination **Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater**	**Fuel spillage during delivery to site.** **Failure of fuel storage tank or tanks in plant and machinery and vehicles.** **Spillage of lubricating and cooling oils from decommissioning of turbines and onsite substation.** **Drainage and seepage water resulting from decommissioning of infrastructure.** **Erosion of sediment from emplace site drainage channels.**

These risks have been assessed in accordance with the relevant classification (Refer to tables 14-1 and 14-2) and the resulting risk analysis is outlined in Table 14-6. The risk register is based upon possible risks associated with the Project. As outlined in Section 14.3.4.2.2, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent major accidents and/or disasters.

Further details regarding the assigned Risk Scores, as set out in Table 14-3, are provided below the table.

14.5.1.5 Assessment of Effects – Summary

Table 14-6 Risk Assessment

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
Operational Phase								
A	**Contamination**	A vehicular incident on the public road or Proposed Development road network, involving fuel, wastewater or sewage transportation in the operational phase.	Damage to, or depletion of aquatic habitats and species. Release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies.	2	As outlined in Appendix 4-4, Operation and Environmental Management Plan, fuel will not be stored on site on an ongoing basis. Fuel will only be stored onsite on a temporary basis if a site outage occurs, in a bunded electrical generator, to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored outside the confines of the site. During maintenance and service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Wind Farm Site and reused, recycled or disposed of in accordance with	1	The risk of a fuel spillage or impact on surrounding drainage during the operational stage will result in a limited consequence, in that there would be 'a limited number of people affected' with 'localised effects of short duration' through the use of bunded containment areas during operation. The potential residual environmental effects are described in detail in Chapters 7 and 8 on Land, Soils & Geology and Hydrology and Hydrogeology, which conclude that there will be no significant environmental effects.	2

					the relevant legislation in an authorised facility. Oils for the purposes of cooling the turbine transformers are stored in bunded tanks within the turbine foundations, within a bund able to contain at least 110% of the volume stored. Any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to ground.			
B	**Severe Weather**	Extreme weather – periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life	2	The risk of severe weather is unlikely when considering the assessment in Chapter 9 (Air and Climate) and weather conditions recorded over the last 30 years within the area	1	The risk of severe weather conditions during the operational phase will result in a minor consequence in that a small number of people will be affected should a severe weather event occur, with no fatalities and a small number of minor injuries with first aid treatment	2
C	**Industrial Accident - Fire/Gas explosion**	Equipment or infrastructure failure; Fuel spillage/storage Electrical problems; and	Illness or loss of life; Damage to, or depletion of habitats and species; and Impacts on ambient air quality.	2	Fuel will not be stored onsite and will only be used infrequently at times of site outages (and within bunded containers), therefore fuel is not considered to be a significant fire risk.	2	Should a fire/explosion occur at the site, a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the nature of the project and the lack of infrastructure or fuel storage	4

		Employee negligence			There is a possibility of equipment failure during the continuation of the operational phase of the Proposed Development. The proposed turbines have an operation life of approximately a further 10 years, but components may need to be replaced before this period has passed. The onsite 110kV substation will need maintenance. In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the development shall be subject to a fire safety risk assessment which would assist in the identification of any major risks of fire on site.		during operation that would result in any such incident. There will be 'normal community functioning' in the area with 'some inconvenience' Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
D	**Collapse/ damage to structures**	Landslide/ Earthquake; and Extreme weather conditions such as flooding and storms.	Injury or loss of life. Movement of peat within the site; Sedimentation of nearby watercourse;	1	According to the Irish National Seismic Network (INSN), earthquakes measuring ~2 on the Richter Scale are "normal" in terms of seismicity in Ireland. These are known as microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. As such,	1	The risk of infrastructure collapse or damage to structures during the operational phase will result in a minor consequence in that 'small number of people would be affected, with 'no fatalities and no real likelihood of any impact on any environmental receptors	1

		Vehicular collisions due to driver negligence	Damage to, or depletion of aquatic habitats and species;		buildings in Ireland are extremely unlikely to be damaged or collapse due to seismic activity. As outlined in Chapter 9 of this EIAR, due to Ireland's latitudinal position, the probability of extreme weather events posing a threat to human life are low. However, in the circumstance of such a weather event occurring at the Site of the Proposed Project during the operational phase, the Severe Weather Plan as set out in the Wexford County Major Emergency Plan will be followed (see also Section 11 of the HSE South East (Area 5) Emergency Plan). Having regard to speed limits in place within the site, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.			
E	**Traffic Incident**	Driver negligence or failure of vehicular operations on site roads.	Injury or loss of life.	3	A limited number of vehicles will be required on the site as part of the operational phase	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a	3

		Traffic Management not implemented			As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site, 'at some time.' An unlikely risk is therefore predicted.		'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small number of minor injuries with first aid treatment.'	
F	**Loss of Critical Infrastructure**	Equipment or infrastructure failure; Electrical problems; and Employee negligence Landslide/ Earthquake; and Extreme weather conditions such as flooding and storms.	Injury or loss of life	1	Eirgrid operate the grid from National Control Centres matching electricity production to customer demand, switching from synchronous to non-synchronous where required to ensure no power outages. The Proposed Development is connected to the National Grid via the existing Ballywater 110kV Substation and Underground Grid Connection to Crane 110kV Substation, and any shortages or failures will not impact other connections to the same substation.	2	As the existing Ballywater 110kV Substation supplies power directly to the Crane 110kV Substation, should a power failure occur, it will not result in any loss of electrical supply to external customers.	2
Decommissioning Phase								
G	**Severe Weather**	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Sedimentation of nearby watercourse	2	The risk of severe weather is unlikely when considering the assessment in Chapter 9 Air and Climate and weather conditions recorded over the last 30 years within the area.	1	The risk of severe weather conditions during the decommissioning phase will result in a minor consequence in that 'small number of people would be	2

			Damage to, or depletion of aquatic habitats and species;		Any site works will be paused should a Status Red weather warning alert be issued by Met Eireann, as is standard practice.		affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'. Decommissioning will not require significant excavations works. There is no real likelihood of any impact on any environmental receptors.	
H	**Flooding**	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Sedimentation of nearby watercourse Damage to, or depletion of aquatic habitats and species;	2	The risk of flooding is considered very unlikely when taking into account the baseline assessment in Chapter 8 (Hydrology and Hydrogeology) of this EIAR, recorded within the Proposed Development boundary.	1	The risk of flooding during the decommissioning phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'.	2
I	**Traffic Incident**	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented	Injury or loss of life.	3	A limited number of vehicles will be required on the site as part of the decommissioning phase. As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site, 'at	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a 'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small	3

					some time.' An unlikely risk is therefore predicted.		**number of minor injuries with first aid treatment.'**	
J	**Contamination**	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles. Drainage and seepage water resulting from infrastructure removal; Erosion of sediment from site drainage channels.	Damage to, or depletion of aquatic habitats and species Release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies.	2	As outlined above, fuel will not be stored onsite and will only be used on site on a temporary basis during infrequent power outages. During such instances, fuel will only be contained within a bunded electrical generator. No fuels, chemicals or solvents will be stored outside of the confines of the site. As detailed in Chapter 8, there are no constructed drainage outfalls associated with the Project infrastructure	2	The risk of a fuel spillage or impact on surrounding drainage during the decommissioning stage will result in a limited consequences in that there would be 'a limited number of people affected' with 'localised effects of short duration' through the use of bunded containment areas during decommissioning.	4

The risk assessment for each of the potential risks identified are consolidated in Table 14-7 which provides their risk scores. A corresponding risk matrix is provided in Table 14-8 which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in Section 14.3.4.2.2, the red zone represents high-risk scenarios, the amber zone represents the medium-risk scenarios, and the green zone represents low-risk scenarios. Further elaboration on the assigned risk ratings are provided in Sections 14.5.1.5.1 and 14.5.1.5.2 following the tables.

Table 14-7 Risk Scores

Risk ID	Potential Risk	Likelihood Rating	Consequence Rating	Risk Score
Operational Phase				
A	**Contamination**	2	1	2
B	**Severe Weather**	2	1	2
C	**Industrial Accident – Fire/Gas Explosion**	2	2	4
D	**Collapse/Damage to Structures**	1	1	1
E	**Traffic Incident**	3	1	3
F	**Loss of Critical Infrastructure**	1	2	2
Decommissioning Phase				
G	**Severe Weather**	2	1	2
H	**Flooding**	2	1	2
I	**Traffic Incident**	3	1	3
J	**Contamination**	2	2	4

Table 14-8 Risk Matrix

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Seriou	5.Catastrophic
Likelihood Rating	**5.Very Likely**					
	4. Likely					
	3. Unlikely	E, I				
	2. Very Unlikely	A, B, G, H	C, J			
	1. Extremely Unlikely	D	F			

Table 14-8 presents the potential risks identified during the operation and decommissioning of the Project all of which can be classified as 'low risk scenarios'.

The scenarios with the highest risk score in terms of a major accident and/or natural disaster during the operation and decommissioning phase of the Project are identified below.

14.5.1.5.1 *Contamination During Decommissioning*

There is a potential risk of contamination from site activities during the decommissioning phase from potential release of hydrocarbons. The risk of contamination was given a risk score of 4 on a very precautionary basis. However, as outlined in Chapter 8: Hydrology and Hydrogeology (Section 8.4.5), measures are proposed and will be put in place to reduce the risk of accidental spillage and contamination of pollution risk to groundwater, surface water and associated ecosystems and to terrestrial ecology.

The risk of contamination is very unlikely to occur and will have limited consequences should it do so, representing a low-risk scenario during operation and decommissioning phases. The conclusions in the relevant chapters of the EIAR concluded that there will be no significant residual effects associated with this potential impact.

14.5.1.5.2 *Industrial Accident – Fires and/or Gas Explosions During Operation*

There is potential risk of fires/explosions at the Project site. However, as outlined in Section 14.3, the scope of this assessment has been based on the understanding that the Project operates in line with current best practice. Furthermore, in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, the Project is and will continue to be subject to a fire safety risk assessment which will assist in the identification of major risks of fire on site.

Therefore, the risk of fires/explosions occurring at the Project, resulting in a major accident and/or disaster was given a risk score of 4 on a very precautionary basis. This indicates a scenario that is very unlikely to occur and having limited consequences should it do so, representing a low-risk scenario during either the continuation of the operational or decommissioning phase.

14.5.2 Mitigation Measures

As outlined in Section 14.5.1 Likely Significant Effects, the scenario with the highest risk score in terms of the occurrence of major accidents and/or disasters was identified as 'Contamination' of the Project site and risk of 'Industrial Accidents – Fire/Gas Explosions' during the continuation of the operation or decommissioning phases.

The Project was designed and built in line with the best practice measures as set out in its original planning application and Environmental Impact Statement (EIS), and as such mitigation against the risk of major accidents and/or disasters was embedded through the design.

14.5.2.1 Mitigation – Contamination During Decommissioning

Potential effects associated with contamination during decommissioning are addressed fully in Chapter 8 Hydrology and Hydrogeology. The mitigation measures outlined in Chapter 8 to protect environmental receptors as well as the procedures and measures described in the Decommissioning Plan (Appendix 4-4) to protect environmental receptors will ensure that the risk from these sources is low.

14.5.2.2 Mitigation – Fire/Explosions During Operation

The Project will continue to be 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.

14.5.3 Residual Effects

The risk of a major accident and/or disaster during the continuation of the operation or decommissioning phases of the Project is considered low, in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010). It is considered that when the mitigation and monitoring measures outlined in the EIAR and Decommissioning Plan are implemented and adhered to, there will not be significant residual effect(s) associated with the continuation of the operational and decommissioning phases of the Project. Therefore, the overall vulnerability of the Project to risks of major accidents and natural disasters is considered low.

14.5.4 Assessment of Cumulative Effects

14.5.4.1 Cumulative Impact Assessment

A search in relation to projects that may have the potential to result in a cumulative impact with the project on the environment was carried out as part of the EIAR. The Project has been considered, cumulatively with the projects set out in Chapter 2, Section 2.9 of the EIAR.

Following a detailed assessment of the potential for any further impacts when considered cumulatively with any or all of the projects, the Project, with mitigation measures in place, was found to have no potential for significant cumulative increase in the vulnerability of the Project to major accidents and/or natural disasters. This is based on the low risk associated with the Project described in this chapter of the EIAR, and a review of the surrounding land uses and projects existing or intended in the surrounding area.

15. INTERACTION OF THE FOREGOING

15.1 Introduction

The preceding Chapters 5 to 14 of this Environmental Impact Assessment Report (EIAR) identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (including Birds), Land, Soils and Geology, Hydrology and Hydrogeology (Water), Air and Climate, Noise and Vibration, Archaeology and Cultural Heritage, Landscape and Visual, and Material Assets (including Traffic and Transport, Telecommunications and Aviation) as a result of the Project as described in Chapter 4 of this EIAR. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or improve them or have a neutral effect.

A matrix is presented in Table 15-1 below to identify potential interactions of impacts between the various aspects of the environment already assessed in this EIAR. The matrix highlights the potential for the occurrence of positive, neutral or negative effects during the Operational phase (O) and the Decommissioning phase (D) of the Project. It is not proposed to decommission the Underground Grid Connection as part of the Project.

As the Project does not include any new construction works, related construction phase effects are not included. It is considered that the potential effects during the decommissioning phase will be similar to typical wind farm construction phase effects, but of a lesser magnitude which has been assessed within their respective chapters, and these have been included in the interaction's matrix below. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

The potential for interaction of impacts has been assessed throughout this EIAR, as part of the impact assessment process. While the work on all parts of the EIAR was not carried out by MKO, the entire project and all the work of all sub-consultants was managed and coordinated by the company, with the exception of Blackstaff Ecology, who were managed directly by the Applicant. This EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and impacts that potentially interact have been assessed in detail in the individual chapters of the EIAR above and summarised in Section 15.2 below.

Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR and highlighted in Section 15.2 below.

15.1.1 Statement of Authority

This chapter of the EIAR was completed by Ciarán Fitzgerald and reviewed by Robert Kennedy, both of MKO. Ciarán Fitzgerald is a Graduate Environmental Scientist who has been working with MKO since June 2024. Ciarán holds a B.Sc. (Honours) in Marine Science from the National University of Ireland Galway and a First-Class Honours PG. Dip in Geographic Information Systems from University College Cork. Ciarán works as part of the Environmental renewables team, as well as a larger multidisciplinary team. Ciarán's role involves undertaking tasks such as EIAR chapter writing and QGIS mapping. Prior to joining MKO Ciarán spent time aboard the Research Vessel "Celtic Explorer" working as part of a team analysing chemical water data, Pelagic species abundance and sorting, bathymetric GIS mapping, data collection and report writing. Ciarán's key strengths lie in GIS mapping and communication. Since joining the company Ciarán has been involved in in a range of wind farm projects, reviewing EIAR chapters and assisting with project development.

Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, policy analysis, and research. Since joining MKO, Robert has gained experience in working with and coordinating large multi-disciplinary teams that are involved in the production of EIA Reports for large-scale renewable energy developments. Robert has experience in working on both onshore and offshore wind farm projects.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

Table 155-1 Interaction Matrix: Potential for Interacting Impacts

EIAR Chapter Title	Phase	Population & Human Health	Biodiversity (Including Birds)	Land, Soils & Geology	Water	Air & Climate	Noise & Vibration	Landscape & Visual	Cultural Heritage	Material Assets
Population & Human Health	O									
	D									
Biodiversity	O									
	D									
Land, Soils & Geology	O									
	D									
Water	O									
	D									
Air & Climate	O									
	D									
Noise & Vibration	O									
	D									
Landscape & Visual	O									
	D									
Cultural Heritage	O									
	D									
Material Assets	O									
	D									

Notes: **O** = Operational Phase **D** = Decommissioning Phase

No Interacting Effect:

Neutral Effect:

Positive Effect:

Negative Effect:

15.2 Impact Interactions

15.2.1 Population and Human Health

Population and Human Health, Land, Soils and Geology, and Air and Climate

The potential for excavation and movement of soils during the decommissioning phase of the Project may lead to generation of dust emissions which, consequently, have the potential to have a **Temporary, Imperceptible, Negative Effect** on local air quality and human health. Mitigation measures to reduce dust emissions generated during the decommissioning phase of the Project are presented in the Decommissioning Plan as outlined in Appendix 4-4 and Chapter 9: Air and Climate.

Population and Human Health, and Hydrology and Hydrogeology

As described in Chapter 8: Hydrology and Hydrogeology of this EIAR, the operational phase of the Project does not involve any alterations to the site drainage or otherwise and will not give rise to significant impacts to the water environment.

The future decommissioning phase of the Project, in 2035, has the potential to give rise to some limited water pollution as a result of likely on-site activities (earthworks, use of hydrocarbons for plant and machinery), and any water pollution could have a potential significant negative effect on the health of other users of that water within the same catchment. Mitigation measures are presented in Chapter 8 to minimise the potential of any such issues occurring.

No Significant Effects on the hydrological and hydrogeological environment are envisaged during the decommissioning stage of the Project.

Population and Human Health, Air and Climate, and Noise & Vibration

As identified in Chapter 5: Population and Human Health of this EIAR, the operational phase has the potential to create long-term, imperceptible residual effects related to health and safety during the operational life of the Project. Mitigation measures to remove any potential health and safety impacts from the wind farm operation are provided in Chapter 5 of this EIAR.

During the operational and decommissioning phases, the Project has the potential to generate noise but as identified in Chapter 10: Noise, the potential effects on population and human health are not significant. Mitigation measures and best practices to be adopted concerning noise are presented in Chapter 10.

During the operational phase, the energy generated by the Project will offset energy and the associated emissions of greenhouse gases (GHGs) from electricity-generating stations dependent on fossil fuels, thereby having a positive effect on air quality and climate (i.e. slowing the rate of global warming). In doing so, the Project will have a **Medium-Term Slight Positive Effect** on human health by reducing the dependence on fossil fuels and harmful greenhouse gasses when compared to the 'do-nothing' scenario (i.e. decommissioning of the existing Ballywater Wind Farm and Ballywater 110kV Substation in 2025).

Population and Human Health, and Landscape and Visual

No significant changes to the wind turbines have been carried out since the wind farm was commissioned or are proposed as part of the lifetime extension application.

The existing Ballywater Wind Farm and Ballywater 110kV Substation has been in operation for approximately 19 years and therefore form part of the existing landscape setting. The existing wind farm and substation will remain aligned with the future landscape and visual designations and policies guiding the development of Co. Wexford. Overall, the Project is deemed to have **Medium-Term 'Slight'** landscape effects. The scale, siting and design of the turbines is considered appropriate, as the turbines do not detract from the scenic amenity views and are readily absorbed into the surrounding landscape. The landscape and visual impact assessment of the Project, included in Chapter 12 of this EIAR, where Photographic visualisations were used to assess the visual effects arising as a result of the Proposed Development from 6 No. viewpoint locations. The significance of the residual visual effect was not considered to be "Profound" or "Very Significant" at any of the 6 viewpoint locations. Receptors around Viewpoint (VP) 4 are deemed to have **'Significant' Medium-Term** residual visual effects on account of a number of residential receptors having views of the existing Ballywater Wind Farm in separate directions. Receptors represented by VPs 2, 3 and 6 are deemed to have **'Moderate' Medium-Term** residual visual effects as a result of the Proposed Development. These viewpoints are located on roads that provide access to more scenic amenities, and where some residential receptors have limited visibility of the existing Ballywater Wind Farm due to mature boundary vegetation. Receptors at VP5 are deemed to have **'Sight' Medium-Term** residual visual effects as a result of the Proposed Development, as the existing Ballywater Wind Farm has limited impact on their visual amenity. Viewpoint 1 represents views from the scenic amenity of Cahore Point, where it was found that the existing Ballywater Wind Farm has limited effects on its scenic sensitivities, resulting in **'Slight' Medium-Term** residual visual effects.

Population and Human Health, and Material Assets

Chapter 13: Material Assets of this EIAR discusses how the operational and decommissioning phases of the Project will impact traffic volumes. The operational phase will have **Medium-Term, Imperceptible, Neutral** effect on traffic and transportation and will not give rise to any significant effects upon the local road network or road users.

The decommissioning phase of the Project will likely result in a residual impact to other road users that is **Short-Term, Slight, Negative** in effect. As noted in Section 4.7 of Chapter 4: Description of the Project, reinstatement proposals for a wind farm are typically made far in advance, so within the proposed 10-year extension of operation of the site, technological advances and preferred approaches to reinstatement are likely to change. Therefore, in order to prevent limiting options too far in advance of actual decommissioning, the final decommissioning plan will be agreed with the Local Authority at least three months prior to decommissioning of the Project.

15.2.2 Biodiversity (including Birds)

Biodiversity, and Land, Soils and Geology

No excavations, groundworks or other disturbance to land or soils is included as part of the operational phase of the Project. Therefore, no disturbance to flora or fauna related to land, soils or geology is likely during the proposed continued operation of the existing wind farm and substation.

The decommissioning phase of the Project may involve limited excavations and groundworks around the turbines, in order to return the site to beneficial use as agricultural land. Chapter 6: Biodiversity (including Birds) provides a full assessment of the likely effects and impacts upon habitats including designated sites, bats and other mammals and concludes that the Project is unlikely to give rise to significant effects on the ecological receptors.

Biodiversity and Water

The decommissioning phase of the Project may cause potential habitat degradation due to sediment loss and/ or hydrocarbon loss to waterbodies which is associated with increased vehicle use on site and increased traffic congestion. The implementation of mitigation measures to ensure there are no significant negative effects on water are outlined in Chapters 4, 6, and 8.

The limited site maintenance activities that will take place during the operational phase do not include any changes to the existing site drainage. With implementation of the mitigation measures outlined in Chapters 6 and Chapter 8 of this EIAR, no impacts to birds from the water environment are envisaged during the operational phase.

Site activities during the future decommissioning phase have the potential to give rise to some water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use waterbodies within the same catchment. Mitigation measures (as per Chapter 6) if implemented will ensure there are no significant effects on birds or their habitat. Further measures would also be included in a decommissioning plan to be agreed with the local authority in advance of works.

Biodiversity, and Air and Climate

During the operational phase, the Project will help offset carbon emissions from fossil fuel-based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and a reduction in air pollution. Consequently, this is likely, in combination with other renewable energy projects, to have a **Medium-Term Slight Positive Effect** on flora and fauna.

Any potential air quality impacts and consequential effects likely to occur during the decommissioning phase are lower than those which would occur under the Do-Nothing alternative outlined in Chapter 9 Air and Climate (2025 Decommissioning Date). There would be exhaust emissions from construction plant and vehicles, and potential dust emissions due to the movement of the same associated with the decommissioning of the wind farm and substation. Mitigation measures will be implemented which is further outlined in Chapter 9. Air and Climate. With the Implementation of Mitigation **No Significant Effects** are envisaged.

During the decommissioning phase of the Project, increased vehicular and dust emissions within and around the site have the potential to be a nuisance for birds, thereby having a **Temporary, Slight, Negative Effect**. The mitigation measures outlined in Chapter 6 of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

Biodiversity, and Noise and Vibration

No potential impacts upon biodiversity from noise and vibration arising during the operational phase of the Project were identified in Chapter 6 of the EIAR.

Site activity during the decommissioning phase could give rise to noise that could be a nuisance for biodiversity (including birds), thereby having a **Temporary, Slight, Negative Effect**. Best practice mitigation measures are included in Chapter 6 and Chapter 10 to minimise the potential negative effect of noise generated during the decommissioning phase on biodiversity.

Biodiversity, and Landscape & Visual

No significant impacts are likely upon vegetation within the Proposed Development footprint and surrounding area during the operational phase of the Project. As the existing wind farm and substation have been in operation since 2005, they have now considered to have become part of the normal landscape of the wider area. No significant visual effects are likely during the operational phase.

Concrete foundations will not be removed from the ground as it is considered to be the least preferred option in terms of having potential effects on the environment. Therefore, the turbine foundations will be backfilled, covered with soil material and re-seeded resulting in a more environmentally prudent option.

15.2.3 Land, Soils and Geology

Land, Soils and Geology, and Water

The operational phase of the Project will not include any groundworks (e.g. excavations) or other activities likely to result in ground disturbance or pollution, which may give rise to impacts upon the water environment. Chapter 7 of the EIAR concluded that no significant effects to the subsurface environment will occur during the extension of the operational phase.

As identified in Chapter 7: Land Soils & Geology and Chapter 8: Hydrology and Hydrogeology of this EIAR, groundworks including excavations and movement of spoil during the decommissioning phase has the potential to have a significant, negative effect on water quality through potentially silt-laden runoff from the proposed works areas. Mitigation measures to ensure there are no significant, negative effects on water quality are presented in Chapters 7 & 8.

Land, Soils and Geology, and Cultural Heritage

No disturbance to the subsurface (soils and geology) is proposed as part of the extended operational phase of the Project. Chapter 11: Cultural Heritage concluded that as no groundworks will take place during the operational phase, no direct or indirect effects on archaeology, architecture and cultural heritage are identified.

There are three upstanding recorded monuments within the site which are not located in close proximity to existing wind farm infrastructure. The remaining two monuments relate to sites or features uncovered during archaeological monitoring of the construction phase of the existing wind farm.

As detailed in Section 4.7 in Chapter 4 and in the Decommissioning Plan included as Appendix 4-4, upon decommissioning of the Project, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling. It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going access and agricultural uses.

Given that minimal works will be required at the decommissioning phase, and it is proposed that the site roads be left in situ, no potential direct effects to the archaeological, architectural or cultural heritage resource are identified and no mitigation is proposed.

Land, Soils and Geology, and Landscape and Visual

There are no likely significant effects upon lands, soils and geology during the operational phase that could result in associated landscape and visual impacts.

Localised groundworks and excavations that may occur during the decommissioning phase are largely concerned with restoration of the site and therefore likely to have a positive impact on the local landscape. The visual effect of this change is expected to be **Positive, Long-Term, Localised in Nature And Slight.**

15.2.4 Air and Climate

Air and Climate, and Material Assets

Chapter 13: Material Assets of the EIAR assesses the traffic effects of the Project during the operational phase and found that typically, no more than two trips per day to the site are made by car or light goods vehicle. As per Chapter 9: Air and Climate of the EIAR, there will be no significant direct or indirect effects to air quality associated with the continued operation of the existing Ballywater Wind Farm and Ballywater 110kV Substation.

During the decommissioning phase, the movement of construction vehicles (e.g. cranes and heavy plant) both within, and to and from the site, has the potential to give rise to dust and exhaust emissions. This is assessed further in Chapters 9 and 13 of this EIAR, and mitigation measures are presented to minimise any potential effects.

15.2.5 Landscape and Visual

Landscape and Visual, and Cultural Heritage

As described in Chapter 11: Cultural Heritage of this EIAR, as the Project is an extension of the operational lifetime of the existing Ballywater Wind Farm and Ballywater 110kV Substation, will not change the landscape setting of recorded sites and monuments, either within the site bounds or in the wider area. It is considered that no direct effects would occur at the operational phase. It is concluded in Chapter 11 that no built heritage structures will be impacted either directly or indirectly by the Project, since nothing additional to the existing baseline environment is being proposed as part of the continued operation of the Project.

During the decommissioning phase a number of mitigation measures will likely be required such as buffer / exclusion zones and fencing, to ensure that large turbine / crane components do not encroach on existing historic sites present. As mentioned previously, a decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Project. No significant landscape or visual effects are likely to occur should the wind turbines and associated infrastructure be removed.

15.2.6 Major Accidents and Natural Disasters

As described in Chapter 14 of the EIAR, major accidents or natural disasters are hazards which have the potential to affect the Project and lead to environmental effects both directly and indirectly. These include accidents during the operation and decommissioning of the Project caused by operational failure and/or natural hazards. The assessment of the potential for significant accidents or disasters is conducted in connection with the information that must be included in the EIAR. This includes aspects such as population and human health, biodiversity, land and soil, hydrology and hydrogeology, air quality, climate, material assets, cultural heritage, and landscape. The risk of a major accident and/or disaster during the construction of the Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010).

When the above mitigation is implemented, and all mitigation detailed in the EIAR is implemented, the residual effect(s) associated with the construction, operation and decommissioning of the Project are not significant.

15.3 Mitigation and Residual Impacts

Where any potential interactive negative effects have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5-14) of the EIAR. These are also outlined in full in Chapter 16: Schedule of Mitigation Measures. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual impacts and the significance of effects, is also presented in each relevant chapter.

16. SCHEDULE OF MITIGATION

16.1 Introduction

All mitigation and monitoring measures relating to the operational and decommissioning phases of the Project are set out in the relevant chapters of the EIAR. In addition, all mitigation and monitoring measures that will be implemented during the operational and decommissioning phases of the Project are outlined in Table 16-1and Table 16-2 below. The mitigation measures can be grouped together according to their environmental field/topic under the following headings:

- Operational Phase
- Decommissioning Phase

There are no construction activities, groundworks or alterations to the existing wind farm, substation or grid connection proposed as part of the Project (i.e. there is no construction phase), therefore no construction phase mitigation and monitoring measures are proposed in this EIAR.

By presenting the mitigation and monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational and decommissioning phases of the Project. The proposal for environmental management framework to be adhered to during the extended operational phase are set out in the Operational and Environmental Management Plan (OEMP) which is included as Appendix 4-3 of this EIAR. The tabular format in which the below information is presented can be further expanded upon during the operation and decommissioning phases to provide a reporting template for site compliance audits.

16.2 EIAR Mitigation Measures

Table 16-1 Schedule of Mitigation, Proposed Lifetime Extension of Ballywater Wind Farm

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		Operational Phase		

MM1	EIAR Chapter 5	Regarding Health and Safety during the operational phase:
		› Mitigation measures that are currently in place will continue during the extended operation of the Proposed Development to ensure that the risks posed to staff, landowners and the general public will remain negligible throughout the extended operational life of the wind farm.
		› Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits.
		› Signs have been erected at suitable locations across the site as required for the ease and safety of operating the various components of the Project. 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 Overhead 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.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		Other operational health and safety measures which are currently in operation at the site include: › All site visitors must complete a site-specific health and safety induction prior to entering the site › Visitors must log onto the site on entry and log the site on exit by contacting a 24-hourly monitored control room › Minimum site Personal Protective Equipment (PPE) is necessary in order to enter the site, including a hard hat, safety boots and hi-visibility clothing › Along the Underground Grid Connection, on the public roadway, underground marker posts are present During the operation of the wind farm regular maintenance of the turbines is carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan has been developed for these works in accordance with the site's health and safety requirements.		
MM2	EIAR Chapter 5	Regarding Residential Amenity during the operational phase: All mitigation as outlined under noise and vibration, visual amenity and shadow flicker in the EIAR, will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Existing Ballywater Wind Farm and Ballywater 110kV Substation Where daily or annual shadow flicker exceedances are predicted at any inhabitable or 3rd party dwelling of the identified 24 no. sensitive properties, a site visit will be undertaken firstly to determine the presence of existing screening and window orientation at each potentially affected property. This will determine if the receptor has an actual line of sight to any turbine and actual potential for shadow flicker to occur. Once this exercise is		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		completed and all of the potentially affected properties identified, the following measures will be employed: **Screening Measures** In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including: › Installation of appropriate window blinds in the affected rooms of the residence; › Planting of screening vegetation; › Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation. If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator. **Wind Turbine Control Measures** If it is not possible to mitigate any identified shadow flicker limit exceedance locally using the measures detailed above, wind turbine control measures will be implemented. Wind turbines can be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm. The shadow flicker control units will be added to any required turbines. A shadow flicker control unit allows a wind turbine to be programmed and controlled using the wind farm's Supervisory Control and Data Acquisition (SCADA) system to change a		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		particular turbine's operating mode during certain conditions or times, or even turn the turbine off if necessary. In order to ensure that the model and SCADA system is accurate and working well a site visit will be carried out to verify the system. The shadow flicker prediction data will be used to select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered to. 1. *Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e. blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still etc.).* 2. *Recording the house number, time and duration of site visit and the observation point GPS coordinates.* 3. *Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation.* 4. *In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded.* 5. *The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working.* 6. *Following 12 months of full operation of the Proposed Project a report can be prepared for the Local Authority describing the shadow flicker mitigation measures used at the wind farm and confirming the implementation and successful operation of the system.* Where a shadow flicker mitigation strategy is to be implemented, it is likely that the control mechanisms would only have to be applied to a turbine to bring the duration of shadow flicker down to the 28-minute post-mitigation shadow flicker target.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
MM3	EIAR Chapter 6, Appendix 6-5	Regarding Biodiversity Mitigation Measures during the operational phase, the following mitigation measures are proposed: **Mitigation for Birds** With regard to birds, management of the wind farm shall continue to maintain the current habitats that support breeding and wintering birds. › In recognition of the relatively high mortality associated with T11, 15, 16 and 24 it is proposed that these turbines will be stopped for an hour at dawn and dusk, periods of high flight activity when many birds are actively commuting from and to roost in low light conditions and when turbines are consequently likely to be least visible. **Mitigation for Bats** With regard to bats, a precautionary approach suggests the implementation of an adaptive monitoring and mitigation strategy (NatureScot 2021). Elements of this strategy include: › Automatic 'feathering' of idling blades will be implemented (through SCADA) to reduce rotation speed of blades to below 2 RPM while idling. Feathering blades has been shown to be effective in reducing fatality rates of bats by up to 50% and does not result in a significant loss of energy output (NatureScot 2021). › Bat activity will be monitored for 3 years (by deployment of passive detectors) after the implementation of the 'feathering' of turbine blades. › Dog-based fatality monitoring will be carried out on a monthly basis between 15 April and 15 October each year of the LTE. Annual reports will be prepared and submitted for the attention of the local authority and NPWS. › Systematic searches will be conducted within a 125m x 125m grid centred on the turbine.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		› A minimum of 5 turbines will be searched at random during each visit. › Search effort will follow NatureScot 2021 and is further detailed in Chapter 6 Biodiversity › In the event that a bat collision is recorded, curtailment will be immediately implemented at the particular turbine (15 April to 15 October annually). › Following NatureScot guidance (where 90% of all bat activity can occur on sites when temperature exceeded 11.5°C and windspeed was below 5m/s; and where bat activity was generally recorded 30 minutes after sunset and 40 minutes prior to sunrise. These conditions are largely consistent with the high seasonal activity peaks recorded at the proposed development site. Therefore, these parameters will be used at the windfarm during the LTE when designing the curtailment programme. › Searcher efficiency trials will also be be conducted alongside Scavenger Removal Rates. › The Bat Monitoring & Mitigation Strategy is designed to be iterative and should be amended as conditions or results dictate. These will be outlined in the annual monitoring reports to The Council. The proposed mitigation methodology is detailed further in Appendix 6-5: 2023 Bat Survey Report.		
MM4	EIAR Chapter 7, Appendix 6-5	Regarding Land, Soils and Geology during the operational phase, the following mitigation measures are proposed: Oil used in transformers (at each turbine and at the substation) and any storage of oils or hydrocarbons within the control building compound could potentially leak during the operational phase and impact on soils and subsoils. During maintenance and service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Wind Farm Site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		facility. Turbine transformers are located within the basement of each turbine (i.e. within the turbine hardstands), with dedicated concrete foundations. Oils for the purposes of cooling the turbine transformers are stored in bunded tanks within the turbine foundations, within a bund able to contain at least 110% of the volume stored. Any leaks would be contained within the turbine transformer units, and hydrocarbons would not be able to permeate to ground. Each transformer is also housed within bunds to prevent any unintended leaks or spillages. In addition: › All plant and machinery to be serviced before being mobilised to site; › Road-going vehicles will be refuelled off site wherever possible; › On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required Irrespective of the buffer distance and location of refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water; › Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. › Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur;		
MM5	**EIAR Chapter 8**	**Regarding Hydrology and Hydrogeology at the site, the following mitigation measures are proposed:** › **All plant and machinery to be serviced before being mobilised to site;** › **Road-going vehicles will be refuelled off site wherever possible;** › **Onsite refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required. Irrespective of the buffer distance and location of**		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water; › Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; and › Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur. These mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils, and to groundwater and surface water quality.		
MM6	EIAR Chapter 9	The following mitigation measures have been proposed during the extended operational phase of the Project, with regards to Air and Climate: › Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.		
MM7	EIAR Chapter 10	The following mitigation measures have been proposed during the extended operational phase of the Project, with regards to Noise: **Wind Turbines** An assessment of the operational wind turbine noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Section 10.3. The findings of the assessment, presented in Chapter 10 have confirmed that the predicted operational noise levels will be within the relevant best practice noise criteria curves at all locations with the exception of locations H012, H013 and H031 where potential exceedances of 0.1 dB and 0.3 dB at wind speeds of 8 m/s respectively during night-time periods, in north and northeast wind directions only.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		It is re-iterated that the predicted noise levels include an allowance for uncertainty as required by the IOA GPG, in this instance of 1 dB, which is greater than the exceedances noted in the predicted noise levels. If the Project is granted permission to continue operating, a commissioning noise survey will be carried out at these dwellings (H006, H012, H013 and H031) or at other locations with the prior agreement with the local authority. Should the exceedances predicted above be confirmed through the commissioning exercise, 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 E70-E4 turbine installed on the site in order to achieve the relevant noise criteria at all NSLs. The E70-E4 can be programmed to run in reduced modes of operation (or low noise modes) to achieve the attenuation required in the specific wind conditions (i.e. wind speed and direction). Operating the turbines in reduced noise modes is referred to as curtailment, which typically results in a corresponding reduction in energy generation capacity for the turbine(s). To demonstrate the principle of curtailment, the example is taken of location H013, where exceedances of the night-time noise criterion of 0.3 dB L_{A90} and 0.1 dB are predicted in north and northeast wind directions, respectively. The following outline curtailment strategy would apply during night-time periods at 8 m/s windspeeds: › Turbine T18 operating in at -1 dB in North wind directions; and › Turbine T19 operating in at -1 dB in North and Northeast wind directions.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		Amplitude Modulation In the event that a complaint which indicates potential amplitude modulation (AM) associated with Project, the operator will employ a qualified acoustic consultant to assess the level of AM in accordance with the methods outlined in the Institute of Acoustics IOA Noise Working Group (Wind Turbine Noise) *Amplitude Modulation Working Group Final Report: A Method for Rating Amplitude Modulation in Wind Turbine Noise* (9 August 2016) or subsequent revisions. The measurement method outlined in the IOA AMWG document, known as the 'Reference Method', will provide a robust and reliable indicator of AM and yield important information on the frequency and duration of occurrence, which can be used to evaluate different operational conditions including mitigation. These mitigation measures, if required, will consist of the implementation of operational controls for the relevant turbine type, which will include turbine curtailment under specific operational conditions. **Low-frequency Noise** In the unlikely event that a complaint which indicates potential low-frequency noise (LFN) associated with the Project, the operator will employ a qualified acoustic consultant an assessment in accordance with guidance in Appendix VI of the EPA document entitled *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4) (EPA, 2016). This guidance is based on the threshold values outlined in the Salford University document *Procedure for the assessment of low frequency noise complaints, DEFRA Contract no. NANR45 Revision 1, December 2011*. If an exceedance of the threshold values associated with the wind farm operations is confirmed, then further investigation of the LFN will be carried out. If considered necessary by that investigation, measures to mitigate LFN at noise-sensitive locations will be implemented		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		through operational controls for the relevant turbine type, which may include turbine curtailment under specific operational conditions.		
MM8	EIAR Chapter 11	No significant operational phase activities are proposed which would require further assessment. The continuation of the operational phase of the Project will not result in any further effects on setting to the Cultural Heritage resource. No significant effects have been predicted for the proposed extended operational phase in relation to Cultural Heritage, therefore no mitigation measures have been proposed.		
MM9	EIAR Chapter 12	No significant effects have been predicted for the proposed extended operational phase in relation to Landscape and Visual Impacts, therefore no additional mitigation measures have been proposed.		
MM10	EIAR Chapter 13	In relation to Material Assets, the following mitigation measures have been proposed for the extended operational phase of the Project: **Telecommunications** In the event of further scoping responses being received from the EIA consultees or from other telecommunication service providers, the comments of the consultees and any proposed mitigation measures will be considered in the continued operation of the wind farm, subject to a grant of planning permission. **Aviation** The Applicant will coordinate with the IAA directly should a grant of planning permission be issued, to ensure that the development remains in compliance with all IAA requirements including lighting requirements. Any further details will be agreed with the Department of Defence, Air Corps and the IAA. The coordinates and elevations for the existing turbines has been supplied to the IAA, as is standard practice for wind farm developments.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		Decommissioning Phase		
MM11	**EIAR Chapter 4**	**In the event that the Proposed Development is decommissioned after the 10 years extension of life, an updated Decommissioning Plan will be prepared for agreement with the local authority. This will be a comprehensive plan updated in line with decommissioning methodologies that may exist at the time.** **The Final Decommissioning Plan will therefore be agreed with the Local Authority at least three months prior to decommissioning the Proposed Development.**		
MM12	EIAR Chapter 6	Regarding Ornithology and Avian Populations, the decommissioning plan will include industry best practice measures to mitigation the impact of works on a bird, which may include the following: › No removal of woody vegetation or scrub will be carried out within the bird breeding season (March 1st to August 31st) › Vantage Point surveys will be carried out for the season before and during the decommissioning process. › All edible wastes will be stored in covered segregated containers and disposed of at licensed facilities. › All measures to mitigate the risks of contamination of watercourses as highlighted in Chapters 7 & 10 will be fully implemented. › The areas within 50m of the hard-stand and turbine foundations will be subject to a pre-works ornithology walkover to highlight any constraints that may be present (e.g. breeding or resting places of protected species). If any significant constraints are identified, appropriate controls will be developed and integrated into the live decommissioning plan ahead of the commencement of the work. › Speed limits will be enforced on internal roads.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		› A detailed traffic management plan will be incorporated into the decommissioning plan which will ensure that areas of marsh & fen are unaffected by traffic or storage of plant and materials.		
MM13	Decommissioning Plan	Regarding Biodiversity at the site, the decommissioning phase will involve the following best practice mitigation measures: › All measures to mitigate the risks of contamination of watercourses as highlighted in Chapters 7 & 10 will be fully implemented. › The areas within 50m of the hard-stand and turbine foundations will be subject to a pre-works terrestrial ecology walkover to highlight any constraints that may be present (e.g. breeding or resting places of protected species, presence of Invasive Plant Species). If any significant constraints are identified appropriate controls will be developed and integrated into the live decommissioning plan ahead of the commencement of the work. › If any Third Schedule Invasive species are present in or adjacent to the works footprint, an Invasive Species Management Plan (ISMP) will be developed, and all recommendations implemented in accordance with the contemporary best practice measures. › Speed limits will be enforced on internal roads. › A detailed traffic management plan will be incorporated into the decommissioning plan which will ensure that areas of intact blanket bog are unaffected by traffic or storage of plant and materials. › All edible wastes will be stored in covered segregated containers and disposed of at licensed facilities. › Any import of soil or fill necessary in the decommissioning process shall be from approved sources and appropriately tested or inspected to minimise the risk of import of invasive species. Only soil appropriate to the site (pH, soil type) will be used. The re-seeding or natural revegetation of reinstated areas will proceed on the advice of a suitably qualified ecologist. Any seed mix used will be on the approval of the ecologist		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
MM14	Chapter 7	The key mitigation measure during the decommissioning phase is the avoidance of sensitive aquatic areas. The River Cahore runs approximately 0.8km from the nearest turbine (T11) and flows in a southeast direction until the waterbody intersects the Ballywater Wind Farm. The Bog and Warren River is sourced approximately 0.51km from the nearest turbine (T09). The Bog and Warren River is a tributary of the River Cahore. The Cahore Canal is situated approximately 0.16km from the nearest turbine (T17) and provides drainage which redirects the Cahore River from the designated sites located along the eastern periphery of Ballywater Wind Farm. Because of this proximity to surface waters, mitigation measures were put in place during the original construction phase. No in-stream works would be required during the decommissioning phase of the existing wind farm. Small amounts of clean granular material may be imported to maintain the surfaces of access tracks and hardstanding areas. During decommissioning works, application of temporary drainage control measures (i.e. silt fencing) and protection measures with regard to oils/fuel usage will be sufficient to prevent any significant hydrological effects in the nearby SAC/SPAs. Best construction practices will be adhered to throughout the decommissioning phase of the development as indicated in Chapter 4, Section 4.7. No earthworks are proposed, no effect on groundwater is anticipated, therefore no further mitigation measures are proposed.		
MM15	EIAR Chapters 4, 5, 7, 8,	Regarding dust, noise and vibration during decommissioning of subsurface infrastructure: › It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. On removal of turbines, the covering of the foundation will be completed using locally sourced material (e.g. topsoil) where possible. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove large volumes of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		Use of an appropriate native seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction is recommended.		
MM16	EIAR Chapters 7, 8, 14	In order to limit impacts upon Soils and the Water Environment from potential leaks and spillages of hydrocarbons during the decommissioning works, the following measures are proposed: › All plant and machinery to be serviced before being mobilised to site; › No plant maintenance completed on-site, any broken-down plant removed from site to be fixed; › Refuelling completed in a controlled manner using drip trays at all times; › Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water; › Only designated trained operators authorised to refuel plant on-site; › Procedures and contingency plans set up to deal with emergency accidents or spills; and, › Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works		
MM17	EIAR Chapter 9	Regarding Air Quality during the decommissioning phase: › All construction vehicles and plant used onsite during the decommissioning phase will be maintained in good operational order. If a vehicle requires repairs this work will be caried out, thereby minimising any emissions that arise. › Turbines components will be transported from the Site on specified routes only, as agreed with the Planning Authority prior to decommissioning. › All machinery will be switched off when not in use.		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		› Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum. › The Materials Recovery Facility (MRF) facility will be as close as possible to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. › All plant and materials vehicles shall be stored in dedicated areas within the Wind Farm Site. › The roads adjacent to the site entrances will be checked weekly for damage/potholes and repaired as necessary.		
MM18	EIAR Chapter 10	Regarding Noise and Vibration control during the decommissioning phase: › Local residents will be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern; › Any extraordinary site work occurring outside of the core working hours (for example, crane operations lifting components off the tower) will be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the site between 19:00 and 07:00, with the exception of abnormal loads that would be scheduled to avoid anticipated periods of high traffic flows; › All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance; › Inherently quiet plant will be selected where appropriate and available - all major compressors would be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use; › Machines will be shut down between work periods (or when not in use) or throttled down to a minimum; › All equipment used on site will be regularly maintained, including maintenance related to noise emissions; and		

Ref No.	Reference Location	Mitigation Measures	Audit Result	Action Required
		› Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation.		
MM19	EIAR Chapter 11	Regarding Cultural Heritage during the decommissioning phase, there will be minimal works required and it is proposed that site roads be left in-site. No potential direct impacts to the archaeological, architectural or cultural heritage resources were identified and therefore no mitigation is required to be proposed.		
MM20	EIAR Chapter 15	Regarding Site Traffic related impacts during the decommissioning phase: › When the Proposed Development is decommissioned after the 10 years extension of life, an updated Decommissioning Plan, including material recycling / disposal and a Traffic Management Plan, developed to minimise impacts to the local road network, will be prepared at the time for agreement with the local authority. A detailed Traffic Management Plan will be prepared in consultation with the local authority prior to any future decommissioning.		

16.3 EIAR Monitoring Proposals

Table 16-2 Schedule of Monitoring, Proposed Lifetime Extension of Ballywater Wind Farm

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
	Operational Phase				
MX1	Mitigation section of Chapter 6 Biodiversity	Dog-based fatality monitoring will be carried out on a monthly basis between 15 April and 15 October each year of the LTE. Annual reports will be prepared and submitted for the attention of the local authority and NPWS.			
MX2	Section 7.1.5 of Appendix 6-6 Ballywater Wind Farm Bat Report	To continually assess the effects of the ongoing Wind Farm site activities on bat activity, at least 3 years of post-consent monitoring is proposed. Post-consent monitoring will include static detector surveys, manual activity surveys and corpse searching to record any bat fatalities resulting from collision. **Monitoring Year 1** **Bat activity surveys** Static monitoring at turbine bases and nacelle shall take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat', a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Key weather parameters and other factors that are known to influence collision risk will be monitored and will include:			

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		- Windspeed in m/s (measured at nacelle height) - Temperature (ºC) - Precipitation (mm/hr) **Carcass searches** Carcass searches, to monitor and record potential bat fatalities, will be conducted at each turbine in accordance with NIEA Guidance. This will include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality. Surveys will cover all activity seasons, and the use of a trained dog detection team will be carried out to ensure maximum efficiency. Should no bat fatalities be recorded in Year 1, curtailment in Year 2 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy. The curtailment programme for Year 2 will then be devised/altered as necessary around key activity periods and weather parameters recorded in Year 1. **Monitoring Years 2 & 3** Monitoring surveys shall continue in Year 2 and 3 and the success of the curtailment strategy will be assessed in line with the baseline data collected in the preceding year(s). The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed will be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity.			

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		At the end of each year, the efficacy of the mitigation/curtailment programme will be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy. A monitoring programme will be submitted to, and agreed with, the relevant planning authority. Any subsequent changes will be agreed with Wexford County Council.			
MX3	Chapter 10 Noise and Vibration - Section 10.5.4.1.3	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. The commissioning survey will include a review for the presence of audible tones associated with the operation of the wind turbine farm in accordance with Annex C of ISO 1996-2:2017 *Acoustics – Description, measurement and assessment of environmental noise Part 2: Determination of sound pressure levels.*			
		Decommissioning Phase			
MX4	Decommissioning Plan Section 3.11	The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.	As required	As required	Site Manager

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