FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BARNADIVANE WIND FARM & SUBSTATION, CO. CORK

VOLUME 2 – MAIN EIAR
CHAPTER 14 – AIR AND CLIMATE

Prepared for: Barna Wind Energy (BWE) and Arran Windfarm Ltd.

Date: February 2023

Core House, Pouladuff Road, Cork, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

Page

14. AIR AND CLIMATE

14.1 Introduction

This chapter identifies, describes and assesses the potential significant direct, indirect and cumulative effects on air quality and climate arising from the construction, operation and decommissioning of the Proposed Development. Where necessary the two elements of the Proposed Development have been split out and assessed separately i.e. the Proposed Wind Farm and the Proposed Substation.

The Proposed Development is located within the jurisdiction of Cork County Council, in the townlands of Lackareagh, Garranereagh and Barnadivane (Kneeves), near Teerelton, approximately 3.5km north east of Coppeen, Co. Cork.

The Proposed Development is located in a rural area. Settlements in the area are made up of one-off rural housing and farmyards generally located along the road network of the area (linear settlement pattern). The primary land-uses within and in the vicinity of the site comprise commercial forestry, sections of peat bog and agricultural lands. Due to the lack of air emissions during the operational phase of the Proposed Development and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. 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 the vicinity of the site.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power generating 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. As discussed later in this chapter there will be some minor short term or temporary indirect emissions associated with the construction of the Proposed Development including vehicular and dust emissions.

A detailed description of the Proposed Development assessed in the EIAR is contained in Chapter 2.

The key elements of the Proposed Project as described in Chapter 2 are referred to as follows throughout this chapter:

- The Proposed Wind Farm;
- The Proposed 110kV Substation;
- The alternative grid connection route (consented) (also referred to in this EIAR as the 'AGCR');
- The turbine delivery route (consented) (also referred to in this EIAR as 'the TDR');

The Proposed Development includes the wind turbines, internal access tracks, hard standings, one permanent meteorological mast, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure, one borrow pit and all associated works related to the construction of the Proposed Wind Farm and Substation.

14.1.1 Statement of Authority

This chapter of the EIAR was completed by Fehily Timoney and Company (FT). Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.90 members of staff, including engineers, scientists, planners and technical support staff. This chapter was written by Brian Cronin. Brian is a Senior Project Environmental Scientist with Fehily Timoney & Company and holds a BSc (Hons) in Environmental Science from UCC, Cork; and an MSc in Environmental Engineering from TCD, Dublin. Brian has 8 years' experience working in technical roles, with 5 years specifically in environmental consulting and 2 years specifically preparing EIAR chapters.

14.1.2 Air Quality – Overview

In order to protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants. These Directives include how we should monitor, assess and manage ambient air quality. The European Commission set down the principles to this approach in 1996 with its Air Quality Framework Directive (96/62/EC). Four "daughter" directives lay down limits for specific pollutants:

- 1st Daughter Directive (99/30/EC): Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead;
- 2nd Daughter Directive (2000/69/EC): Carbon monoxide and benzene;
- 3rd Daughter Directive (2002/69/EC): Ozone;
- 4th Daughter Directive (2001/107/EC): Polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air.

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008. It replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFE at a later stage. The limit and target values for both Directives are outlined below.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces 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 Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management) Regulations, 1999 (S.I. No. 33 of 1999). The fourth Daughter Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). Table 14.1 details the limit values for pollutants as per the CAFÉ Directive.

Table 14-1: Limit Values of CAFE Directive 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m3)	Limit Value (ppb)	Basis of Application of the Limit Value
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
SO_2	Protection of vegetation	calendar year	20	7.5	Annual mean
SO_2	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
NO_2	Protection of human health	calendar year	40	21	Annual mean
NO + NO_2	Protection of ecosystems	calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year
$PM_{2.5}$	Protection of human health	calendar year	40		Annual mean
$PM_{2.5}$ - stage 1	Protection of human health	calendar year	25		Annual mean
$PM_{2.5}$ - stage 2	Protection of human health	calendar year	20		Annual mean
Lead	Protection of human health	calendar year	0.5		Annual mean
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene	Protection of human health	calendar year	5	1.5	Annual mean

There are no statutory limits for dust deposition. However, the TA Luft (German Government 'Technical Instructions on Air Quality') state a guideline value of maximum 350 mg/m^2/day.

There are no limit values in relation to ozone. However, the Ozone Daughter Directive sets target values. These are detailed in Table 14.2 along with information threshold and alert threshold values.

Table 14-2: Target Values for Ozone

Objective	Calculation	Target Value for 2020
Protection of Human Health	Maximum daily 8-hour mean	120 µg/m^3
Protection of vegetation	AOT40*, calculated from 1-hour values from May to July	6000 µg/m^3-h
Information threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hour average	240 µg/m^3
*The sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g. for forest and crops.		

Air Quality and Health

According to the EPA (Irelands Environment 2020 – Chapter 14 – Environment, Health and Wellbeing), the number of deaths directly linked to air pollution is estimated at 1,300 premature deaths in Ireland annually due to poor air quality (predominantly due to PM2.5), with a figure of 6 to 7 million premature deaths worldwide (UN Environment, 2019)[1].

Generally, air quality in Ireland is acceptable. However, in the short term, when compared with WHO guideline values and EEA reference level values; ozone, particulate matter and PHAs are of concern and NO_2 is expected to increase as traffic on our roads increase.

The use of fossil fuel-based electricity generation leads to NOx and SOx emissions; however, wind generation does not produce any NOx or SOx emissions. An operational substation will not produce these emissions either.

14.1.3 Climate - Overview

Carbon dioxide (CO_2) is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence climate change. Once the Proposed Development is constructed there will be no resultant negative impacts on climate change. The provision of the project will have a long-term positive impact by providing a sustainable energy source as discussed in Section 14.4.2 of this chapter. Should the project not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other emissions, and hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce 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 put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C above pre-industrial levels and to limit the increase to 1.5°C. 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.

[1] EPA, 2020, cited in' Irelands Environment 2020 – Chapter 14 – Environment, Health and Wellbeing', p. 364.

The International Panel on Climate Change (IPCC) has put forward its clear assessment 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. In this regard the Government enacted the Climate Action and Low Carbon Development Act 2015 which provides for the approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a low carbon, climate resilient and environmentally sustainable economy.

Under the Kyoto Protocol and the Doha Amendment, during the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent below 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020.

In December 2018, the revised Energy Efficiency Directive, the revised Renewable Energy Directive and the new Governance Regulation were formally adopted. The new regulatory framework includes a binding renewable energy target for the EU for 2030 of 32% with an upwards revision clause by 2023. This agreement will help the EU meet the Paris Agreement goals. The commission has also indicated an intention to adopt the increased target of 55% at the EU's Nationally Determined Contribution (NDC) under the Paris Agreement by the end of 2030. As well as the target being given legislative force in the EU through the proposed EU Climate Law, it will oblige all EU institutions across all areas of competence, and the Member States, to work collectively to achieve the target of 55%[2].

The main achievements of this agreement in terms of renewable energy production are:

- Sets a new, binding renewable energy target for the EU for 2030 of 32%, including a review clause by 2023 for an upward revision of the EU level target;
- A financial framework for investors is to be established to facilitate investment in renewable energy projects;
- Increases competition and market integration of renewable electricity;
- Will reduce dependence on energy imports and increase energy security;
- Improves the design and stability of support schemes for renewables.

The June 2018 'Off Target Report' published by the Climate Action Network (CAN) Europe which ranks EU countries ambition and progress in fighting climate change listed Ireland as the second worst performing EU member state in tackling climate change. It also stated that Ireland is set to miss its 2020 climate (20% reduction in greenhouse gases) and renewable (40% increase in overall energy from renewable electricity sources) energy targets. Additionally, it was noted that Ireland is also off course for its 2030 emissions target.

In July 2021 Ireland signed the Climate Action and Low Carbon Development (Amendment) Bill into law. This supports Ireland's transition to Net Zero by 2050 with legally binding commitments and targets. Actions for each sector will be detailed in the Climate Action Plan that is to be updated annually.

The Government published and updated Climate Action Plan 2023 (CAP23) in December 2022. The CAP provides a framework for delivering the Government's target of a 51% reduction (relative to 2018) in greenhouse gas (GHG) emissions by 2030. CAP23 follows 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.

[2] https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1599

The Act provides a governance framework for annual revisions of the Climate Action Plan and the development of a National Long-Term Climate Action Strategy at least once every ten years. As part of this plan, the Government is also committed to reducing emissions by an average 7% per annum by 2030. The Action Plan is underpinned by a series of sectoral emissions reduction ambitions and enabling actions, with a selection of relevant actions that are relevant to the Proposed Wind Farm outlined below.

CAP23 sets out an objective to more than double Ireland's onshore wind energy capacity to 8 GW by 2030 in order to meet new renewable energy targets and reduce emissions.

Key actions in CAP23 which are relevant to the topics or Air Quality and Climate include:

- *The electricity system must achieve a 75% reduction in CO2, reaching 3MtCO2eq in the final year of 2026-20230 carbon budget period.*
- *Complete a revised version of Shaping our Electricity Future to define required new grid construction and reinforcements to achieve sectoral ceilings and carbon budgets.*
- *As an urgent priority, establish the investment framework and competitive market, arrangements needed to deliver zero carbon system services.*

The policies and objectives of the CAP are reflected in the *Draft National Energy & Climate Plan (NECP)* 2021-2030, which was submitted to the European Commission in December 2018.

The NECP was prepared to incorporate all planned policies and measures that were identified up to the end of 2019 and will collectively deliver a 30% reduction by 2030 in non-ETS greenhouse gas emissions (from 2005 levels). The NECP was drafted in line with the current EU effort-sharing approach, before the Government committed to its higher level of ambition, and therefore does not reflect this higher commitment. Further interactions of the NECP will reflect the current government's stronger climate governance.

14.1.3.1.1 Climate Change Performance Index

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 2022 CCPI was published in November 2021. While the 2022 CCPI indicated signs of potential reductions in global emissions, no country achieved a "very high" and therefore the first three places of the ranking system remain unoccupied.

Ireland has fallen 7 places from 39th out of 61 globally ranked countries to 46th place and remains at "low" in international performance. In addition, Ireland received a "very low" in the EU Performance category. Ireland also received a "very low" on the Greenhouse Gases Emissions Rating Table.

There is little commentary in the 2022 CCPI on Ireland's performance. However, the 2020 CCPI report states that GHG per capita emissions are at a high level and "significant challenges lie ahead in closing Ireland's emission gap, meeting the current (2030) target and aligning Ireland's emission trajectory with a net zero goal for 2050.

Therefore, the country still ranks among the bottom ten performers in this indicator." Recognising Ireland's Climate Action Plan 2019, the 2020 CCPI states:

> *"the government must go much further in implementing policies across all sectors that drive sustained emissions reductions over the next decade. Near-term ambition needs to be ratcheted up quickly by specifying deep cuts in fossil fuel and reactive nitrogen usage to put Ireland on a net zero emissions pathway aligned with the Paris temperature goals".*

14.1.4 Carbon Emissions

CO_2 emissions occur naturally in addition to being released with the burning of fossil fuels. All organic material is composed of carbon, which is released as CO_2 when the material decomposes. Organic material acts as a store of carbon. Peatland habitats are significant stores of organic carbon. The vegetation on a peat bog slowly absorbs CO_2 from the atmosphere when it is alive and converts it to organic carbon. When the vegetation dies, in the acidic waterlogged conditions of bogs and peatlands, the organic material does not decompose fully and the organic carbon is retained in the ground.

The carbon balance of Proposed Wind Farm developments in peatland habitats has attracted significant attention in recent years. When developments such as wind farms are proposed for peatland areas, there will be direct impacts and loss of peat in the area of the development footprint. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, locally, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO_2. It is essential therefore that any wind farm development in a peatland area displaces more CO_2 produced from fossil fuel sources than it releases during the construction, operation and restoration of the wind farm site.

The Proposed Project is situated in an area which has peat habitats. Isolated, albeit relatively large (up to 12 hectares), deposits of Blanket Peat can be found along the western and southern margins of the site. The site is currently used for agricultural grazing. Agricultural lands such as those found at the site have been found to have limited carbon storage value and the UK's Committee on Climate Change (2020) have advised that large proportions of agricultural land be repurposed into land use types which reduce emissions and/or sequester carbon. The Proposed Project has been sensitively situated within an upland environment of limited carbon storage habitat value.

The Scottish Carbon Calculator Tool[3] was used to calculate whole life carbon emissions and carbon savings as a result of the Proposed Wind Farm. Input data used in the calculations is presented in Appendix 14.1.

Ireland's Carbon Emissions

Ireland's greenhouse gas (GHG) emissions are tracked and projected by the EPA for submission to the EU UNFCCC annually. Carbon dioxide emissions are reported alongside methane (CH4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

For 2021, the total national greenhouse gas emissions was estimated to be 61.53 million tonnes carbon dioxide equivalent (Mt CO_{2eq}) (EPA, 2022). This is a 4.7% increase on 2020 levels.

[3] https://informatics.sepa.org.uk/CarbonCalculator/index.jsp

SEAI estimate that 33.2% of electricity generation was from renewable sources in 2018 (SEAI, 2020); Renewable Energy avoided 4.9 million tonnes of CO_2 emissions in 2018. Over 358 MW of wind generation was installed during 2018, and an additional 461MW was installed in 2019 and wind generation now accounted for 28% of the electricity generated at the time of reporting (SEAI, 2020).

The EPA's latest projections report, 'Ireland's Greenhouse Gas Emissions Projections 2021-2040' (June 2022[4]) projected Ireland's greenhouse gas emissions under two scenarios: The With Existing Measures scenario and the With Additional Measures scenario. The With Existing Measures (WEM) scenario incorporates the anticipated impact of policies and measures that were in place (and legislatively provided for) by the end of 2020. The With Additional Measures (WAM) scenario is primarily based on SEAI's Advanced energy projection (which includes existing and planned policies and measures) and anticipated progress in the implementation of Government renewable and energy efficiency policies and measures including those set out in the Climate Action Plan 2021. Plate 14.1 illustrates the WEM and WAM projected emissions in relation to Energy Industries.

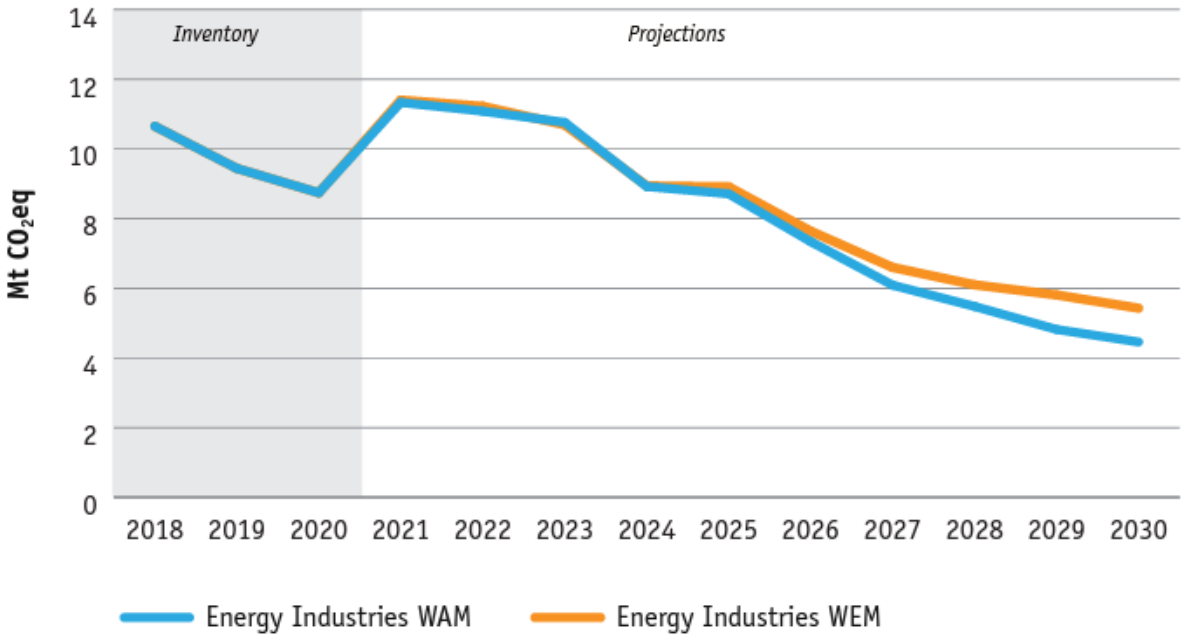

Plate 14-1: Greenhouse Gas Emissions Projections from the Energy Industries Sector under the WEM and WAM scenarios out to 2030

Ireland's 2020 target was to achieve a 20% reduction of non-Emission Trading Scheme (non-ETS) sector emissions i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020. Ireland exceeded the binding targets in 2014-2016.

A new Effort Sharing Regulation setting out 2030 targets for EU Member States has recently been adopted by the European Council. Irelands 2030 target is a 30% reduction of emissions compared to 2005 levels by 2030 with binding annual limits over the 2021-2030 period to meet that target.

[4] EPA 'Ireland's Greenhouse Gas Emissions Projections' 2021-2040.

Over the longer-term, Ireland's National Policy Position on Climate change has set a target of an aggregate reduction in carbon dioxide (CO_2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors.

According to '*Ireland's Greenhouse Gas Emissions Projections 2019-2040*' (EPA, 2020), Ireland is projected to save 79 Mt CO_2 equivalent over the period 2021-2030 with the implementation of the 'With Additional Measures' scenario when compared to the With Existing Measures scenario. This represents an average annual reduction of 2.9% over that period.

On 14th May 2018, the European Council adopted a regulation on greenhouse gas emission reductions. The regulation sets out binding emission reduction targets for Member States in sectors falling outside the scope of the EU emissions trading system for the period 2021- 2030. In the National Energy and Climate Plan 2020, the results of the government projections show that, Ireland will exceed the carbon budget over the period 2021 – 2030 by approximately 32 Mt CO_2 equivalent with full use of the ETS and LULUCF flexibilities (DoECC, 2020).

14.2 Methodology

As mentioned in section 14.1.3, operational wind farms do not give rise to emissions, with respect to air and climate. A properly-functioning substation will not give rise to emissions during its operational phase. The Proposed Substation will be of air-insulated switchgear (AIS) design, which will not give rise to emissions with respect to air and climate during the operational phase.

The Proposed 110kV Substation will be of AIS, the operational phase of the wind farm and the substation (the operational phase of the Proposed Development) will not give rise to emissions with respect to air and climate. Therefore, this chapter focuses on the potential emissions which may arise during the construction and decommissioning phases of the Proposed Development. Where possible, the potential impacts associated with the Proposed Wind Farm are separated from the potential impacts associated with the Proposed Substation. This will enable each element to be assessed separately should there be a requirement to grant consent for one element but not the other.

The Scottish Windfarm Carbon Assessment Tool was also used to predict the carbon savings for the Proposed Wind Farm for an operational period of 25 years and includes all activities and associated potential impacts during the construction, operation and decommissioning phase.

14.2.1 Air Quality

A review of existing air quality monitoring data undertaken by the Environmental Protection Agency (EPA) was reviewed and used to characterise the existing environment.

The impact assessment methodology involved the review and assessment of the construction methods for the Proposed Development to identify the potential for air emissions during construction and decommissioning.

To assess the impacts of construction dust emissions, the Institute of Air Quality Management (IAQM) guidance document: '*Guidance on the Assessment of Dust from Demolition and Construction*'[5] was used, as is recommended in Transport Infrastructure Ireland's (TII) Air Quality Assessment of the NRA's *Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation In Place*[6] was used. This approach involves a number of "steps" to assess the potential impact of dust on nearby receptors.

The steps involved in the dust impact assessment, as prescribed by the IAQM, are as follows:

1. Screen the requirement for a dust impact assessment
2. Assess the risk of dust impacts by:
   - 2A The scale and nature of the works – the "magnitude" of the potential dust emission
   - 2B The sensitivity of the surrounding area
   - 2C Combining 2A and 2B into a risk matrix to assess the risk of dust impacts
3. Identify site-specific mitigation measures
4. Examine the residual impacts and whether or not these are significant
5. Prepare a Dust Assessment Report

Step 1, the screening process, has been set out by the IAQM to be deliberately conservative. One of the threshold criteria which will trigger the requirement for a dust impact assessment, for example, is that a human receptor exists within 350 m of the site boundary. As this is the case for The Proposed Development, the screening process indicates that a dust impact assessment is required.

Step 2 of the process will be carried out in the Impact Assessment section of this chapter (section 14.4.2). Step 3 will be carried out in the Mitigation Measures section of this chapter (14.5.1). Step 4 will be covered by the Residual Impacts section (14.6.1) and step 5 will therefore be addressed by writing the process and results of the dust impact assessment into this chapter.

Table 14-5 details the descriptors for changes in annual mean nitrogen dioxide, PM10 and PM2.5 at receptors.

14.2.2 Climate

A desk-top study assessment was undertaken of available climatic information to characterise the existing environment. In terms of climatic impact, the appraisal considered the net impact that operating the Proposed Wind Farm will have in terms of CO_2 and its displacement of CO_2 from other energy sources over the carbon losses caused by its manufacturing, transportation, construction and decommissioning using the Scottish Carbon Calculator tool.

In addition to the CO_2 factored for emissions purposes, greenhouse gas (GHG) emissions are also factored into the overall carbon calculation. GHG are associated with the manufacture, transport, construction, operation (linked to backup generation) and decommissioning of wind turbines.

[5] http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf
[6] https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf

The impact assessment considered the positive impacts the Proposed Wind Farm will have on contributing to national targets for the reduction of greenhouse gas emissions. The results are described below and in summary the Proposed Project will result in the production of energy from a renewable source which, once fed into the National Grid, has the potential to avoid several thousand tonnes of carbon dioxide (CO_2) annually that would have been released had the energy been generated by the average Irish power generation mix.

Figures from the Sustainable Energy Authority of Ireland (SEAI, 2020) indicate that the net CO_2 displacement intensity by wind generation was 577 kilo tonnes of CO_2 in 2005, and this increased to 3.1 million tonnes CO_2 in 2018. It was estimated that in 2019, approximately €297 million in fossil fuel imports were avoided due to renewable electricity generation.

The Intergovernmental Panel on Climate Change (IPCC) in 'Renewable Energy Sources and Climate Change Mitigation' (2014) state that 50 estimates from 20 studies indicate that emissions "are small compared to the energy generated and emissions avoided over the lifetime of wind power plants [farms]: the GHG [greenhouse gas] emissions intensity of wind energy is estimated to range from 8 to 20g CO_2/kWh in most instances". The IPCC (2010) report that the energy payback time, based on lifecycle assessment procedures, per turbine vary between 0.25 years and 0.65 years for onshore developments. A more recent study in 2019 by Dammeier, Loriaux, Steinmann, Smits, Wijnant, van den Hurk and Huijbregts found the greenhouse gas payback time of wind turbine in Northwestern Europe was between 1.8 and 22.5 months with an average of 5.3 months.

The amount of CO_2 that could potentially be avoided on an annual basis due to the Proposed Wind Farm is estimated based on the expected output of the Proposed Wind Farm. The net displacement value may increase or decrease somewhat, as the generation mix in Ireland develops, under different fuel price scenarios and as demand changes over time, and as more storage, interconnection and demand side management (smart meters) come online. Refer to Section 14.4.4 for details of the calculations for carbon saving as a result of the Proposed Wind Farm.

Monthly meteorological data from Met Eireann was reviewed to gain an understanding of the existing climatic condition of the site. The Scottish National Heritage carbon calculator which accounts for all stages of the project, was used to determine the long term effect of the project on climate. The impact assessment also involved a review of construction methodology for the construction, operational and decommissioning phases to determine impacts on both the micro and macro climates of the site.

14.2.3 Carbon Calculation

14.2.3.1 Proposed Wind Farm

Previously, guidance produced by Scottish Natural Heritage in 2003 had been widely employed to determine carbon payback in the absence of any more detailed methods. Concerns were raised about the methods of calculating carbon savings for large scale wind farms being developed in Scotland as many of the developments were located on peatlands and forestry which can contain large carbon stocks and which are poorly protected. The methodology for calculating carbon losses was created in 2008 by scientists at the University of Aberdeen and the Macauley Institute with support from the Rural and Environment Research and Analysis Directorate of the Scottish Government, Science Policy and Co-ordination Division. The document, 'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands', was developed to calculate the impact of wind farm developments on the soil carbon stocks held in peat. This methodology was refined and updated in 2011 based on feedback from users of the initial methodology and further research in the area. The web-based version of the carbon calculator, which supersedes the excel based versions of the tool, was released in 2016. The tool provides a straightforward method for estimating the impacts of wind farms on the carbon dynamics of peatlands. The tool also provides guidance when figure inputs are unknown.

The carbon calculator, whilst designed for Scottish wind farm developments is used for assessing Irish wind farm developments due to the similarity in development sites, i.e. high ground on peatlands which contain forestry in a similar climate.

The calculator was created to calculate the loss of carbon from acidic bog or fen habitat and defines peat soils as soils with a surface horizon of peat greater than 50cm deep.

The calculator takes into account the carbon fixing potential from peatland plants (which is small) and calculates the total area of peat excavation and the total area of peat affected by drainage, using the annual gains due to carbon fixing potential and the time required for any habitat restoration. Carbon stored within the peat itself represents a large potential source of carbon which can be lost during excavation and drainage. Carbon losses as a result of vegetation clearance are calculated from the area to be cleared, the average carbon sequestered annually, and the lifetime of the wind farm. The calculator also takes into account the carbon emissions from the life cycle analysis of the wind turbines and the backup source in order to calculate carbon savings and carbon payback times of a wind farm. A capacity factor is also required to provide a realistic payback time for a site. The capacity factor is a factor applied to the rated output of a wind turbine to give a more accurate indication of the amount of power a turbine will generate. It takes into account the intermittent nature of wind and for this project it is taken a 35% or 0.35.

In keeping with guidance, specific figures have been inputted wherever possible and where this information was not available the guidance provided by the calculator was used. The assumption to use the fossil fuel generation emission factor was made based on the reality that additional wind generation will displace fossil fuel generation (Scot. Gov., 2018).

With regard to the windfarm characteristics the following presumptions for the Proposed Wind Farm were made: the lifetime of the windfarm is 25 years and the MEC is 24MW, the capacity factor is 35%. With regards to the characteristics of the 'peatland', the recent site walkover (October 2022) indicated that peat was not present at any of the proposed infrastructure locations across the site. Therefore, the assumption is that there will be no impacts on carbon-storing peat. Vegetation clearance may be required if the underground tail fed AGCR is developed. However, the preferred option of the on-site substation and loop-in to the overhead line would not require any significant vegetation clearance other than occasional trees or hedges which require removal in widening the access tracks at the site. Therefore no measurable impacts on carbon-storing forestry would occur.

The Scottish Government on-line carbon calculator as outlined above, was used to assess the impacts of the Proposed Wind Farm in terms of potential carbon losses and savings taking into account the whole life of the wind farm development including materials manufacture, transport and installation and all construction activities including peat removal, drainage, and vegetation clearance. A copy of the outputs is provided as Appendix 14.1 of this EIAR. A summary of the main CO_2 losses due to the Proposed Wind Farm project are summarised in Table 14.12.

14.2.3.2 Proposed Substation

While the Scottish Carbon Calculator has been utilised to estimate the amount of carbon emissions offset by the development of the Proposed Wind Farm, the calculator does not allow for the construction of a substation. No calculator could be identified to run a similar calculation for the Proposed Substation.

However, it can be assumed that emissions will be mostly "embodied carbon" associated with the manufacture of the steel components of the substation, as well as the embodied carbon associated with sourcing and transporting the stone and concrete aggregates for the construction of the substation. Emissions due to this embodied carbon associated with the substation would be low, relative to the embodied carbon associated with the aggregates required for the Proposed Wind Farm.

The Proposed Substation in and of itself would not offset carbon emissions. However, it would constitute necessary infrastructure to enable the offset of carbon emissions by way of connecting renewable energy projects to the national grid.

14.3 Existing Environment

14.3.1 Air Quality

European air quality legislation requires that each member state be defined in terms of Zones and Agglomerations for air quality, with Ireland divided into four zones. The EPA has designated four zones within Ireland[7]:

- Zone A: Dublin City and its environs
- Zone B: Cork City and its environs
- Zone C: 24 cities and towns (such as Galway, Limerick and Waterford cities and towns such as Naas, Newbridge, Celbridge, Leixlip) with a population of greater than 15,000
- Zone D covers the remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The Proposed Wind Farm and all infrastructure associated with either connection option (the substation or the AGCR) are located in Zone D. The point of arrival for the wind farm plant is likely to be Cork Harbour (Zone B). , The other parts of the TDR are contained within Zone D.

The air quality in each zone is monitored by the EPA and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. The number of monitoring locations required is dependent on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold. The Air Quality In Ireland Report 2021 (EPA 2022) noted that Ireland's overall air quality was good, however there are localised issues across the country impacting negatively on the air quality. The report showed that: particulate matter $PM_{2.5,}$ originating primarily from the domestic burning of solid fuels, and $NO_{2,}$ primarily an emission from road transport; are the main threats to good air quality in Ireland. Ireland is also above the WHO guidelines for $PM_{2.5}$ at 65 monitoring stations in 2021 and the EEA reference level for PAH, a toxic chemical at 3 monitoring locations due to the residential burning of solid fuels such as coal, peat and wood. $PM_{2.5}$ has been highlighted by the EEA as being predominantly responsible for most of the 1,300 estimated premature deaths. The Air Quality Index for Health map on the EPA website, shows that the current air quality within the Proposed Development, AGCR and turbine delivery route is classed as Good.

[7] EPA. Air Quality Zones

The EPA undertakes continuous ambient air monitoring at various stations in Ireland. Although no data is available on air quality in the immediate vicinity of the study area, it is expected that the air quality data from the nearest stations to Barnadivane are representative of the air quality at the Site. In the case of the Proposed Development, the closest EPA monitoring stations are Macroom (10 km from the Site), Munster Technological University (MTU [30km from the Site]) and University College Cork (UCC [35 km from the Site]). PM_{10} and $PM_{2.5}$ are measured at Macroom; SO_2, O_3 and PM_{10} are measured at MTU; and NO_2, O_3 and $PM_{2.5}$ are measured at UCC.

A summary of data collected at these monitoring stations is found in the following sections. The EPA allows a maximum of 6 months' of data to be exported to CSV files. Therefore, data for 8th August 2022 to 1st February 2023 has been used to create the summary tables below.

14.3.1.1 Sulphur Dioxide (SO_2) – Munster Technological University

Sulphur Dioxide for the period of 8th August 2022 to 1st February 2023 recorded at the Munster Technological University air monitoring station is presented in Table 14.6. Neither the hourly limit value nor the 24-hour limit value as set out in the CAFE Directive were exceeded during the monitoring period.

Table 14-3: Sulphur Dioxide Data for MTU 08/08/2022 – 01/02/2023

Parameter	Measurement
Number of Hours	4406
No. of measured values	4142
Percentage Coverage	94%
Maximum hourly value	47.36 µg.m^{-3}
98 percentile for hourly values	6.32 µg.m^{-3}
Mean hourly value	2.53 µg.m^{-3}
Maximum 24 hour mean	18.37 µg.m^{-3}
98 percentile for 24-hour mean	6.07 µg.m^{-3}

14.3.1.2 Particulate Matter (PM_{10})

Particulate matter are very small particles which can be either solid or liquid. Some of these particles occur naturally, while many are man-made. Particulate matter is referred to as PM. The number following the PM is used to show how small the PM is. The EPA monitors two types of PM and compare levels to limit values in the CAFE (Clean Air for Europe) Directive and WHO guidelines. These are PM_{10} and $PM_{2.5}$.

Particulate matter (PM_{10}) data for the 8th August 2022 to 1st February 2023 monitoring period in Macroom is presented in Table 14.7. The maximum daily value of PM_{10} recorded during the period was 79.11 µg.m^{-3} which is above the threshold of 50 µg.m^{-3} which must not be exceeded any more than 25 times in a year. Of the 6 months of data examined, this threshold was exceeded on 2 days (December 10th and December 16th 2022) which is representative of less than 25 exceedances per year. Therefore, it is assumed that the PM_{10} concentrations throughout the year are compliant with the CAFÉ Directive. The mean daily value recorded during the period was 15.11 µg.m^{-3} which does not exceed the threshold in the CAFÉ Directive of 40 µg.m^{-3} annual mean concentration.

Table 14-4: Particular Matter (PM_{10}) data for Macroom 08/08/2022 – 01/02/2023

Parameter	Measurement
No. of Days	177
No of measure values	177
Percentage coverage	100%
Maximum daily value	79.11 µg.m^{-3}
Mean daily value	15.11 µg.m^{-3}

14.3.1.3 Particulate Matter ($PM_{2.5}$)

Particulate matter ($PM_{2.5}$) data for the 8th August 2022 to 1st February 2023 monitoring period in Macroom is presented in Table 14-8. Both the Stage 1 and Stage 2 threshold values for PM2.5 were exceeded (annual mean concentration of 25 and 20 µg.m^{-3} respectively) throughout the 6 month period However, in general the PM2.5 concentration is below the threshold value (mean daily value of 10.63 µg.m^{-3}).

Table 14-5: Particular Matter ($PM_{2.5}$) data for Macroom 08/08/2022 – 01/02/2023

Parameter	Measurement
No. of Days	177
No of measure values	177
Percentage coverage	100%
Maximum daily value	75.72 µg.m^{-3}
Mean daily value	10.63 µg.m^{-3}

14.3.1.4 Nitrogen Dioxide (NO_2)

Nitrogen dioxide for the 8th August 2022 to 1st February 2023 monitoring period in UCC is presented in Table 14-9. The hourly limit values for the protection of human health were not exceeded during the assessment. Neither the hourly threshold (200 µg.m^{-3}) nor the annual mean threshold (40 µg.m^{-3}) values were exceeded during the monitoring period.

Table 14-6: Nitrogen Dioxide from UCC – 08/08/2022-01/02/2023

Parameter	Measurement
No. of Hours	4345
No of measure values	4187
Percentage coverage	96.36%
Maximum hourly value (NO_2)	67.5 µg.m^{-3}
98 percentile for hourly rates (NO_2)	40.09 µg.m^{-3}
Mean hourly value (NO_2)	9.66 µg.m^{-3}

14.3.1.5 Dust

The WHO[8] defines dust as: "*Airborne contaminants (which) occur in the gaseous form (gases and vapours) or as aerosols. In scientific terminology, an aerosol is defined as a system of particles suspended in a gaseous medium, usually air in the context of occupational hygiene, is usually air. Aerosols may exist in the form of airborne dusts, sprays, mists, smokes and fumes*". In more general terms, dust is an airborne particulate matter ranging in diameter from 10 to 50 microns which is generated by organic and inorganic matter such as coal, grain, metal, ore, rock and wood. Dust can be generated by activities which process organic and inorganic matter. Dust can be stirred up from inert states through weather and wind conditions and deposit on all parts of the surrounding environment.

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.

Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. 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) and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route. Dust suppression measures will be out in place as per section 4.3.1.1.1.2 of the CEMP.

14.3.2 Climate

Climate is defined by the EPA as "*the average weather over a period of time*". Climate change is a term that is used to describe a "*significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer*. [9]" There is scientific evidence[10] which suggests that the current climate is rapidly warming, having reached approximately 1°C above pre-industrial levels in 2017, increasing at a rate of 0.2 °C per decade. Warmer weather places pressure on flora and fauna which cannot adapt to a rapidly changing environment.

[8] https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf
[9] https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/
[10] IPCC Special Report "Global Warming of 1.5°C": https://www.ipcc.ch/sr15/download/#chapter

In Ireland, the pressure on flora and fauna is mitigated due to the dominant influence of the Gulf Stream on Ireland's climate. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitudes.

The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann, the national meteorological service of Ireland. The nearest weather station to the Proposed Project is the Aherlamore weather station which is approximately 17km east of the Proposed Development. However, the Aherlamore weather station only records rainfall data. The nearest weather station recording a more comprehensive dataset of weather conditions is Cork Airport, located approximately 33km east of the Proposed Development. These meteorological conditions are presented in Table 14.10 for the period January 2019 – November 2022 for Cork Airport Weather station, and January 2019 – August 2022 for Aherlamore Weather Station This was the most up-to-date data available at the time of writing (source www.met.ie/climate)..

Table 14-7: Climate Records January 2019 - October 2022

Total rainfall in millimetres for AHERLAMORE WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2022	36.5	82.9	77.8	68.5	36.6	78.3	27.7	5				
2021	105.9	253.6	55.9	13.2	165.9	32.6	40.4	77.1	78.3	180.9	34.5	173.9
2020	132.5	202.2	59.4	58.4	66.4	80.7	81.4	160.1	46.9	140.9	160.2	196.9
2019	69.6	103.1	137.7	137.7	35.5	77.2	60.4	121	120.1	161.7	143	137.1
mean	86.1	160.5	82.7	69.5	76.1	67.2	52.5	119.4	81.8	161.2	112.6	169.3

Mean temperature in degrees Celsius for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2022	6.5	7	7.3	9	12.1	13.4	16.1	17.1	13.8	11.9	8.8	
2021	4.7	5.8	7.3	7.7	9.5	13.7	16.6	15.4	14.6	11.3	8.2	7.7
2020	6.2	6	9.6	11.4	13.6	14.8	15.5	13.5	9.7	8.3	5.5	6.2
2019	6.4	7.3	7.2	8.9	11.1	12.5	16	15.2	13.6	9.8	6.6	6.2
mean	6.0	6.5	7.9	9.3	11.6	13.6	16.1	15.3	12.9	10.3	6.8	6.7

Potential Evapotranspiration (mm) for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2022	13.8	20.6	43.4	57.8	76.3	79.4	93.4	96.8	50.2	25.9	12.5	
2021	11.4	13.0	32.7	61	72.4	91.4	95.5	72.1	42.9	24.7	15.4	12.1
2020	10.7	19.6	36.1	57.4	83.9	78.4	85.3	70.0	47.5	28.2	11.9	11.0
2019	13.0	16.0	35.3	51.6	81.0	79.4	87.6	67.7	47.0	27.1	13.9	11.5
mean	12.8	20.1	32.1	52.5	71.2	81.7	81.3	69.1	46.1	24.7	13.8	10.9

MEAN WIND SPEED (KNOT) FOR CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2022	8	12.7	9.9	9.4	8.9	9.3	8.3	7.9	9	10.9	11.5	
2021	9.4	13.3	10.4	8.4	9.9	8.7	7.6	8	7.2	9.2	8.7	11.4
2020	9.8	14.6	8.3	9.7	10.3	9.6	8.6	8.6	11.4	10.6	11.8	9.8
2019	8.3	12.3	10.9	11	8.7	8.9	8.5	9.8	9.2	9.9	10.6	10.7
Mean	8.9	13.2	9.9	9.6	9.5	9.1	8.3	8.6	9.2	10.2	10.4	10.6

14.4 Impact Assessment

14.4.1 Do-Nothing Impact

14.4.1.1 Proposed Wind Farm

If the Proposed Wind Farm does not proceed, local air quality and the microclimate will remain unchanged. On a national scale, there will be an increase in greenhouse gas emissions if increasing future electricity needs are not met by alternative renewable sources which has the potential to contribute to air pollution and climate change. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and to meet national targets as set out in the Climate Action Plan would also be lost.

14.4.1.2 Proposed Substation

If the Proposed Substation does not proceed, local air quality and the microclimate will remain unchanged. If the wind farm development proceeds but the substation does not, there will be short-term negative impacts on air quality along the AGCR. Local residents living adjacent to the trenching and ducting works would be impacted by emissions.

If neither element of the development is constructed (neither the wind farm nor the substation), on a national scale, there will be an increase in greenhouse gas emissions if increasing future electricity needs are not met by alternative renewable sources which has the potential to contribute to air pollution and climate change. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and to meet national targets as set out in the Climate Action Plan would also be lost. The opportunity for other potential future energy projects in the area which could have connected into the substation will be lost.

14.4.2 Air Quality

14.4.2.1 Construction Phase Impacts

14.4.2.1.1 Proposed Wind Farm

The principal sources of potential air emissions during the construction of the Proposed Wind Farm will be from dust arising from earthworks, construction of the new access tracks, the temporary storage of excavated materials, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source. Dust emissions can lead to elevated PM_{10} and $PM_{2.5}$ concentrations and may also cause dust soiling. The amount of dust generated and emitted from a working site and the potential impact on the surrounding areas varies according to:

- The type and quantity of material and working methods
- Distance between site activities and sensitive receptors
- Climate/local meteorology and topography

Table 14-8: IAQM descriptions for the magnitude of an earthworks project

Source	
Scale	**Description**
Large	Total site area greater than 10,000m^2, potentially dusty soil type, more than 10 heavy earth-moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved greater than 100,000 tonnes .
Medium	Total site area greater 2,500m^2, moderately dusty soil type, 5-10 heavy earth-moving vehicles active at any one time, formation of bunds 4 to 8 m in height, total material moved 20,000 tonnes to 100,000 tonnes.
Small	Total site area less than 2,500m^2, soil type with large grain size (e.g. sand), less than 5 heavy earth-moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 tonnes, earthworks during wetter months.

Source: IAQM, 2014[5]

Applying the IAQM criteria in Table 14.11, the overall construction of the Proposed Wind Farm is considered a large scale construction site as the site area is greater than 10,000m^2 and potentially dusty soil types such as clays are present throughout much of the site. The “magnitude” of the potential emissions is therefore “large”.

There are two human receptors; both of which are residential, occupied dwellings; within 100m of the red-line boundary of the site (House number 20 at ITM 535473, 564075 and House number 30 at 535012, 563959). Due to the small number of receptors, and distance from the source of the dust emissions, the “sensitivity” of the area is considered to be “low”.

Combining the large magnitude of the earthworks with the low sensitivity, the IAQM guidance indicates that the Risk of Dust Impacts are “Low Risk” for the Proposed Development. This will apply during the construction stage. Dust emissions during the operational stage will be negligible, following the same guidance. As turbine foundations will be left in-situ following decommission, the Risk of Dust Impacts during the decommissioning stage would be considered “Low Risk” at worst, if not negligible.

Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. Local receptors may be exposed to these emissions. This exposure would be slight and short duration (but also recurring) as the setting is rural and will allow for emissions to rapidly dilute in the open air.

It is not predicted that an air quality impact will occur due to traffic at the Proposed Wind Farm as the impacts will fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007), on which the TII guidance is based. This UK DMRB guidance states that road links meeting one or more of the following criteria can be defined as being ‘affected’ by a Proposed Development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

On the surrounding road network as detailed in Chapter 11 Traffic and Transportation, there will be an increase in traffic volumes over a construction period of 12 to 18 months. Traffic volumes in chapter 11 are described in terms of Passenger Car Units (PCUs) where a Heavy Goods Vehicle (HGV) for example, equates to 2.4 PCUs.

The estimated increase in traffic volumes is equivalent to 19 HGV trips (46.3 PCUs) per day estimated throughout most of the construction period, ramping up to 60 trips (144 PCUs) per day estimated for a relatively short period, during the concrete foundation pouring. This is considered Stage 1 (preparing the site to receive the turbines). Stage 2 will involve delivery of the turbines and associated plant to site. These deliveries will primarily occur at night in order to mitigate against impacts on day-time traffic. The Stage 2 traffic volumes will include an increase of 3 extended articulated lorries per night (30 PCUs), 4 days per week over a duration of 4 weeks.

None of the criteria set out in the UK DMRB are met. Therefore, the air quality assessment model is not required in this instance.

Some receptors have the potential for dust soiling due to trucks travelling along local routes. This is a temporary, moderate impact. Mitigation measures for this are described in Section 14.5.1.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be imperceptible.

14.4.2.1.2 Proposed Substation

The principal sources of potential air emissions during the construction of the Proposed Substation will be as listed above for the wind farm, but on a smaller scale.

Applying the IAQM criteria in Table 14.11, the construction of the Proposed Substation is considered a medium construction site.. There is one receptor within 50m of the red-line boundary of the site (House number 30 at 535012, 563959). One receptor at relative distance is considered to be a “low” sensitivity. Therefore, applying the IAQM matrix of magnitude vs sensitivity, the Risk of Dust Impacts during the construction phase of the substation are “Low Risk”. However, this receptor may experience the soiling, deposition or vegetation effects as construction traffic passes in close proximity to the dwelling.

Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. Local receptors may be exposed to these emissions. This exposure would be slight and short duration (but also recurring) as the setting is rural and will allow for emissions to rapidly dilute in the open air.

It is not predicted that an air quality impact will occur due to traffic at the Proposed Substation as the impacts will fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007), on which the TII guidance is based.

Some receptors have the potential for dust soiling due to trucks travelling along local routes. This is a temporary, slight impact. Mitigation measures for this are described in Section 14.5.1.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be imperceptible.

14.4.2.2 Operational Phase Impacts

14.4.2.2.1 Proposed Wind Farm

Once the Proposed Wind Farm is constructed there will be no significant direct emissions to the atmosphere.

Maintenance vehicles will access the Proposed Wind Farm site during the operational period. However, due to the low traffic movements involved, the impact will be imperceptible. The operational phase of the Proposed Wind Farm will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

14.4.2.2.2 Proposed Substation

Once the Proposed Substation is constructed there will be no significant direct emissions to atmosphere.

Maintenance vehicles will access the Proposed Substation during the operational period. However, due to the low traffic movements involved, the impact will be imperceptible. The operational phase of the Proposed Substation will result in positive impacts on air quality due to the displacement of fossil fuels, provided the substation is being used to feed renewable electricity onto the national grid.

14.4.2.3 Decommissioning Phase Impacts

14.4.2.3.1 Wind Farm

In terms of decommissioning, there will be truck movements associated with removing the proposed wind turbines, earthmoving to cover foundations and landscaping resulting in vehicular emissions and also dust. However, the number of truck movements will be significantly less than the construction phase and will potentially result in a slight temporary impact. There will also be emissions from machinery on site including for the movement of soil to cover the foundations, however, this is not likely to result in significant impacts.

14.4.2.3.2 Proposed Substation

During the decommissioning phase, the proposed grid connection infrastructure including the substation and ancillary electrical equipment will form part of the national grid and shall be left in situ. Therefore, there are no expected impacts associated with decommissioning of the substation.

If, for some unforeseen reason, the Proposed Substation was decommissioned, the impacts would be similar to those described above for the Proposed Wind Farm but on a smaller scale.

14.4.3 Climate

There is the potential for greenhouse gas emissions to the atmosphere during the construction, operation and decommissioning phases of the Proposed Development such as those arising from construction vehicles, the use of on-site generators, pumps, and excavation works. The potential climatic impacts arising from these emissions are assessed hereunder with respect to micro and macro climates.

14.4.3.1 Microclimate

14.4.3.1.1 Proposed Wind Farm

The significance of impacts associated with the conversion of vegetated surfaces to un-vegetated surfaces is assessed through the consideration of the area of the land experiencing such a change.

The Proposed Wind Farm site is predominately an upland location with the exception of existing public road ways and internal track ways. The total area of proposed new permanent hardstanding surface will amount to a small fraction of the overall wind farm site and consequently there will be no direct or indirect impact on air temperature and microclimate because of the relatively small proportion of new permanent hardstanding surface.

14.4.3.1.2 Proposed Substation

The total area of proposed new permanent hardstanding surface associated with the Proposed Substation will be smaller than that of the Proposed Wind Farm. Therefore, again, due to the small fraction of land take relative to the surrounding area, there will be no direct or indirect impact on air temperature and microclimate due to the Proposed Substation.

14.4.3.2 Macroclimate

14.4.3.2.1 Proposed Wind Farm

Carbon dioxide (CO_2) is a greenhouse gas which if released in excessive amounts can lead to increases in global temperatures known as 'global warming' or 'greenhouse effect' which can influence climate change. Section 14.4.4 details the carbon savings that have been calculated for the Proposed Wind Farm.

Should the Proposed Wind Farm not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

The Proposed Project offers Ireland an indigenous form of sustainable electricity and would provide for security of supply against our dependence on imports in addition to the positive impact on the macroclimate.

14.4.3.2.2 Proposed Substation

The Proposed Substation, provided it is utilised to feed renewable electricity onto the national grid, will have a positive impact on the macroclimate. The Proposed Substation will form part of the future grid infrastructure which is necessary to dispense with the carbon-intensive fossil fuel electricity generation described in the previous section.

14.4.4 Carbon Balance

14.4.4.1 Proposed Wind Farm

In terms of carbon losses and savings, the online Scottish Windfarm Carbon Assessment Tool (https://informatics.sepa.org.uk/CarbonCalculator/index.jsp) was used to estimate carbon savings as a result of the proposed construction, operation and decommissioning of the Proposed Wind Farm. The assumptions are located in Section 14.2.3 and Appendix 14.1 details the inputs to the model.

Carbon Losses

Based on the Scottish Windfarm Carbon Assessment Tool, the total expected losses due to the project will be between 28,920 and 54,849 tonnes of CO_2. This represents 4.1 to 6.4 % of the total amount of CO_2 emissions that will be offset by the Proposed Project. Losses include the manufacture, construction and decommissioning of turbines, losses due to reduced carbon fixing potential and losses from soil organic matter. Values for these figures are presented in Table 14-12.

Carbon Gain through Avoided Emissions

In total, it is estimated that between 709,625 and 851,550 tonnes of CO_2 emissions will be displaced over the proposed twenty five-year lifetime of the wind farm i.e. between 28,385 and 34,062 tonnes of CO_2 per annum, which assists in realising the ambitious goals of the Climate Action Plan 2023. From an operational perspective, the Proposed Project will displace the emission of CO_2 from other less clean forms of energy generation, predominantly gas, and will assist Ireland in meeting its renewable energy targets and obligations. The burning of fossil fuels for energy creates greenhouse gases, which contributes significantly to climate change. These and other emissions also create acid rain and air pollution.

For the Proposed Project with 6 no. turbines assuming an MEC of 25MW at 35% capacity factor, and operational period of 25 years, the payback time for the manufacture, construction, and decommissioning phases (including carbon losses from soil, vegetation clearance etc.) of the Proposed Wind Farm is expected to be 1.2 years.

As discussed in Section 14.1.4, the carbon calculator was created to calculate carbon loss from acid bog and fen habitats. The site has been cultivated and drained in the past and is mainly covered in agricultural pastures. The site does not function as an acid bog or fen habitat and therefore does not contain the same high levels of carbon. The calculator is therefore an over-estimate of impact.

The carbon calculator takes into consideration the area of forestry which is required to be felled for the development. This would typically apply to the felling of large swathes of plantation forestry, where the area of forestry to be felled must be input in hectares. In the case of The Proposed Development, minimal vegetation clearance is scheduled which would have a negligible value in the context of the carbon calculator. The area of forestry for felling, for the purposes of the carbon calculation, is therefore assumed to be zero.

Table 14-9: Carbon Balance Results

Origin of Losses	Total CO_2 Losses (tonnes $C0_2$ equivalent)	
	Lower Range Output	Higher Range Output
Turbine manufacture, construction and decommissioning	22,135	23,715
Losses due to Backup	7,096	16,558
Felling of Forestry	0	0
Losses due to reduced carbon fixing potential	23	122
Losses from soil organic matter	-346	13,619
Total Expected Losses	28,920	54,849
Emissions Savings	**Expected $C0_2$ emission savings (tonnes CO_2 per Annum)**	
Versus fossil fuel electricity generation	28,385	34,062
Energy output from windfarm	**MWh**	
Estimated Annual Output	66MWh	79MWh
Carbon payback time	**Years**	
Fossil fuel mix of electricity generation	0.8	1.9

The Scottish Carbon Calculator automatically compares the CO_2 emission savings to the grid-mix emissions in a Scottish context. The CO_2 emission savings from the project, relative to the current Scottish grid-mix of electricity has been calculated as 14,824 tonnes CO2 per annum. However, for an Irish wind farm, it is more appropriate to compare to the Irish situation. SEAI (2020) provides an emission value for natural gas (the predominant fuel for electricity generation in Ireland) of 366 gCO_2/kWhr. Taking the "Lower" estimated annual output for the wind farm of 66MWhr (conservative estimate) the wind farm would displace 28,054 tonnes CO_2 per annum as calculated in the "Explanation" column of the "Counterfactual emission factors" on page 2 of Appendix 14.1. It is worth noting that while this calculation makes a more appropriate comparison to the emissions associated with electricity generation in Ireland, it does not take into account the same detail as the Scottish Carbon Calculator i.e., it does not account for CO_2 emissions in the manufacture, construction and decommissioning of the turbines; the loss of carbon sequestration due to vegetation clearance or peat removal etc.

14.4.4.2 Proposed Substation

While the Scottish Carbon Calculator has been utilised to estimate the amount of carbon emissions offset by the development of the Proposed Wind Farm, the calculator does not allow for the construction of a substation. No calculator could be identified to run a similar calculation for the Proposed Substation.

However, it can be assumed that emissions will be mostly "embodied carbon" associated with the manufacture of the steel components of the Proposed Substation, as well as the embodied carbon associated with sourcing and transporting the stone and concrete aggregates for the construction of the Proposed Substation. Emissions due to this embodied carbon associated with the Proposed Substation would be low, relative to the embodied carbon associated with the aggregates required for the Proposed Wind Farm.

The Proposed Substation in and of itself would not offset carbon emissions. However, it would constitute necessary infrastructure to enable the offset of carbon emissions by way of connecting renewable energy projects to the national grid.

14.5 Mitigation Measures

14.5.1 Air Quality

14.5.1.1 Construction Phase

A Construction and Environmental Management Plan (CEMP) has been prepared and is included in Appendix C. This includes for the following mitigation measures during the construction phase of the Proposed Project relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate which compacts, preventing dust
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled and directed to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the main entrance/exit point of the Proposed Development as described in the CEMP accompanying this EIAR (Appendix C);
- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP (a CEMP is contained in Appendix C). In the event the Planning Authority decides to grant permission for the Proposed Wind Farm, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

14.5.1.2 Operational Phase

As the operation of the Proposed Wind Farm will have positive impacts on air quality, mitigation measures are considered unnecessary.

14.5.1.3 Decommissioning Phase

Mitigation measures for the removal of wind turbines and all other site works from the Proposed Development site will be the same as the construction phase with respect to dust control and minimisation. The proposed access tracks across the Proposed Wind Farm site will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the Proposed Substation, this will be left in situ and so no mitigation measures are proposed.

14.5.2 Climate

It is considered that the Proposed Development will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2022. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase up to 80% by 2030, with up to 8GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As no significant impacts on climate are predicted during construction, operation and decommissioning no mitigation measures are necessary or proposed. In terms of the operational phase, the operation of the Proposed Development will have a positive effect on climate due to the displacement of fossil fuels.

14.6 Residual Impacts

14.6.1 Air Quality

Following the implementation of the above mitigation measures, the Proposed Development will result in slight to moderate residual impacts arising from fugitive dust emissions during construction activities involving excavations, vegetation clearance or earthmoving. These will be localised in nature and as they will be associated with particular elements of the construction phase, they will be temporary in nature and will not result in any permanent residual impacts.

Impacts related to vehicle emissions will reduce significantly following construction and no significant impacts are anticipated. There will be a low level of maintenance traffic during the operational period, which will have an imperceptible impact.

Impacts on air quality due to vehicle emissions and dust during the decommissioning phase are expected to be similar in nature to the construction phase but of a smaller magnitude. They will be temporary in nature and result in slight to moderate residual impacts. There will be no permanent residual impacts due to the decommissioning phase.

During operations, the Proposed Development will result in the avoidance of emissions from fossil fuel generators which is a positive effect on air quality.

14.6.2 Climate

There will be positive residual impacts from the operation of the Proposed Development in terms of the displacement of fossil fuel energy generation, and replacement with renewable energy.

Section 14.4.3 assessed the potential impacts on climate as a result of the Proposed Development through microclimate and macroclimate. At the microclimate level, the Proposed Development will involve the construction of hardstanding surfaces (hardstandings, access tracks, structures) which represent a relatively small infrastructure footprint relative to the footprint of the entire site. The assessment found that this relatively small increase in hardstanding would not negatively impact the vegetation necessary to maintain a microclimate.

In terms of macroclimate, it is estimated that an annual average output[11] of between 57MWh - 79MWh for the Proposed Development will result in the net displacement of between 24,522 and 34,331 tonnes of CO_2 per annum. This results in a positive impact by removing the GHG emissions that would have otherwise been part of the output of traditional energy generation (i.e. gas, coal, biomass, peat, etc). Potential impacts to climate can have the potential to affect human health and the environment.

No direct or indirect impact on air temperature, microclimate or macroclimate has been associated with the development of the Proposed Development due to the location of the site which is predominately of upland livestock grazing land use.

Should the Proposed Development not be developed, fossil fuel power stations will likely be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

It is therefore considered that there will be a net positive residual impact on climate as a result of the Proposed Development due to the displacement of between 24,522 and 34,331 tonnes of CO_2 per annum.

14.7 Cumulative Impacts

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the site and was in the process of construction at the same time. The most obvious developments which may occur in tandem with the construction of the Proposed Wind Farm and substation are the construction of the consented alternative grid connection route (AGCR) and the consented turbine delivery route (TDR).

[11] Per Scottish Wind Farm Calculation Tool

14.7.1 Alternative Grid Connection Route (AGCR)

The consented grid connection cable route between the permitted and constructed Carrigarierk Wind Farm and Proposed Wind Farm will be developed as an alternative should the proposed looped-in connection via the proposed onsite 110kV substation currently under consideration by An Bord Pleanála (PL04.308208) be refused consent and/or unviable at the time of development. In the event that the AGCR is developed, the Proposed Substation will not be developed.

The majority of the consented AGCR is located within the public road corridor. The AGCR travels from the L8514-0 within the Proposed Development Site and follows the public road network for approximately 16.4km to location 523,095E 562,474N (ITM) before joining an existing forestry road in the townland of Gortatanavally (523,095E 562,474N). The cable route follows this forestry road for 240m and traverses approximately 280m of coniferous forestry to location 522,709E 562,203N (ITM). From here the cable route will be lain following a southwestern direction and connect into the Carrigarierk Wind Farm site infrastructure. The Carrigarierk Wind Farm connects to the Carrickdangan 110kV substation, which in turn connects to the Dunmanway 110kV substation (CCC reference: 17/431; ABP reference: 301563-18).

This alternative consented grid connection route between the Proposed Wind Farm and connection point at Carrigarierk Wind Farm measures approximately 17.1 kilometres, and passes through 18 townlands as described in Chapter 2 of this EIAR.

Cumulative impacts may arise if the permitted AGCR is selected as the option for connecting the Proposed Wind Farm to the grid, in place of the proposed LILO connection to the overhead line. The construction of the consented AGCR is considered a medium scale construction site under the IAQM guidance. Due to the number of residential dwellings located in close proximity to the AGCR, the sensitivity of the surrounding area would be considered “medium”. Therefore, there would be a “medium risk” of dust impacts affecting the residential dwellings along the AGCR.. Some houses may experience soiling and deposition of vegetation effects depending on how close to the road corridor they are located. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. However, due to the nature of construction along the AGCR as described in Chapter 2, which works as a “rolling” construction site, meaning that these works will not be concentrated in any one area of the route, these effects in relation to dust and air pollutants are considered to be short term, slight negative impacts on air quality.

Receptors which have the potential to receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the AGCR construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling occur.

During the operational period of the grid connection route, maintenance vehicles will access the joint bays for periodic maintenance and carry out point works along the proposed grid connection route to address any issues during the operational period. However, given the low and infrequent traffic movements involved, the impact will be imperceptible. While the impacts of these traffic movements would be imperceptible, they must be considered cumulatively with the non routine maintenance to turbines which may also be required. Cumulative impacts of traffic movements associated with maintenance of the AGCR, together with impacts associated with maintenance of the turbines would be imperceptible to slight. The operational phase of the AGCR which connects to and operates the Proposed Wind Farm will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

14.7.2 Turbine Delivery Route (TDR)

Large components associated with the wind farm construction will be transported to the Site via the identified TDR. The point of arrival for the wind farm plant is likely to be Cork Harbour. The TDR includes the following routes:

- Turn off the N22 national secondary road at Inchirahilly;
- R585 through Crookstown and Béal na Bláth;
- R585 / L6008 junction at Bengour West;
- Local road network through Lackereagh;
- Access junction and route through the Site.

A grant of permission by Cork County Council was received for road improvement works at the junction of the R585 and L6088 (CCC PL Ref. 14/6803) to facilitate the delivery of turbine components to the site.
The study area and existing environment associated with the TDR shall be confined to the public road corridor associated with the above roads. The applicant applied for planning permission for improvements to the public road to facilitate the TDR, as a standalone application (CCC PL Ref. 14/6803) to Cork County Council. The application was granted permission in May 2015 for 10 years.

Cumulative impacts may arise due to the impacts associated with the consented turbine delivery route (TDR), acting together with the construction of the Proposed Wind Farm. The construction works associated with the proposed turbine delivery route is considered a moderate construction site as it will result in soiling effects which have the potential to occur up to 50m from the source, with PM_{10} deposition and vegetation effects occurring up to 15m from the source. Many of the TDR work areas are very small and require minor works such as tree trimming or street furniture removal. The main TDR works areas are the road improvement works at the junction of the R585 and L6088; and the junction at the access to the Site. The impacts on air quality are due to air pollutants from plant and vehicles and the potential for dust when excavating to formation level and placing the imported stone into the excavation. Compaction of the layers of stone may also result in some dust migration. These impacts are considered to be short term, and due to the road improvements being small relative to a typical road works project, the impacts are considered slight in magnitude. Therefore, these road improvement works will amount to a short term, slight negative impact on air quality.

14.7.3 Other developments which may act cumulatively

There are a small number of existing and approved projects and developments in the planning system within 500m of the site which include agricultural and residential developments. There is also an application for the retention of an 80m high meteorological mast. These developments are either small in nature or do not involve any active works (e.g. retention of mast), and therefore will not act cumulatively with the Proposed Wind Farm.

There are a number of larger projects and activities which are consented, ongoing or operational within 20km of the Proposed Development. These are:

Applicant Name	Direction from Proposed Development site	Distance from Proposed Development site (km)	Decision
CEPL Limited	**N**	**9 km**	**FI**
The demolition of an existing two storey dwelling house and single storey garage and the construction of a residential development of 96 no. residential units, a creche and all ancillary site development works. The proposed development comprises the construction of 8 no. 5 bedroom semidetached dwelling houses, 24 no. 4 bedroom semi-detached dwelling houses, 3 no 4 bedroom townhouses, 20 no. 3 bedroom semi-detached dwelling houses and 28 no. 3 bedroom town houses. The proposed development includes a 2-3 storey, split-level building with ground floor creche, 1 no 2 bedroom apartment and 1 no. 1 bedroom apartment with 11 no. 2 bedroom duplex townhouses at upper floors. Ancillary site works include hard and soft landscaping, servicing proposals, bicycle parking for the proposed creche and all other associated development works. Vehicular access to the proposed development will be provided via an upgraded vehicular entrance from new street (N22).			
Massey Developments Ltd	**N**	**10 km**	**28/03/2019**
The development will consist of revisions to development previously permitted under Ref No. 05/54023, 06/54047, 06/54059 to provide for alternative layout and house types on part of the site. The development will incorporate the replacement of 127 No. permitted dwellings with 106 No. new two storey house types comprising of 14 No. 4 bed semi-detached dwellings (1,424 sq.ft approx), 78 No. 3 bed semidetached dwellings (36 No. 1,149 sq. ft approx. & 42 No. 1,086 sq. ft approx) and 14 No. 2 bed terraced houses (886 sq. ft. approx). The total revised number of permitted and proposed dwelling on the overall site will be 176 No. dwellings comprised of 55 No. 4 bed dwellings, 100 No. 3 bed dwellings and 21 No. 2 bed dwellings along with the crèche as permitted. The application also seeks associated revisions to road layout and site development and landscape works. Extension of Duration of Permission granted under Planning Ref. No. 08/54057 and 14/5160.			
Massey Developments Ltd	**N**	**10 km**	**17/02/2022**
The development will consist of revisions to development previously permitted under Ref No. 05/54023, 06/54047, 06/54059 to provide for alternative layout and house types on part of the site. The development will incorporate the replacement of 127 No. permitted dwellings with 106 No. new two storey house types comprising of 14 No. 4 bed semi-detached dwellings (1,424 sq.ft approx), 78 No. 3 bed semidetached dwellings (36 No. 1,149 sq. ft approx. & 42 No. 1,086 sq. ft approx) and 14 No. 2 bed terraced houses (886 sq. ft. approx). The total revised number of permitted and proposed dwelling on the overall site will be 176 No. dwellings comprised of 55 No. 4 bed dwellings, 100 No. 3 bed dwellings and 21 No. 2 bed dwellings along with the crèche as permitted. The application also seeks associated revisions to road layout and site development and landscape works. Extension of Duration of Permission granted under Planning Ref. No. 08/54057, 14/5160 and 19/04234.			
Michael Murnane	**N**	**15 km**	**Conditional 27/03/2009**
An increase in hub height from 60 to 85 metres and rotor blade diameter from 66 to 82 metres as well as the addition of 1no. wind turbine to the permitted wind farm development at Cahernafulla. Associated changes to include relocation of permitted turbines, relocation of permitted substation & access tracks, and increase in site area to provide for new access road and entrance.			
Burren Energy Ltd. c/o Kevin Brogan	**N**	**15 km**	**09/06/2008**
Completion of wind farm to include 7 no. turbines, substation and site tracks granted under pl . reg. no. 01/6529			

Green Energy Supply Ltd.	**N**	**24 km***	**Conditional 28/05/2018**
Construction of an extension to existing 110kv electricity substation. The proposed works for which planning permission is sought will involve the construction of new palisade fencing, bunded concrete plinths, 4no. battery storage units, transformers, control cabin, access track and all associated site works.			
Reeve Wave Ltd.	**N**	**24 km***	**Conditional 30/07/2019**
An extension to the permitted solar photovoltaic (PV) array permitted by Cork County Council (planning reference 16/5455). The development will consist of; 1) up to 41,600 m2 of solar panels on ground mounted steel frames, internal underground cables & ducts, up to 5 no. inverter units, boundary security fence, CCTV and landscaping; 2) underground electrical grid connection cabling and ducting connecting the permitted onsite control cabin (planning reference 16/5455) to the national grid at Boggeragh Substation in the townland of Crinnaloo South, Co. Cork and 3) all associated ancillary works. A Natura Impact Statement (NIS) accompanies this application.			
Reeve Wave Ltd.	**NE**	**7 km**	**01/07/2020**
A solar PV panel array consisting of up to 5400sqm of solar panels on ground mounted steel frames, electricity control room, power inverter unit, underground cable ducts, temporary laydown area, boundary security fence, site entrance, CCTV and all associated site works. Extension of Duration of permission granted under Planning Reference 14/06644 and (ABP 04.244539).			
Mallow Contracts Ltd.	**NE**	**14 km**	**Conditional 28/04/2021**
Permission for the development of a small-scale quarry with the extraction of rock using ripping and rock breaker and the on-site crushing and screening with mobile plant, and open storage of crushed rock. The installation and use of a mobile wheel wash and the continued use of the site access road, facility entrance from regional road R618, continued use of the existing weighbridge office, welfare facilities and existing septic tank and percolation area. The extraction of rock will extend to an area of 2.15 hectares. Following extraction, the site will be restored using stripped overburden, an eight-year quarry lifespan is sought.			
Grey Ruby Ltd.	**NE**	**19 km**	**Conditional 08/07/2022**
A twenty-year permission for the importation and recycling of up to 80,000 tonnes of construction and demolition (C&D) material per annum, including the construction of a new shed to manage/recycle the C&D material; and permission for the importation of up to 200,000 tonnes per annum of imported inert material (consisting of mainly soil/subsoil and stone) and the restoration/infilling of an existing quarry to provide agricultural/biodiversity uses, and all associated ancillary development works including tree planting and the provision of 4 no. bird/wildlife observation hides. The proposed development will utilise the existing quarry infrastructure including internal roads, site office, machinery shed, weighbridge, staff canteen and welfare facilities. An Environmental Impact Assessment Report (EIAR) will be submitted to the planning authority with the application. The application relates to development which comprises an activity requiring a waste licence (which has been provided by the Environmental Protection Agency under Licence Register No. W0255-02).			
Tulligmore Quarry Solutions Limited	**NE**	**19 km**	**Conditional 15/04/2019**
A ten-year permission for the continued use of an existing sand and gravel quarry with 2 no. new extraction areas measuring approximately 3.32ha combined and all associated ancillary development works including the implementation of a phased restoration programme			
Amarenco Solar Cloghmacow Limited	**E**	**8 km**	**Conditional 16/12/2020**
A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.12 hectares, 2 no. single storey inverter / transformer stations, 1 no. single storey delivery station, security fencing, CCTV, and all associated ancillary development works.			

Amarenco Solar Beal na mBlath	**E**	**8 km**	**Withdrawn 07/11/2022**
A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.5 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV and all associated ancillary development works Extension of Duration to Permission granted under Planning Ref. No. 16/4783.			
Roadstone Limited	**E**	**11 km**	**Conditional 23/09/2021**
The development will consist of quarrying activities within the red line application area of 40.17ha of an existing permitted quarry (06/13499 and PL04.226347). Development is sought for a period of 20 years. The proposed development will comprise the extension of the existing quarry excavation area vertically by an additional 2 X 18m high benches from the current floor level of ca.4mAOD to -32mAOD and a deepening of the quarry sump from the current level of ca -22mAOD to -36mAOD within the permitted extraction footprint area of 20.2ha. The proposed development will involve the stripping of overburden and its storage for use in environmental bunds and site restoration; the extraction of rock by means of blasting, the crushing and processing of rock. The proposed development will utilise the existing quarry infrastructure and other ancillaries to complete the works. An Environmental Impact Assessment Report and Natura Impact Statement will be submitted to the planning authority with this application.			
BNRG Neon Holdings Ltd.	**SE**	**16 km**	**Conditional 25/03/2019**
A ground mounted solar photovoltaic (PV) farm within a site area of approximately 40 hectares consisting of solar photovoltaic panels covering an area of up to 75,100sq.m on ground mounted steel frames, 1 no. on-site substation with 2 possible locations, option 1 identifies the substation location within the townland of Finnis and option 2 identifies the substation location within the townland of Mishells, up to 8 no. inverter/transformer stations, underground cables and ducts, boundary security fence, new internal tracks, CCTV cameras and all associated site services and works located within the townlands of Finnis and Mishells.			
BNRG Finnis Ltd	**SE**	**16 km**	**FI**
2km of grid connection infrastructure on the public road and agricultural land to connect the approved Finnis Solar Farm (Planning reference 17/6111) to the existing Bandon Substation and to connect two parcels of land within the consented development comprising the laying of underground electricity cables, associated infrastructure and horizontal directional drilling.			
Premier Solar Ltd.	**SE**	**16 km**	**Conditional 12/06/2017**
The development will consist of a solar PV array consisting of approximately 20,000 solar panels on ground mounted steel frames, 1 no. single storey delivery substation, 2 no. single storey inverter/transformer units, drainage swales, underground cable ducts on site, temporary construction compound (including site offices, portable toilets and parking area), boundary security fence, site entrance, access tracks, CCTV and all associated site works.			
Carbery Food Ingredients Ltd. T/a Carbery Group	**S**	**9 km**	**Conditional 16/10/2018**
The demolition of an existing 2-storey detached dwelling and ancillary structures, including fencing, gates, and part of the existing front boundary walls; removal of existing signage; extensions to the main plant and warehouse building, to include: part single-storey/part 2-storey tank room/storage area, with upper floor laboratory/MCC room and lobby, to the south-western elevation; new door, part single-storey processing plant area, and 2-storey loading docks/office, to the southern elevation; new first floor processing/plant area to existing internal processing area; and new single-storey extension/infill to the existing internal open loading bay area, including increase in roof height. The proposed development will also consist of a single-storey extension to the existing chill water plant; signage: 5 no. car parking spaces; new doors/fire doors/roller shutter doors; 5 no. new storage vessels and associated pipe bridge; 10 no. existing storage vessels to be replaced and increased in height; additional roof-top plant (AHU's, extract fans, roof access ladders/gantry); all site development works, landscaping, drainage and ancillary development including: elevational treatment; revisions to the existing easternmost vehicular entrance, including erection of new retaining boundary wall and fencing; revisions to the westernmost vehicular access,			

including replacement and relocation of existing weighbridge and new single-storey weighbridge office and associated works; and the relocation of 3 no. flagpoles. The proposed development is for modifications to an establishment to which the Major Accidents Directive applies. This application relates to a development which comprises of an activity for which an Industrial Emissions License under part IV of the Environment comprising of an activity for which an Industrial Emissions License under part IV of the Environment Protection Agency 1992 (as amended) is required. An Environmental Impact Assessment Report (EIAR) has been prepared in respect of the proposed development.			
Keel Energy Limited	**SW**	**11 km**	**Conditional 21/06/2019**
10 year permission for proposed development consisting of: (1) A 110kV electricity substation including 2 no. control buildings associated electrical plant and equipment, underground electricity cabling, fencing, alterations to a previously permitted borrow pit and temporary construction compound at the Carrigarierk Wind Farm (An Bord Pleanala Ref. PL04.246353, Cork County Council Ref. 15/730) in the townland of Carrigdangan; (2) 110kV underground electricity cabling connecting the proposed substation to the existing Dunmanway ESB substation in the townlands of Carrigdangan, Inchincurka, Kilnadur, Aultaghreagh, Aultagh, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick; (3) 33kV underground electricity cabling connecting the proposed substation to the permitted Carrigarierk Wind Farm through the townlands of Carrigdangan and Gortatanavally and the permitted Shehy More Wind Farm (ABP Ref. PL04.243486; Cork County Council Ref. 13/551), through the townlands of Shehy More, Coolcaum, Coolmountain, Tullagh, Lackabaun, Clogher, Farrannahineeny, Crushterra, Gurteen and Carrigdangan. Together with all ancillary works and apparatus. The proposed development is located north of Dunmanway, Co. Cork. This application is accompanied by An Environmental Impact Statement (EIS) and a Natura Impact Statement (NIS).			
Keel Energy Limited	**SW**	**13 km**	**Conditional 01/11/2016**
Ten year planning permission for the construction of a wind farm of up to 5 No. wind turbines, with a maximum ground to blade tip height of up to 140m, upgrading of existing and provision of new internal access roads, provision of a wind anemometry mast (height up to 90 metres), 2 no. borrow pits, underground electricity cabling, underground grid connection electrical cabling including all associated infrastructure, junction accommodation works for the proposed delivery route, 1 no. electricity sub-station with control building and associated equipment, 1 no. construction compound, upgrading of the existing site access junction, permanent signage and all ancillary site works.			
Irish Water	**W**	**12 km**	**Conditional 01/06/2021**
The development will consist of the construction of a wastewater treatment scheme for the village of Inchigeelagh. Permission is sought for the following components of the scheme; 1. Below ground pumping station (PS) with emergency storage capacity, control kiosk and boundary treatment, to be located on the north bank of the River Lee, just to the east of Inchigeelagh Bridge. 2. Wastewater treatment plant (WWTP) for a population equivalent of 292 people with associated and ancillary development works including tanks, kiosks, inlet works, hardstanding and boundary fencing. 3. Outfall pipe to convey treated effluent from the WWTP to the River Lee. 4. Access road from the R584 road to the WWTP site with boundary treatment. 5. Access road from the WWTP site to the PS site. 6. All associated ancillary site development works above and below ground.			
Cleanrath Windfarm Ltd	**NE**	**15 km**	**Conditional 19/05/2017**
The proposed wind farm will comprise the provision of a total of 11 no. wind turbines with a maximum ground to blade tip height of up to 150m, upgrading of existing and provision of new internal access roads, provision of a wind anemometry mast (height up to 100 metres), 2 no. borrow pits, underground electrical cabling, underground grid connection electrical cabling including all associated infrastructure, junction accommodation works for the proposed turbine delivery route and provision of a temporary roadway to facilitate turbine component deliveries, 1 no. electricity sub-station with control building and associated equipment, 1 no. construction compound, upgrading of the existing site access junctions, permanent signage, and all ancillary site works. The proposed development comprises the redesign of a wind farm at this location previously considered by Cork County Council and An Bord Pleanala under pl. ref: 11/5245, and PL 04.240801 respectively.			

*while this table deals with developments within a 20 km radius of the Proposed Development, two proposed projects have been included in this table which are than 20 km from the Proposed Development. It was the authors professional opinion that these proposed projects should not be excluded from consideration due to the scale and nature of these projects and the distance being marginally greater than 20 km from the Proposed Development

The nature of the Proposed Development and other energy developments within 20 kilometres are such that, once operational, they will have a cumulative long-term, significant, positive effect on the air quality and climate. Energy developments over 20km away are not considered to have cumulative impacts due to the large separation distance between developments.

14.7.4 Air Quality

Cumulative air impacts may arise if the construction, operational and maintenance period and decommissioning of these projects occurs simultaneously with the construction of the Proposed Wind Farm, turbine delivery route works, the AGCR or the Proposed Substation.

This could result in slight increased traffic and dust emissions, however, provided the mitigation measures as detailed in Section 14.5 are implemented, there will be no significant cumulative effects on air quality due to dust or GHG emissions.

There will be no net carbon dioxide (CO_2) emissions from operation of the Proposed Wind Farm.

Emissions of carbon dioxide (CO_2), oxides of nitrogen (NOx), sulphur dioxide (SO_2) or dust emissions during the operational phase of the Proposed Development will be minimal, relating to the use of operation and maintenance vehicles onsite, and therefore there will be no measurable negative cumulative effect with other developments on air quality.

14.7.5 Climate

Cumulative impacts on climate associated with the construction phase of the Wind Farm, acting cumulatively with the TDR and the substation or the AGCR, due to greenhouse gas emissions from plant and machinery associated these works, will be short term and not significant.

In terms of climate and carbon, the Proposed Wind Farm will act cumulatively with other renewable energy projects in reducing CO_2 emissions by displacing fossil fuel in the production of electricity, resulting in a long-term slight-moderate positive impact on climate.

The cumulative impact on the climate during the decommissioning phase will be similar in nature to the construction phase but will be of reduced magnitude and temporary in duration.

14.8 Conclusion

There are no significant impacts expected on Air Quality or Climate as a result of the construction, operation and decommissioning of the Proposed Development.

There are no significant cumulative impacts expected on Air Quality and Climate as a result of other existing or the Proposed Development.

There will be a long term positive residual impact on air quality and climate as a result of the Proposed Development due to the displacement of fossil fuels.

The mitigation measures identified in this Chapter will be adopted and implemented by the Contractor and have been incorporated into the construction stage CEMP included in Appendix C.

14.9 References

Committee on Climate Change (2020) Land use: Policies for a Net Zero UK. (online). Available at: https://www.theccc.org.uk/publication/land-use-policies-for-a-net-zero-uk/

Design Manual for Roads and Bridges (DMRB) (2007). Volume 11 Environmental Assessment Section 3 Environmental Assessment Techniques.

EirGrid (2018). All-Island Generation Capacity Statement 2018 – 2027. (online). Available at: http://www.eirgridgroup.com/site-files/library/EirGrid/Generation_Capacity_Statement_2018.pdf.

EPA (2020). 'Irelands Environment 2020 – Chapter 14 – Environment, Health and Wellbeing', p. 364.

Department of Communications, Climate Action and Environment (2019). Ireland's National Energy and Climate Plan 2021 – 2030 : https://www.gov.ie/en/publication/0015c-irelands-national-energy-climate-plan-2021-2030/

EPA (2020). Irelands Greenhouse Gas Emissions Projections: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/2020-EPA-Greenhouse-Gas-Emissions-Projections_final.pdf

Dammeier, Loriaux, Steinmann, Smits, Wijnant, van den Hurk and Huijbregts (2019). Space, Time, and Size Dependencies of Greenhouse Gas Payback Times of Wind Turbines in Northwestern Europe: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6686152/

EPA (2022). Air Quality in Ireland: Report 2021. (online). Available at: https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2021.php

EPA (2022). Air Quality Zones. (online). Available at: https://airquality.ie/information/air-quality-zones

EPA (2022). Ireland's Final Greenhouse Gas Emissions – 1990 – 2021. (online). Available at: https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/

EPA (2020). Greenhouse Gas Emissions Projections' 2019-2040. Online. Available at: http://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2019-2040/2020-EPA-Greenhouse-Gas-Emissions-Projections_final.pdf.

EPA (2020). 'Irelands National Inventory Report, 2020: Greenhouse Gas Emissions 1990-2018'. Table 2.1. Online. Available at: http://www.epa.ie/pubs/reports/air/airemissions/ghg/nir2020/NIR%202020_Merge_finalv2.pdf.

EPA (2020). What is Climate Change? (Online). Available at: https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/.

The Journal (2022). 'ESB Networks fined over greenhouse gas leakages at Moneypoint power station'. Online. Available at: https://www.thejournal.ie/esb-networks-fined-greenhouse-gases-moneypoint-5804477-Jun2022/

Illinois Department of Public Health. (2020). Polycyclic Aromatic Hydrocarnons (PAH's). Online. Available at: http://www.idph.state.il.us/cancer/factsheets/polycyclicaromatichydrocarbons.htm.

Institute of Air Quality Management (2014). Guidance on the Assessment of Dust from Demolition and Construction. Online. Available at: http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

Intergovernmental Panel on Climate Change (IPCC). (2018). 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. (online). Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.

Intergovernmental Panel on Climate Change (IPCC) (2014). Renewable Energy Sources and Climate Change Mitigation. (online). Available at: https://www.ipcc.ch/report/renewable-energy-sources-and-climate-change-mitigation/

Met Eireann (2022). Monthly Data. (online). Available at: https://www.met.ie/climate/available-data.

SEAI (2020). Energy-related CO2 emissions in Ireland 2005 -2018 https://www.seai.ie/publications/Energy-Emissions-Report-2020.pdf

SEAI (2018). Quantifying Ireland's Fuel and CO_2 Emissions Savings from Renewable Electricity in 2005-2016. (online). Available at: https://www.seai.ie/publications/Energy-Emissions-2017-Final.pdf

Scottish Government Windfarm Carbon Assessment Tool –

Scot Gov (2018). Calculating potential losses and savings from wind farms on Scottish peatlands; technical note – Version 2.10.0. (online). Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/carbon-calculator-technical-guidance/documents/calculating-potential-carbon-losses-and-savings-from-wind-farms-on-scottish-peatlands-technical-guidance/calculating-potential-carbon-losses-and-savings-from-wind-farms-on-scottish-peatlands-technical-guidance/govscot%3Adocument/Calculating%2Bpotential%2Bcarbon%2Blosses%2Band%2Bsavings%2Bfrom%2Bwind%2Bfarms%2Bon%2BScottish%2Bpeatlands%2B-%2Btechnical%2Bguidance.pdf

Statutory Instrument (S.I. No. 180 of 2011) – Air Quality Standards Regulations, 2011.

TII (2011). Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes. https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf

TII (2022). Air Quality Assessment of Proposed National Roads – Standard. Online. Available at: PE-ENV-01107 (tiipublications.ie)

WHO. (2018). Ambient (outdoor) air pollution. Online. Available at: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.

WHO. (2020). Hazard Prevention and Control in the Work Environment: Airborne Dust WHO/SDE/OEH/99.14. (online). Available at: https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf .

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

www.fehilytimoney.ie

CORK OFFICE
Core House,
Pouladuff Road,
Cork, T12 D773,
Ireland
+353 21 496 4133

Dublin Office
J5 Plaza,
North Park Business Park,
North Road, Dublin 11, D11 PXT0,
Ireland
+353 1 658 3500

Carlow Office
Unit 6,
Bagenalstown Industrial Park,
Royal Oak Road, Muine Bheag,
Co. Carlow, R21 XW81,
Ireland
+353 59 972 3800