Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Lackareagh Wind Farm, Co. Clare

Chapter 10 – Air Quality

Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

10. AIR QUALITY

10.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality arising from the construction, operation and decommissioning of the Proposed Project. The full description of the Proposed Project is detailed in Chapter 4. Alternative designs initially proposed for the Proposed Project and their potential for effects on air quality are considered in Chapter 3 Consideration of Reasonable Alternatives.

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

The assessment has been carried out according to best practice and guidelines relating to air quality.

10.1.1 Background

The Proposed Wind Farm is located immediately east of the village of Kilbane, Co. Clare and 6km west of Killaloe, Co. Clare. It is proposed to access the Proposed Project site via upgrades to the L7080 Local Road ('the Gap Road') which runs from the western boundary through the Proposed Project. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks.

The Proposed Grid Connection Route includes for underground 38kV cabling from the proposed onsite 38kV substation, in the townland of Killeagy (Goonan), to the existing Ardnacrusha 110kV substation in the townlands of Ballykeelaun and Castlebank. The Proposed Grid Connection Route to Ardnacrusha, measuring approximately 14.7 km in length, is primarily located within the public road corridor.

The townlands in which the Proposed Project is located are listed in Table 1-1 in Chapter 1 of this EIAR. Current land-use within the Proposed Wind Farm comprises coniferous forestry and low intensity agriculture. Current land-use along the Proposed Grid Connection Route comprises public road corridor, public open space, discontinuous urban fabric, pastures, mixed forestry, and land principally used by agriculture with significant areas of natural vegetation. Land-use in the wider landscape of the site comprises a mix of agriculture, quarrying, low density residential and commercial forestry.

Due to the non-industrial nature of the Proposed Project 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 coal or oil-based power stations. Harnessing more energy by means of wind farms will reduce dependency on oil, gas and coal power stations, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor indirect emissions associated with the construction of the Proposed Project include vehicular and dust emissions.

10.1.2 Statement of Authority

This section of the EIAR has been prepared by Catherine Johnson and reviewed by Niamh McHugh and Sean Creedon, all of MKO. Catherine is an Environmental Scientist with MKO with over two years

of private consultancy experience and expertise in climate and sustainability matters. Catherine holds a BSc in Earth and Ocean Science and a LLM in Global Environment and Climate Change Law. Prior to joining MKO in 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise regarding international climate law and policy, earth processes, ocean science, and sustainability/ESG. Catherine has been involved in a myriad of environmental service offerings at MKO including EIA Screenings and Reports, climate and sustainability related work and renewable energy infrastructure projects. Niamh is a Project Environmental Scientist who has been working with MKO since June 2021. Niamh possesses a BSc (Hons) in Environmental Science from the National University of Ireland, Galway. Niamh has been involved in the compilation and production of a number of EIARs, mainly in the field of Renewables. Emily graduated from the National University of Ireland, Galway in 2022 with a B.Sc. in Environmental Science. Since beginning her work with MKO, Emily has been working as part of a large, multidisciplinary team in order to complete complex Environmental Impact Assessment Reports (EIARs) for largescale onshore wind energy developments, as well as other large renewable developments. Robert is an Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022.

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

10.1.3 Relevant Guidance

The air quality section of this EIAR is carried out in accordance with the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU and having regard, where relevant, to guidance listed below:

- Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document PE-ENV-01106 (Transport Infrastructure Ireland, December 2022)
- Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022).
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – June 2022' (EPA, 2022).
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report' (EC, 2017)
- Environmental Protection Agency (2023) Air Quality in Ireland Report 2022.
- Environmental Protection Agency (2021) Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects.
- European Environment Agency (2022) Air Quality in Europe 2022
- Guidance on the Assessment of Dust from Demolition and Construction V2.2 (IAQM 2024)
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII, 2011)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (TII, 2009)
- Rialtas na Éireann Clean Air Strategy for Ireland (April 2023)
- UK Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management, (LAQM) (DEFRA, 2018);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA

105 Air Quality (UKHA 2019)
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulphur Dioxide Global Update 2005 (WHO 2005).

10.2 Air Quality

10.2.1 Relevant Legislation

In 1996, the Air Quality Framework Directive (on ambient air quality assessment and management) (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 22 of 1999). The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene.
- The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive (2004/107/EC), published in 2004, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016).

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality and cleaner air for Europe) (as amended by Directive EU 2015/1480) which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for particulate matter less than 2.5 micrometres (µm), referred to as PM2.5, including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years for particulate matter less than 10µm (PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 10-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (µg/m3) and parts per billion (ppb). The notation PM10 is used to describe particulate matter or particles of 10µm or less (coarse particle) in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5µm (fine particles) in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016

(S.I. 659 2016). The 2011 Regulations superseded the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999). The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) was revoked on 31 December 2022 and has been replaced by the Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022).

10.2.2 Air Quality Standards

The recently implemented Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022) remains aligned to the CAFÉ Directive and diverts to the CAFÉ Directive for the Limit values outlined in Table 10-1, the Assessment Thresholds in Table 10-2, the Ozone limits and Assessment Thresholds in in Table 10-3 and Table 10-4 respectively and the other thresholds in Table 10-5.

Table 10-1 Limit values of the CAFÉ Directive 2008/50/EC, (Source: https://airquality.ie/information/air-quality-standards)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen monoxide	Protection of vegetation	Calendar year	30	16	Annual mean	19th Jul 2001

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
(NO) and nitrogen dioxide (NO_2)						
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	Not to be exceeded	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	Annual mean	1st Jan 2010

Table 10-2 Assessment Thresholds from CAFE Directive 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Basis of Application of Limit Value
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	Not to be exceeded more than 3 times in a calendar year
Sulphur dioxide (SO_2)	Lower assessment threshold for the	24 hours	50	Not to be exceeded more

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Basis of Application of Limit Value
	protection of human health			than 3 times in a calendar year
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	Not to be exceeded more than 18 times in a calendar year
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	Not to be exceeded more than 18 times in a calendar year
Particulate matter 10 (PM_{10})	Upper assessment threshold	24 hours	35	Not to be exceeded more than 35 times in a calendar year
Particulate matter 10 (PM_{10})	Lower assessment threshold	24 hours	25	Not to be exceeded more than 35 times in a calendar year
Lead (Pb)	Upper assessment threshold	Calendar Year	0.35	-
Lead (Pb)	Lower assessment threshold	Calendar Year	0.25	-
Carbon Monoxide (CO)	Upper assessment threshold	8 hours	7000	-
Carbon Monoxide (CO)	Lower assessment threshold	8 hours	5000	-
Benzene (C_6H_6)	Upper assessment threshold	Calendar Year	3.5	-
Benzene (C_6H_6)	Lower assessment threshold	Calendar Year	2	-

Ozone is set out differently in the CAFE Directive in that it sets target values and long-term objectives for ozone rather than limit values. Table 10-3 presents the target values and long-term target values for ozone and Table 10-4 details the threshold values for Ozone.

Table 10-3 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Long-Term Target Value from 2020
Protection of human health	Maximum daily 8-hour mean	120 µg/m^3 not to be exceeded more than	120 µg/m^3

Objective	Parameter	Target Value for 2010	Long-Term Target Value from 2020
		25 days per calendar year averaged over 3 years	
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 µg/m^3.h averaged over 5 years	6,000 µg/m^3.h

*AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m^3 and is expressed as g/m^3 hours.

Table 10-4 Threshold for Ozone Defined in Directive 2008/50/EC (source: https://airquality.ie/information/air-quality-standards and Directive 2008/50/EC)

Pollutant	Averaging Period	Threshold
Information Threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hour average	240 µg/m^3

On the 26th of October 2022 the EU Commission announced a proposed review of Air Quality Standards.[1] The proposed revision will set interim 2030 EU air quality standards, seeking to align more closely with WHO recommendations, while putting the EU on a trajectory to achieve zero pollution for air at the latest by 2050, in synergy with climate-neutrality efforts. To this end, regular reviews of the air quality standards are proposed to reassess them in line with latest scientific evidence as well as societal and technological developments. The first review is proposed to take place by the end of 2028, with the objective of ensuring full alignment with WHO recommendations.[2]

10.2.2.1 Air Quality and Health

In September 2023 the EPA published '*Air Quality in Ireland 2022*'[3] which reports that although air quality in Ireland is generally good and on track to meet the majority of 2030 EU Commitments for national emission levels, there are concerning localised issues. Fine particulate matter ($PM_{2.5}$) from solid fuel combustion and nitrogen dioxide (NO_2) from vehicle emissions are the main pollutants. People's health and the health of our environment is impacted by these pollutants. Ireland's ambition in the 'Clean Air Strategy for Ireland' (Section 10.2.2.1.1 below) is to move towards alignment with the WHO Air Quality guidelines, this will be challenging but will have a significantly positive impact on health.

The European Environmental Agency (EEA) Report, '*Air Quality in Europe 2022*'[4] report highlights the negative effects of air pollution on human health. The report assessed that poor air quality in Europe accounted for premature deaths of approximately 238,000 people in the 27 EU Member States in 2021. In 2020 in the European Union, 96% of the urban population was exposed to levels of fine particulate matter above the health-based guideline level set by the World Health organisation. Furthermore, in 2020 damaging levels of nitrogen deposition to ecosystems were exceed in 75% of the total ecosystems are in the EU-27. This represents a fall of 12% since 2005.

[1] *European Commission, Revision of the Ambient Air Quality Directives.* <https://environment.ec.europa.eu/topics/air/air-quality/revision-ambient-air-quality-directives_en>
[2] *Revision of the Ambient Air Quality Directives* <https://environment.ec.europa.eu/topics/air/air-quality/revision-ambient-air-quality-directives_en>
[3] *Air Quality in Ireland 2022* <https://www.epa.ie/publications/monitoring–assessment/air/air-quality-in-ireland-2022.php#:~:text=Circular%20Economy-,Air%20quality%20in%20Ireland%202022,on%20the%20air%20we%20breathe.>
[4] *Air Quality in Europe 2022* <https://www.eea.europa.eu/publications/air-quality-in-europe-2022>

The Office of Energy Efficiency and Renewable Energy in the United States published an article on August 24, 2023, entitled '*How Wind Can help Us Breathe Easier*.'[5] This article details the CO_2 emissions from different energy sources over the entire lifespan of the technology. It was found that wind energy produces around 11 grams of CO2 per kilowatt-hour (g CO_2/kWh) of electricity generated, compared with about 980 g CO_2/kWh for coal and roughly 465 g CO_2/kWh for natural gas. That makes coal's carbon footprint almost 90 times larger than that of wind energy, and the footprint of natural gas more than 40 times larger. During combustion of high-emitting energy sources, other air pollutants, i.e., nitrogen oxides (NOx) and sulphur dioxide (SO2), are also released into the atmosphere. This results in the emission of pollutants that can cause adverse health effects, including asthma, bronchitis, lower and upper respiratory symptoms, and heart attacks. As stated above, air pollution is responsible for a large number of premature deaths relating to these illnesses.

The EEA published a briefing[6] on Europe's air quality status in April 2023. This briefing presented the status of concentrations of pollution in ambient air in 2021 and 2022 for regulated pollutants in relation to both EU air quality standards and the 2021 WHO guideline levels. The assessment shows that, in spite of constant improvements, exceedances of air quality standards are common across the EU, with concentrations well above the latest WHO recommendations. Full validated data on air quality in Europe in 2022 will only be available later in 2023 and presented in the 2024 briefing.

These emissions, including sulphur oxides, carbon monoxide, benzene and lead are produced during fossil fuel-based electricity generation and traffic in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from site operations throughout the construction, operation and decommissioning of the Proposed Project, mitigation measures will be implemented at the Proposed Project to reduce the impact from dust and vehicle emissions, which are discussed in Section 10.2.4.6 below.

The EPA 2020 report '*Ireland's Environment – An Integrated Assessment*'[7] states that across Europe, the most problematic pollutants have consistently been particulate matter, nitrogen oxides and ozone. The EPA 2020 report goes on to state that:

> *"Ireland has excellent indigenous renewable energy resources, and renewable energy is playing an increasing role in the domestic energy supply. Ireland has more onshore (land-based) and offshore energy potential than most other European countries.*
>
> *The use of renewable energy reduces or eliminates generation losses, which are significant for combustion related generation. Reducing these losses also contributes to meeting energy targets and decarbonisation. Overall, reducing the loss and waste of energy has multiple* ***benefits for the climate and human health and wellbeing****."*

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

[5] *Office of Energy Efficiency and Renewable Energy (2023) How Wind Can Help Us Breathe Easier*
[6] *Europe's air quality status 2023 briefing.* <https://www.eea.europa.eu/publications/europes-air-quality-status-2023>
[7] *Ireland's Environment – An Integrated Assessment (2020)* <https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/state-of-environment-report-/>

10.2.2.1.1 Clean Air Strategy for Ireland 2023

Irelands Clean Air Strategy 2023[8] sets out the detail of seven strategic frameworks that will be used to ensure that air quality continues to improve (Figure 10-1). The aims of these key strategic frameworks are:

- To set appropriate targets and limits to ensure continuous improvements in air quality across the country, and to deliver health benefits for all.
- To ensure the integration of clean air considerations into policy development across Government.
- To increase the evidence base that will help Ireland to continue to evolve it's understanding of the sources of pollution and their impacts on health, in order to address them more effectively.
- To enhance regulation required to deliver improvements across all pollutants.
- To improve the effectiveness of our enforcement systems.
- To promote and increase awareness of the importance of clean air, and the links between cleaner air and better health.
- To develop the additional targeted/specific policy measures as required to deal with national or local air quality issues.

Figure 10-1 Seven Strategic Frameworks for Air Quality, with associated chapters in brackets. Reproduced as Figure 1 from Clean Air Strategy 2023

Chapter 11 of the Clean Air Strategy discusses Air Quality Policy Development. The chapter discusses energy policy and acknowledges how the State's accelerated transition to renewable electricity will be critical to successfully meeting the ambitious renewable energy and greenhouse gas emission reduction targets outlined in the European Green Deal and Ireland's Climate Action Plan 2023 (reaffirmed in the most recent Climate Action Plan (2024)), as well as to protecting against security of supply risks and removal of fossil fuels from power generation. Wind (offshore and onshore) and solar energy will be the leading cost-effective technologies to achieve our energy and emissions targets, as well as displacing emissions in other sectors, including household heating and vehicle transport. The targets of the Climate Action Plan 2024 and the European Green Deal are to deliver net-zero greenhouse gas

[8] *Rialtas na Éireann Clean Air Strategy April 2023. Available at: <https://www.gov.ie/en/publication/927e0-clean-air-strategy/#:~:text=The%20Clean%20Air%20Strategy%20provides,delivering%20on%20wider%20national%20objectives>*

emissions by 2050 and reduce GHG emissions to at least 55% by 2030, compared to 1990 levels. For further details on greenhouse gas emissions please refer to Chapter 11 of this EIAR.

10.2.3 Methodology

The assessment of the development footprint of the Proposed Project site, within this EIAR Chapter, is based on the maximum potential footprint for all of the infrastructural elements. This precautionary approach is taken as the assessment of the maximum development footprint will, in the absence of mitigation measures, give rise to the greatest potential for significant effects. Should the development footprint be less than the maximum, the potential for significant effects will also be reduced.

10.2.3.1 Air Quality Zones

The air quality zone for the site was selected, followed by a review of EPA collated baseline air quality data namely Sulphur Dioxide (SO_2), Particulate Matter (PM_{10}), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Ozone (O_3) for the selected air quality zone to determine the representative levels of such emissions for the Proposed Project.

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin
- Zone B: Cork
- Zone C: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the CAFE Directive, Framework Directive and Daughter Directives. The Proposed Project site lies within Zone D, which represents rural areas located away from large population centres.

10.2.3.2 Air Quality Data Review

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2022' was published by the EPA in 2023. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. These are detailed in the Section 10.2.4 below.

10.2.3.3 Dust

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) was considered in the dust impact assessment. The guidance document outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. This methodology has been used to predict the likely risk of dust as a result of the construction phase works, operational phase maintenance and monitoring activities and decommissioning phase. The use of UK guidance is considered best practice in the absence of applicable Irish guidance. The major dust generating activities are divided into four types within the IAQM guidance (2014) to reflect their different potential impacts. These are:

- Demolition (There are no demolition works required for any phase of the Proposed Project)
- Earthworks.
- Construction.

- Trackout.[9]

The magnitude of dust generating activities is divided into 'Large', 'Medium' or 'Small' scale depending on the nature of the activities involved. IAQM (2024) guidance provides example definitions for the scale of the activities, and these are applied for this development as outlined in Table 10-5.

Table 10-5 Description of magnitude for nature of activities

	Large	Medium	Small
Demolition	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12m above ground level	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months
Earthworks	Large: Total site area >110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height	Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height	Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height
Construction	Total building volume >75,000 m^3, on site concrete batching, sandblasting	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m
	Note: A vehicle movement is a one way journey. i.e. from A to B and excludes the return journey. HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average		

The earthwork requirements as outlined in Appendix 4-3 of this EIAR results in the classification of the Proposed Wind Farm as 'Large' for Earthworks and Construction activities. The Proposed Grid Connection Route falls under the classification of 'Medium' for Earthworks and 'Small' for Construction due to the lower volumes of construction material required. The number of heavy-duty vehicle movements per day, as outlined in Section 15.1 in Chapter 15 Material Assets of this EIAR, results in

[9] *The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when Heavy Goods Vehicles (HGVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HGVs transfer dust and dirt onto the road having travelled over muddy ground on site*

the classification of the Proposed Wind Farm as 'Large' and Proposed Grid Connection Route as 'Small' for Trackout activities.

The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities.

10.2.3.3.1 Defining the Sensitivity of the Area

For the purposes of this assessment, high sensitivity receptors are regarded as those properties where people are likely to spend most of their time and are referred to as 'Sensitive Receptors'. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.[10]

The IAQM (2024) guidance has outlined three types of effects to be considered:

- Sensitivities of People to Dust Soiling Effects
- Sensitivities of People to the Health Effects of PM_{10}
- Sensitivities of Receptors to Ecological Effects

Sensitivities of People to Dust Soiling Effects

Dust soiling effects can occur for a distance of 250m from works areas, but the majority of deposition occurs within the first 50m (IAQM, 2024). Table 10-6 below identifies the sensitivity of an area to dust soiling effects on people and their properties, relative to different receptor sensitivities.

Table 10-6 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Sensitivities of People to the Health Effects of PM_{10}

When assessing the sensitivity of people to the health effects of PM_{10}, the IAQM (2024) guidance recommends the use of sensitivities bands based on whether or not the receptor is likely to be exposed to elevated concentrations of PM_{10} over a 24-hour period. Table 10-7 below identifies the sensitivity of an area to human health effects of PM_{10}, relative to different receptor sensitivities. As indicated in Section 10.2.3.1 above, the Proposed Project is situated in Zone D. According to the 2021 EPA baseline air quality data[11]; the average PM_{10} for Zone D is 14µg/m^3. Therefore, the only annual PM_{10} concentration categorised in the IAQM (2024) guidance relevant to the Proposed Project is the minimum concentration of <24µg/m^3 (<14 µg/m^3 in Scotland).

[10] *Please see Section 7.3 (pg. 18) of the 2024 IAQM Guidance on the assessment of dust from demolition and construction (https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf) for full definitions of high, medium, and sensitive receptors for each of the three types of effects being considered*

[11] https://www.epa.ie/resources/charts–data/air/air-quality–pm10.php

Table 10-7 Sensitivity of the Area to Human Health Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>10	Low	Low	Low	Low
		1-10				
Low	-	≥1	Low	Low	Low	Low

Sensitivities of Receptors to Ecological Effects

Dust deposition due to demolition, earthworks, construction and trackout has the potential to physically and chemically affect sensitive habitats and plant communities. Table 10-8 below identifies the sensitivity bands to be used when assessing ecological impacts from dust deposition.

Table 10-8 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

The Proposed Project is located immediately south of the Slieve Bernagh Bog SAC and two Article 17 habitats are located immediately south of the Proposed Project, Active Blanket Bog and Dry Heath respectively.[12] Therefore, there are ecologically sensitive habitats within 50m of the Proposed Project, as described by the IAQM (2024) guidance. The receptor sensitivity is classified as high for ecological effects.

10.2.3.3.2 *Defining the Risk of Impacts*

The dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts with no mitigation applied. The matrices in Table 10-9 below provide a method of assigning the level of risk for each activity.

Table 10-9 Risk of Dust Impacts – Earthworks, Construction and Trackout (IAQM, 2024)

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

[12] https://www.npws.ie/sites/default/files/publications/pdf/Red%20List%20No.%2012%20Mammals.pdf

The significance rating of environmental effects from the EPA classification terminology as presented in Table 1-2 of Chapter 1 of this EIAR (and in Table 10-10 below) have been correlated with the equivalent risk rating from Table 10-9 above.

Table 10-10 Correlation of Impact Classification Terminology (EPA, 2022) to Risk Rating

EPA Term	EPA Description	Risk Rating
Imperceptible	An effect capable of measurement but without significant consequences	Negligible
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities	Low
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends	Medium
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment	High

The risk of dust impacts for the Earthworks, Construction and Trackout activities from the Proposed Project is summarised in Section 10.2.4 below.

10.2.4 Existing Air Quality

The air quality in the vicinity of the Proposed Project site is typical of that of rural areas in the southwest of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, *'Air Quality in Ireland 2022'*[13] was published by the EPA in September 2023. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. These are detailed in the following tables.

10.2.4.1 Sulphur Dioxide (SO2)

Sulphur dioxide data collected in 2022 at Cork Harbour, Kilkitt, Shannon Estuary/Askeaton, Edenderry and Letterkenny is presented in Table 10-11.

Table 10-11 Sulphur Dioxide Data for Zone D Sites in 2022

Parameter	Measurement
Annual Mean	5.0 ug/m^3
Hourly values > 350	0.0

[13] *EPA (2023). Air Quality in Ireland 2022.*

Parameter	Measurement
Hourly max (Average)	83.6 ug/m^3
Daily values > 125	0.0
Daily max (Average)	22.8 ug/m^3

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can be observed from Table 10-11 the average maximum hourly value recorded during the assessment period was 83.6 µg/m^3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO_2 values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites above.

10.2.4.2 Particulate matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, dust from soil and road surfaces, construction works and industrial emissions. The Air Quality in Ireland 2022 report provides annual mean PM_{10} concentration for sixteen Zone D towns: Tipperary Town, Carrick-on-Shannon, Askeaton, Enniscorthy, Birr, Macroom, Castlebar, Cobh Carrignafoy, Claremorris, Kilkitt, Cavan, Roscommon Town, Edenderry, Mallow, Longford, Cobh Cork Harbour and Killarney. Particulate matter (PM_{10}) data for 2022 is presented in Table 10-12.

Table 10-12 Particulate Matter (PM_{10}) Data for Zone D Sites in 2022

Parameter	Measurement
Annual Mean	12.7 ug/m^3
% Data Capture (Average)	93.2%
Values > 50 ug/m^3	Max 10 Exceedances
Daily Max (Average)	56.5 ug/m^3

The daily limit of 50 µg/m^3 for the protection of human health was exceeded on 40 days which is greater than the PM_{10} daily limit for the protection of human health of a max of 35 days >50 µg/m^3 applicable from 2005. The greatest number of exceedances occurred at Edenderry where the PM_{10} daily limit was exceeded on 10 occasions. In the Air Quality in Ireland 2022 report, it notes that there were EPA breaches in the level of particulate matter which in Ireland mainly comes from the burning of solid fuel, such as coal, peat, and wood to heat homes. It is expected, based on a comparison of the monitoring location in Edenderry and the rural nature of the Proposed Project site, that the PM10 values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites above.

10.2.4.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data for Emo Court, Birr, Castlebar, Carrick-on-Shannon, Kilkitt, and Edenderry in 2022 is presented in Table 10-13.

Table 10-13 Nitrogen Dioxide Data for Zone D Sites in 2022

Parameter	Measurement
Annual Mean (Average)	7.4 ug/m^3

Parameter	Measurement
NO_2 Values >200	0.0
Values > 140 (UAT)	1
Values >100 (LAT)	4
Hourly Max. (Average)	87.3 ug/m^3

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. The lower assessment threshold of 100 µg/m3 was exceeded 4 no. times during the monitoring period in Emo Court, Co. Laois and the upper assessment threshold of 140 µg/m3 was exceeded once during the monitoring period, also in Emo Court, Co. Laois. Both did not exceed the 18 days limit during the monitoring period. In 2022, no other monitoring locations in Zone D had exceedances in the lower and upper assessment thresholds of 100 and 140 µg/m3. The average hourly max. NO_2 value of 87.3 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It is expected based on professional judgement that NO_2 values at the site is similar or lower than those recorded for the Zone D sites above.

10.2.4.4 Carbon Monoxide (CO)

The Air Quality in Ireland 2022 report provides rolling 8-hour carbon monoxide concentrations for Birr, a Zone D site. Carbon Monoxide data for 2022 is presented in Table 10-14.

Table 10-14 Carbon Monoxide Data for Birr - Zone D Site in 2022

Parameter	Measurement
Annual Mean (Average)	0.8 mg/m^3
Median	0.7 mg/m^3
% Data Capture	95.9%
Values > 10	0.0
Max	3.4 mg/m^3

The average concentration of carbon monoxide was 0.8 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10 mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/50/EC. It would be expected that CO values at the Proposed Project site would be similar or lower than those recorded for the Zone D site above.

10.2.4.5 Ozone (O_3)

The Air Quality in Ireland 2022 report provides rolling 8-hour ozone concentrations for seven Zone D sites, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. Ozone (O_3) data for 2022 is presented in Table 10-17. As can be observed from Table 10-15 there were 17 no. exceedances of the maximum daily eight-hour mean limit of 120 µg/m3. The CAFE Directive stipulates that this limit should not be exceeded on more than 25 days per calendar year, averaged over 3 years. It would be expected that O_3 values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites below.

Table 10-15 Ozone Data for Zone D Sites in 2022

Parameter	Measurement
Annual Mean	61.7 µg/m^3
Median	62.2 µg/m^3
% Data Capture	89.5%
No. of days > 120	17 days

10.2.4.6 Dust

There are no statutory limits for dust deposition in Ireland. However, the EPA guidance suggest that a deposition of 10mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240mg/m^2/day. The EPA recommend a maximum daily deposition level of 350mg/m^2/day when measured according to the German TA-Luft standard (maximum permissible emission level for dust deposition of 350 mg/m^2/day). This limit value can also be implemented with regard to dust impacts from construction activities associated with the Proposed Project.

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, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

The potential dust-related effects on local air quality and the relevant associated mitigation measures during the construction, operational and decommissioning phases of the Proposed Project are presented in Section 10.3 below.

10.3 Likely Significant Effects and Associated Mitigation Measures

10.3.1 'Do-Nothing' Effect

If the Proposed Project were not to proceed, the current agricultural and forestry practices would likely continue, and the air quality would likely remain similar to current status recorded for Zone D areas. However, the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than renewable energy sources, such as the Proposed Wind Farm. This will result in an indirect negative impact on air quality nationally, regionally and locally.

If the Proposed Wind Farm were not to proceed, the opportunity to capture part of Clare's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions.

10.3.2 Construction Phase

10.3.2.1 Exhaust Emissions

Proposed Project Infrastructure

The construction of the Proposed Wind Farm (i.e., turbines, meteorological mast, substation, site roads and other onsite infrastructure) (as outlined in Chapter 4 of this EIAR) will require the operation of construction vehicles and plant on and off-site, and the transport of workers to and from the Proposed Wind Farm. Exhaust emissions associated with vehicles and plant such as NO_2, Benzene and PM_{10} will arise as a result of construction activities. This potential effect will not be significant and will be restricted to the duration of the construction phase and localised to works areas. Therefore, this is considered a short-term slight negative effect. Mitigation measures to reduce this impact are presented below.

The construction of the Proposed Grid Connection Route to the existing Ardnacrusha 110kV substation will require the use of construction machinery, thereby giving rise to exhaust emissions. This is a short-term, slight, negative effect, which will be reduced through use of the best practice mitigation measures as presented below.

Transport to and from Proposed Project site

The transport of turbines and construction materials, waste, and workers to and from the Proposed Project site, (see Section 15.1 of this EIAR) will also give rise to exhaust emissions associated with the transport vehicles. This constitutes a short-term moderate negative effect in terms of air quality. Mitigation measures in relation to exhaust emissions are presented below.

Mitigation:

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise. If a vehicle requires repair, this work will be carried out off site, thereby minimising any emissions that arise.
- Turbines and construction materials will be transported to the site on specified routes only, unless otherwise agreed with the Planning Authority.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The expected waste volumes generated onsite are unlikely to be large enough to warrant source segregation at the Proposed Project site. Therefore, all wastes streams generated onsite will be deposited into a single waste skip which will be covered. This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.
    - The MRF facility will be as close as possible to the site to reduce the amount of emissions associated with vehicle movements.

Residual Effect

Following implementation of the mitigation measures above, residual impacts of exhaust emissions for the construction phase of the Proposed Project will have a short-term slight negative effect.

Significance of Effects

Based on the evaluation above there will be no significant direct or indirect effects on air quality due to the construction of the Proposed Project.

10.3.2.2 Dust Emissions

Proposed Project Infrastructure

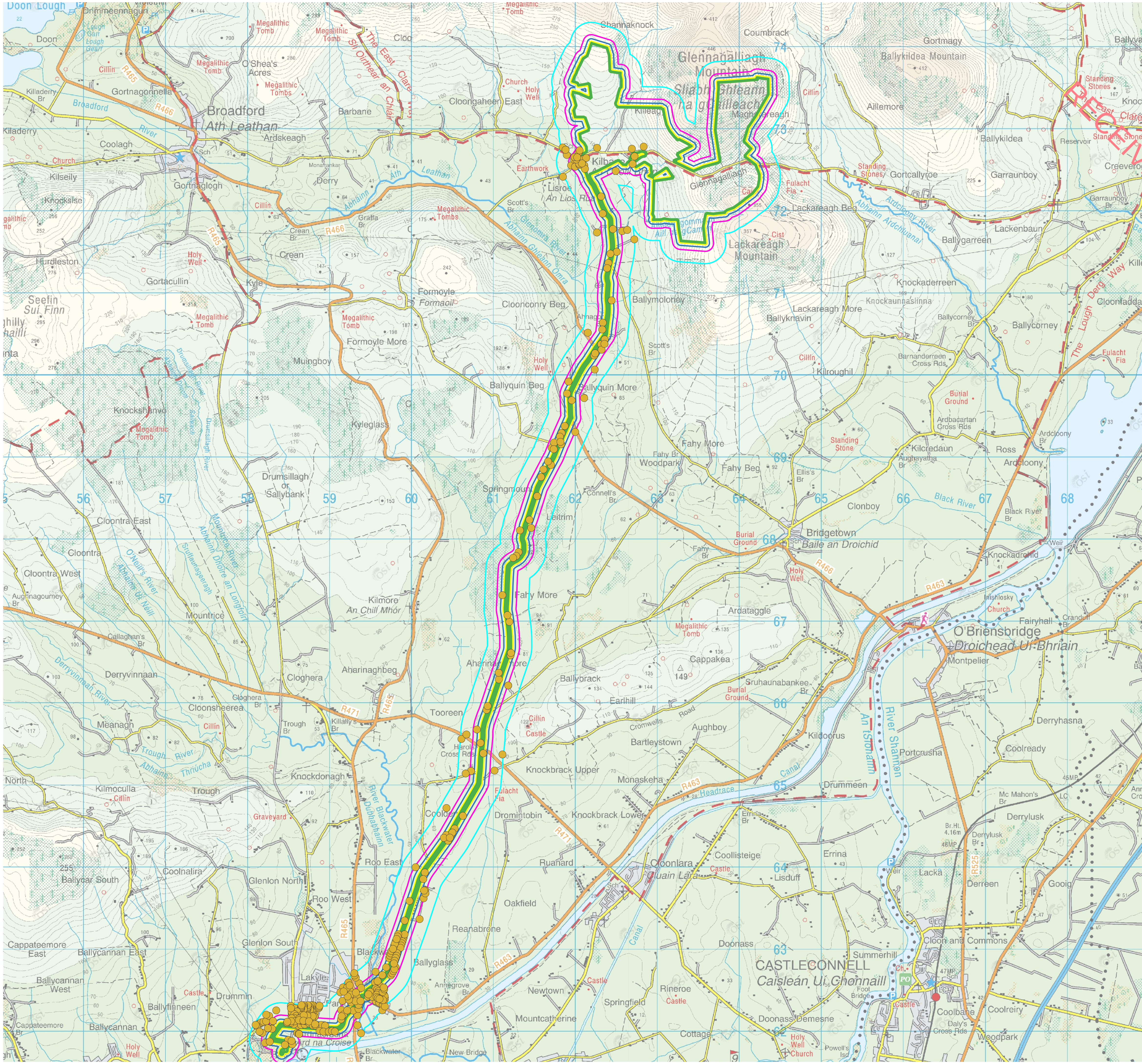
The construction of the Proposed Wind Farm (i.e. turbines and associated foundations and hard-standing areas, 38kV electrical substation, meteorological mast, access roads, temporary construction compound, underground cabling, site drainage, tree felling, and all ancillary works and apparatus as outlined in Chapter 4 of this EIAR) will give rise to dust emissions during the construction phase. In order to accommodate the delivery of turbine components, accommodation works will be required at various locations on the national and regional road network between the port of arrival in Foynes (Shannon) Co. Limerick and the Proposed Wind Farm site. These will be limited to temporary measures including temporary local road widening, overruns of roundabout island and temporary relocation of some signs and street furniture. The locations of the accommodation areas are shown in Figure 4-23 and further detailed in Section 4.5.3.1 of Chapter 4 of this EIAR.

The excavation of the Proposed Grid Connection Route trench will give rise to localised dust emissions. Due to the nature of the proposed construction works along the Proposed Grid Connection Route, as described in Chapter 4 of this EIAR, which is termed a 'rolling' construction site, meaning that these works will not be concentrated in any one area of the route for any considerable length of time.

There are a number of sensitive receptors within the vicinity of the Proposed Project. Some receptors may experience soiling and deposition of vegetation effects depending on how close to the construction works they are located.

The IAQM methodology for *the Assessment of Dust from Demolition and Construction* as discussed in Section 10.2.3.3 is used to predict the likely risk of dust impacts as a result of the construction works. Dust deposition impacts can occur for a distance of 350m from works areas, but the majority of deposition occurs within the first 50m (IAQM, 2024). As discussed in Section 10.2.3.3, Sensitive Receptors were derived from the constraint's identification and mapping process, and a detailed and updated planning search which informed the sensitive property dataset. The sensitive receptors located within the appropriate distance from potential dust emission sources, provided by the 2024 IAQM Guidance, are detailed below and can be seen in Figure 10-2.

- There are 12 no. Sensitive Properties within 20m of the Proposed Wind Farm (3 of which are involved landowners, H004, H014, H026); and 94 sensitive properties within 20m of the Proposed Grid Connection Route;
- There are 2 no. Sensitive Properties within 50m of the Proposed Wind Farm; and 49 sensitive properties within 50m of the Proposed Grid Connection Route;
- There are 6 no. Sensitive Properties within 100m of the Proposed Wind Farm; and 44 sensitive properties within 100m of the Proposed Grid Connection Route;
- There are 4 no. Sensitive Properties within 250m of the Proposed Wind Farm; and 109 sensitive properties within 250m of the Proposed Grid Connection Route; where construction activities with the potential to generate dust can occur.



Map Legend

- EIAR Site Boundary
- Sensitive Properties
- 20m IAQM Dust Deposition Band
- 50m IAQM Dust Deposition Band
- 100m IAQM Dust Deposition Band
- 250m IAQM Dust Deposition Band

Drawing Title
IAQM Dust Deposition Bands and Relevant Sensitive Properties for Assessment

Project Title
Lacakreagh Wind Farm, Co. Clare

Drawn By	Checked By
CJ	NMcH
Project No. 220245	**Drawing No.** Figure 10-2
Scale 1:45,000	**Date** 2024-05-30

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

As per the criteria in Table 10-16 below, the overall sensitivity of the area to dust soiling impacts is **Medium**. For the construction phase, the impact from dust emissions is considered to be a short term, slight negative effect.

Table 10-16 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 10-17 below identifies the sensitivity of people in the area surrounding the development footprint of the Proposed Project to the health effects of PM_{10}, as described in Section 10.2.4.2 above. The overall sensitivity of the area to human health effects of PM_{10} is considered to be **Low**. As indicated in Section 10.2.3.1 above, the Proposed Project is situated in Zone D. According to the 2021 EPA baseline air quality data[14]; the average PM_{10} for Zone D is 14µg/m^3. Therefore, the only annual PM_{10} concentration categorised in the IAQM (2024) guidance relevant to the Proposed Project is the minimum concentration of <24µg/m^3 (<14 µg/m^3 in Scotland).

Table 10-17 Sensitivity of the Area to Human Health Impacts from Proposed Wind Farm site construction works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>10	Low	Low	Low	Low
		1-10				
Low	-	≥1	Low	Low	Low	Low

As per the criteria in Table 10-18 below, the overall sensitivity of the area to ecological impacts is **high** when assessed with no mitigation applied for the major dust generating activities during the construction phase. Therefore, the potential effects of on ecological receptors from the construction phase of the Proposed Project are considered to be equivalent to a short-term, moderate effect.

Table 10-18 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50

[14] https://www.epa.ie/resources/charts–data/air/air-quality–pm10.php

High	High	Medium
Medium	Medium	Low
Low	Low	Low

As identified in Section 10.2.3.3 above, the Proposed Project is classified as 'Large' for Earthworks, Construction and Trackout activities. Therefore, when combined with the sensitivity of the area, using Tables 10-16, 10-17 and 10-18 above as guidance, the pre-mitigation risk of impacts from the Proposed Project is summarised in Table 10-19 below

Table 10-19 Summary Dust Risk Table for Proposed Wind Farm site Activities (IAQM, 2024)

Potential Impact	Dust Emission Magnitude			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	Medium Risk	Medium Risk	Medium Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk
Ecological	N/A	High Risk	High Risk	Medium Risk

The overall risk of dust emission impacts with no mitigation applied for the major dust generating activities during the construction phase of the Proposed Project is **Medium**. Therefore, the potential effects of dust from the construction phase of the Proposed Project are considered to be equivalent to a short-term, moderate effect.

Transport to and from the Proposed Project site

In order to accommodate the delivery of turbine components and other abnormal loads, temporary accommodation works will be required at 1 no. locations along the delivery route in the townland of O'Briensbridge, Co. Clare. Excavation works associated with the temporary accommodation works will give rise to localised dust emissions.

There is 1 no. residential dwelling located 50m from the accommodation works proposed in the townland of O'Briensbridge. Upon completion of the construction phase of the Proposed Project, the temporary accommodation works occurring in O'Briensbridge will be decommissioned and the previous land use will be reinstated. These works are considered to be short-term and will have a slight negative effect. Mitigation measures to reduce this effect are discussed below.

The transport of construction materials and waste to and from the Proposed Project site will give rise to some localised dust emissions during periods of dry weather. This is a short-term slight negative impact. Mitigation measures to reduce the significance of this effect are presented below.

Mitigation

- A wheel wash facility will be installed within the Proposed Project and will be used by vehicles before leaving site.
- In periods of extended dry weather, dust suppression may be necessary along the haul roads, site roads, Proposed Grid Connection Route, road widening sections, onsite 38kV substation, and construction compounds to ensure dust does not cause a nuisance. If necessary, such as during periods of dry weather, de-silted water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads, turbine bases, and site compounds to prevent the generation of dust where required.

- Water bowser movements will be carefully monitored by the Ecological Clerk of Works to avoid, insofar as reasonably possible, increased runoff as outlined in the Construction and Environmental Management Plan (CEMP, Appendix 4-3).

- Areas of excavation will be kept to a minimum and stockpiling of excavated material will be minimised by coordinating excavation, placement of material in peat and spoil management areas.
- Turbines components and construction materials will be transported to the Proposed Wind Farm on specified haul routes only, as agreed with the local authority.
  - The transportation of construction materials from locally sourced quarries for the Proposed Project will be covered by tarpaulin where necessary
- The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as deemed necessary by the construction Site Supervisor/Site Manager.
- The transport of construction materials may have the potential to generate dust in dry weather conditions. Roads will be watered down to suppress dust particles in the air as deemed necessary by the Site Supervisor/Manager.
- A CEMP will be in place throughout the construction phase (see Appendix 4-3). The CEMP includes dust suppression measures.

Residual Effect

Following implementation of the mitigation measures above, residual effects of dust emissions for the construction phase of the Proposed Project will have a short-term imperceptible negative effect.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to dust emissions during the construction phase of the Proposed Project.

10.3.3 Operational Phase

10.3.3.1 Exhaust Emissions

The operational phase of the Proposed Project will generate additional traffic to the area in the form of light goods vehicles (LGVs) visiting the Proposed Wind Farm. Once the Proposed Wind Farm is operational it is estimated that there will be 1-2 staff members employed on site with a similar number of vehicle trips. It is also likely that the Proposed Wind Farm will attract some recreational trips, although it is expected that visitor numbers will be low. It is considered that the traffic impact during this phase will be imperceptible. On occasion, HGVs maybe required to visit the Proposed Wind Farm for maintenance/substation component replacement. On occasion, the removal of hydrocarbons (transformer oil) and waste from substation welfare facilities will be removed from the Proposed Wind Farm by a licenced waste disposal company.

The permanent onsite 38kV substation and battery energy storage system will be operated and maintained by ESB. It is anticipated that impacts on traffic movements on the surrounding local highway network will be negligible given that there will only be 1-2 daily trips made to the Proposed Grid Connection Route.

The addition of a LGV to the area 1-2 times per day during the operational phase will give rise to a long-term imperceptible negative impact on air quality. The addition of several HGVs on occasion over the 35-year lifetime of the Proposed Project will give rise to a long-term imperceptible negative effect on air quality.

In addition to the above, the Proposed Project site will continue to be used as a working farm and for commercial forestry and therefore farm machinery and machinery required for tree felling will continue to utilise the site as required.

Mitigation

- Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.

Residual Effects

Following implementation of the mitigation measures above, residual effects of exhaust emissions for the operational phase of the Proposed Project will have a long-term imperceptible negative effect.

Significance of Effects

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

10.3.3.2 Dust Emissions

As discussed above in Section 10.3.3.1, the operational phase of the Proposed Project will generate additional traffic to the area in the form of LGVs 1-2 visits per day and on occasion, daily LGVs and HGVs for short periods if maintenance or component replacement is required. This additional traffic may give rise to dust emissions. This will be a long-term imperceptible negative impact on air quality due to dust emissions.

Mitigation Measures

- Maintenance vehicles brought onsite during the operational phase will be maintained in good operational order, thereby minimising any dust emissions that arise.
- Waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.
    - The MRF facility will be local to the site to reduce the emissions associated with vehicle movements.

Residual Effect

Based on the above, the residual effect on air quality from dust emissions during the operational phase is a long-term imperceptible negative effect.

Significance of Effects

Based on this assessment above the effects on air quality from dust emissions generated at the Proposed Project during the operational phase will be imperceptible.

10.3.3.3 Air Quality

Although a long term negative imperceptible impact on air quality is expected during the operational phase due to exhaust and dust emissions from maintenance vehicles, there will be no net carbon dioxide (CO_2) emissions from operation of the Proposed Project. The Proposed Wind Farm, by

providing an alternative to electricity derived from coal, oil, or gas-fired power stations, will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide SO_2. The production of renewable energy from the Proposed Wind Farm will have a long-term moderate positive effect on air quality due to the offsetting of approximately 32,565 tonnes of CO_2eq per annum. Please see Chapter 11 Climate for further details on carbon displacement calculations.

Residual Effect

The overall residual effect will be a long-term moderate positive effect on air quality due to the offsetting of approximately 32,565 tonnes of CO_2 per annum (see Chapter 11 for details), due to the provision of renewable energy in the range of approximately 35,770 Irish households with electricity per year.

Significance of Effects

Based on the assessment above there will be a long-term moderate positive effect on air quality due to the operation of the Proposed Project.

10.3.3.3.2 *Human Health*

Whilst the operational phases of the Proposed Project will give rise to minor increases in dust and vehicle emissions, the implementation of the mitigation measures discussed above, and good management practices can prevent or minimise potential effects off-site. Good management practice consists of good site design and layout, adopting appropriate working methods, choosing the right equipment and ensuring that the workforce understands the company's responsibilities and is familiar with good working practice and dust suppression techniques. The potential for health effects are considered negligible as the potential for both exhaust and dust emissions will be limited and controlled through site layout design and mitigation measures.

Exposure to chemicals such as SO2 and NOx, Pb, benzene and O3 are thought to be harmful to human health. The production of clean renewable energy from the Proposed Wind Farm will offset the emission of these harmful chemicals by fossil fuel powered sources of electricity and, therefore, will have a long term slight positive impact on human health. Further information on the impact of the Proposed Project on human health is contained in Chapter 5: Population and Human Health.

Residual Effect

Residual effect on human health during the operational phase of the Proposed Project will have a long-term slight positive effect.

Significance of Effects

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

10.3.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Wind Farm are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the Proposed Project may be decommissioned fully.

The works required during the decommissioning phase are described in Section 4.9 in Chapter 4: Description of the Proposed Project. Any impact and consequential effects that occur during the decommissioning phase are similar to that which occur during the construction phase, be it of less

impact. The Proposed Grid Connection Route will be left in situ in the public roadway; thus, no works will be required for this during the decommissioning phase. Likewise, the substation will remain onsite resulting in no additional truck movements or requirement for demolitions and removal works for this piece of infrastructure. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts.

A Decommissioning Plan is included as in Appendix 4-7 of this EIAR for the decommission of the Proposed Project, the detail of which will be agreed with the local authority prior to any decommissioning. Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts. The potential for effects during the decommissioning phase of the Proposed Project has been fully assessed in this EIAR and Appendix 4-7.

10.3.5 Cumulative Assessment

Potential cumulative effects on air quality between the Proposed Project and other permitted or proposed projects and plans in the area, (wind energy or otherwise), as set out in Section 2.9 in Chapter 2 of this EIAR, were also considered as part of this assessment. The other plans and projects considered as part of this cumulative assessment are presented in Appendix 2-2 of this EIAR, with relevant developments within 1km of the Proposed Wind Farm site and Proposed Grid Connection Route presented below in Table 10-20. This is in line with the Transport Infrastructure Ireland (TII) Publication Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107, December 2022. Forestry operations in the townlands of Fahymore, Killokennedy, and Lackareagh have also been. The cumulative project list was prepared following a review of planning files (An Board Pleanála and Local Authority files), EPA search engines, development plans and National Roads Office/Transport Infrastructure Ireland road projects.

Table 10-20 Other Plans and Projects with the potential to cause cumulative effects on air quality alone and in combination with the Proposed Project

Planning Ref.	Description	Decision
317227	Development of a wind farm together with the development of an underground grid connection cable to the national grid. The development will consist of 8 wind turbines, a permanent meteorological mast, an onsite 38kV electrical substation, and all associated site works. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been submitted with the application	Grant Permissions with Conditions
318505	Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan windfarm to the existing 110kV substation at Ardnacrusha.	Case is due to be decided by 23/05/2024
318846	The erection of a temporary 100m high lattice type meteorological mast for a period of 5 years which also includes a hardstanding area and all ancillary works.	Case is due to be decided by 20/05/2024

In addition to the Proposed Project, the following permitted and proposed developments are acknowledged to have permitted or proposed grid connection underground cabling routes connecting to the Ardnacrusha 110kV substation:

- Proposed Knockshanvo Wind Farm
- Permitted Carrownagowan Wind Farm
  - Grid connection assessed in EIAR supporting the planning application to An Bord Pleanála, however this project component was not part of the planning application
- Permitted Fahy Beg Wind Farm

10.3.5.1 Construction Phase

10.3.5.1.1 *Air Quality*

During the construction phase of the Proposed Project and other permitted or proposed projects and plans in the area, there will be minor emissions from construction plant and machinery and potential dust emissions associated with the construction activities. However, once mitigation proposals, as outlined in Section 10.3.2 are implemented during the construction phase of the Proposed Project, there will be no cumulative negative effect on air quality.

As established above in Section 10.3.2, there are temporary to short-term, imperceptible to slight negative effects on air quality during the construction phase from:

- Exhaust emissions during the construction of turbines, spoil management areas, substation and all other supporting infrastructure;
- Exhaust emissions through vehicle transit to and from the Proposed Project site;
- Dust emissions during the construction of turbines, spoil management areas, substation and all other supporting infrastructure;
- Dust emissions through vehicle transit to and from the Proposed Project site.

Therefore, it is considered there will be no cumulative effects on air quality, should other proposed or consented projects within the surrounding landscape be constructed in parallel with the Proposed Project.

10.3.5.2 Operational Phase

10.3.5.2.1 *Air Quality*

There will be no net carbon dioxide (CO_2) emissions from operation of the Proposed Project. Exhaust emissions of carbon dioxide (CO_2), oxides of nitrogen (NO_x), sulphur dioxide (SO_2) or dust emissions during the operational phase of the Proposed Project 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.

As established above in Section 10.3.3, there will be a long-term imperceptible negative effect on air quality from:

- Exhaust emissions from maintenance LGV vehicles visiting the Proposed Project site 1-2 times per day station infrastructure replacement.
- Dust emissions from maintenance LGV vehicles visiting the Proposed Project site 1-2 times per day and on occasion more frequent LGV and HGV visits during component or substation infrastructure replacement.

As established above in Section 10.3.3, post-mitigation, there will be an overall long-term moderate positive effect on Air Quality from:

- The provision of an alternative to electricity derived from coal, oil, or gas-fired power stations. The Proposed Project will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2). The production of renewable energy from the Proposed Project will have a long-term significant positive impact on air quality due to the offsetting of approximately 32,565 tonnes of Carbon Dioxide (CO_2) per annum. Please see Chapter 11 Climate for further details on carbon displacement calculations.

Therefore, it is considered there will be no measurable negative cumulative effects on air quality should other proposed or consented plans and within the surrounding landscape be operational in parallel with the Proposed Project. However, once the Proposed Project is operational, there will be a long-term, moderate, positive impact on air quality.

10.3.5.3 Decommissioning Phase

The works required during the decommissioning phase are described in Section 4.10 of Chapter 4 of this EIAR. Any cumulative impact and associated effect that occur during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential cumulative effects.