

18 AIR QUALITY AND CLIMATE

This chapter has been reviewed and updated where necessary considering any subsequent modifications, updates and additional information acquired for the Further Information Request issued by Louth County Council (LCC) on the 6th February 2025 (Reference No: 2460766). It is noted that for ease of reference all changes from the original chapter are shown in orange. Where text has been removed it is shown as ~~strikethrough~~.

Following a review of the proposed development based on the Request for Further Information, it has been determined that site entrance 4 is not required for the construction, operation and decommissioning of the proposed development, as all works can be accommodated via the proposed site entrances 1-3. Therefore, it is proposed that entrance 4 will not be taken forward as part of the proposed development, and the initially proposed use of entrance 4 will instead be accommodated at entrance 2. The author of this chapter has reviewed the revision, and no implications for the assessment presented in this chapter have been identified.

After a review of the RFI documentation as outlined in Chapter 1 Introduction, please note that this chapter does not require any modifications or changes.

18.1 INTRODUCTION

This chapter assesses the impacts of the Proposed Development (**Figure 1.2**) on air quality and on climate in **Section 18.2** and **18.4** respectively. The Proposed Development refers to all elements of the application for the construction of Kellystown Wind Farm (**Chapter 2: Description of the Proposed Development**). Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment assesses the potential effects during the following phases of the Proposed Development:

- Construction of the Proposed Development
- Operation of the Proposed Development
- Decommissioning of the Proposed Development

Common acronyms used throughout this EIAR can be found in **Appendix 1.3**. This chapter of the EIAR is supported by Figures provided in Volume III and by the following Appendix documents provided in Volume IV of this EIAR:

- **Appendix 18.1** Scottish Government – Carbon Calculator Input and Output Data

18.1.1 Statement of Authority

Jennings O'Donovan & Partners Ltd. (JOD) have extensive experience in all aspects of wind farm development, from design and planning stages through to construction. JOD

have been active as engineering consultants in the wind energy market in Ireland since 1998 and have completed numerous wind farm projects, varying from single wind turbine installations to large-scale, multi-turbine developments with a total of over 2,000 MW generation capacity.

This chapter has been prepared by Environmental Scientists of Jennings O'Donovan & Partners Ltd; Mr. Darren Timlin (Bachelor Hons. Degree in Environmental Science from Atlantic University of Sligo), Ms. Angelika Thiel (Bachelor's Degree in Geography from the Leibniz University of Hannover, Germany) and Ms. Aisling Layden (PhD research in Global Lake Climatology and MSc in Environmental Sustainability from The University of Edinburgh). This chapter has been reviewed by David Kiely, Director of JOD (MSc in Environmental Protection from IT Sligo and Bachelor of Engineering in Civil Engineering from University College Dublin).

This Chapter was reviewed considering any subsequent modifications, updates and additional information acquired for the Further information Request issued by Louth County Council (LCC) on the 6th February 2025 (Reference No: 2460766) by Mr. Ryan Mitchell an Environmental Scientists at Jennings O'Donovan & Partners Ltd.

Detailed biographies/CVs of those of those who contributed to the preparation of this EIAR have been included in **Appendix 1.1: Author Qualifications**.

18.1.2 Background and Objectives

Air quality in Ireland is generally of a high standard across the country and is amongst the best in Europe; however, levels of some pollutants remain of concern, with those produced by traffic approaching limit values in urban areas. The combustion of fossil fuels for energy results in the release of several gases which contribute to climate change and acid rain, including carbon dioxide (CO₂), sulphur dioxide (SO₂), nitrogen oxides (NO_x), and Particulate Matter (PM₁₀ and PM_{2.5}).

The factors that indicate climate change are well established in Ireland, with increased air temperatures, sea level rises and changes in precipitation patterns. In 2005, greenhouse gas emissions data estimated that Ireland was 25.4% above 1990 levels. Emissions data from 2007 show that Ireland was 24.6% above the level for 1990 (the base year for Kyoto targets). By 2013, total emission levels in Ireland had dropped back almost to 1990 levels, largely as a result of the economic downturn, with indications that individual households

had reduced their emissions (EPA, 2014)¹. However latest EPA greenhouse gas emissions projections indicate an overall increase in greenhouse gas emissions from most sectors. The projected growth in emissions is largely underpinned by projected strong economic growth and relatively low fuel prices leading to increasing energy demand over the period². The EU Commission has also imposed targets on Ireland's emissions. Ireland's target is to reduce Effort Sharing Regulation (ESR) emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this. This value is the national total emissions less emissions generated by stationary combustion and aviation operators that are within the EU's emissions trading scheme. This indicates that Ireland is not in compliance with its 2023 Effort Sharing Regulation annual limit, exceeding the allocation by 2.27 Mt CO₂eq after using the ETS flexibility³.

This chapter assesses the following as per the EIA Directive:

- The air quality environment of the area of the Proposed Development site and the potential effects on air quality during the construction, operation and Decommissioning phases of the Project. This assessment includes mitigation measures, residual effects and cumulative impacts of the Project.
- The climatic environment of the area of the Proposed Development site and the potential effects on climate through GHG emissions during the construction, operation and Decommissioning phases of the Project. This assessment includes mitigation measures, residual effects and cumulative impacts of the Project.

18.1.3 Relevant Legislation and Guidance

- The Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC), as amended by Commission Directive (EU) 2015/1480
- 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).
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – June 2022 (EPA, 2022).
- Environmental Protection Agency (2023) Air Quality in Ireland Report 2022

¹ Environmental Protection Agency "Air Quality in Ireland 2014 - Key Indicators of Ambient Air Quality" Available at: <https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2014.php> [Accessed 23/09/2024]

² Environmental Protection Agency "Ireland's Greenhouse Gas Emissions Projections 2017-2035 Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA_2018_GHG_Emissions_Projections_Summary_Report.pdf [Accessed: 23/09/2024]

³ Environmental Protection Agency "Latest emissions data (2023) Available at: <https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/> [Accessed: 23/09/2024]

- WHO global air quality guidelines (2021) Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide <https://www.who.int/publications/i/item/9789240034228>
- WHO Air Quality Guidelines, Global Update 2005, Particulate matter, ozone, nitrogen dioxide and sulfur dioxide
- IAQM (2024) Guidance on the assessment of dust from demolition and construction, version 2.2
- IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning, Institute of Air Quality Management. 2016.

18.1.3.1 Background to the Relevant Legislation and Guidance

The Ambient Air Quality and Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC), as amended by Commission Directive (EU) 2015/1480 incorporates revised provisions for sulphur dioxide (SO₂), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), benzene (C₆H₆) and carbon monoxide (CO). This replaced the Air Quality Framework Directive (96/62/EC) and first three Daughter Directives (1999/30/EC, 2000/69/EC, 2002/3/EC). The Fourth Daughter Directive (2004/107/EC) will be incorporated into the CAFE Directive at a later date and stands alone as a separate EU Directive.

The Fourth Daughter Directive (2004/107/EC) relates to arsenic (As), cadmium (Cd), nickel (Ni), and mercury (Hg) and polycyclic aromatic hydrocarbons (PAH) in ambient air and has been 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)'.

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 Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), (as amended by Directive EU 2015/1480) 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 PM_{2.5} (fine particulate matter) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.

- The possibility for time extensions of three years (for particulate matter PM₁₀) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

18.1.4 Assessment Structure

In line with the revised EIA Directive and current EPA guidelines listed in **Chapter 1, Section 1.7** the structure of this Air Quality and Climate chapter is as follows:

- Description of baseline conditions at the site;
- Do Nothing Impact Assessment
- Identification and assessment of impacts to air quality and climate associated with the Project, during the construction, operational and Decommissioning phases of the Project;
- Mitigation measures to avoid or reduce the impacts identified;
- Identification and assessment of residual impact of the Project considering mitigation measures, and
- Identification and assessment of cumulative impacts if and where applicable.

The assessments undertaken for this chapter are considered adequate to allow the Local Authority to assess the air quality and climate impacts arising from all phases of the Project.

Sensitive Receptors:

There are 375 sensitive receptors (Dwellings and one school) situated within 2km of the site (**Figure 2.2**), mostly along existing public roads. For general dust and exhaust emissions, receptors situated within 1km of the Wind Farm Site infrastructure are defined as sensitive receptors. There are 235 sensitive receptors within 1km of Wind Farm Site infrastructure. Users of the public roads within the vicinity of the Proposed Development are also considered as sensitive receptors.

For nuisance dust (larger dust particles) receptors situated within 100m the Wind Farm Site infrastructure are defined as sensitive receptors. There are 9 sensitive receptors within 100m of the Wind Farm Site infrastructure.

This chapter is an EIA of the Proposed Development on air quality and climate. A full description of the Proposed Development is outlined in **Chapter 2, Section 2.3** and includes one TDR (the proposed TDR) and one GCR (the proposed GCR). Other viable GCR/TDRs have also been assessed as part of the EIAR. These routes; GCR option 2 and TDR option

2 and TDR option 3 do not form part of the planning application, yet these route options are fully assessed as documented in **Appendix 3.1**.

18.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

In this section, a description of the methods employed for each part of the assessment, (itemised in **Section 18.1.3**) are outlined.

The following data and reports were employed to assess the baseline Air Quality and Climate:

- Air quality limit values of CAFE Directive 2008/50/EC is compared with the recorded local and national emission values for year 2022
- Review of relevant WHO and EPA Air Quality reports
- Review of Air Quality Zones in Ireland
- A review of the contributors to the local air quality conditions
- A review of local and national climate conditions

This following tool was employed to assess Climate impact of the Project:

- Carbon calculator for wind farms⁴, developed under the guidance of the Scottish Government, Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Forestry Research. The tool's purpose is to assess, in a comprehensive and consistent way, the carbon impact of wind farm developments.

Do Nothing Impact Assessment: This section outlines the impact if the Proposed Development were not to go ahead and the likely evolution thereof without the Proposed Development as far as natural changes from the baseline scenario.

Significance of effects: The significance of effects resulting from the Proposed Development is determined through consideration of a combination of the sensitivity of the receiving environment and the predicted level of change from the baseline state, as outlined in **Chapter 1, Table 1.6** and **Table 1.7**. Where negative effects are predicted, appropriate mitigation approaches are identified.

Mitigation measures: The mitigation hierarchy approach, as outlined in Chapter 1 of Avoidance, Reduction/ Elimination and Remedy aims to avoid significant impact through embedded mitigation (avoidance), and where avoidance is not possible, through mitigation

⁴ SEPA, 2023, Carbon calculator for wind farms, Available at: <https://informatics.sepa.org.uk/CarbonCalculator/> [Accessed Sep 2024]

measures. Remedy, the lowest rung of the mitigation hierarchy is only considered where mitigation measures are not feasible or possible.

Cumulative Assessment: Other large developments (operational and in the planning process) within a 20km of the Proposed Development (shown in **Appendix 2.4** of the EIAR), in conjunction with the Proposed Development, are assessed to determine the potential cumulative effects on Air Quality and Climate.

18.3 AIR QUALITY

18.3.1 Air Quality Standards

The limit values of the CAFE Directive are set out in **Table 18.1**. Limit values are presented in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $\text{PM}_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

Table 18.1: Limit values of CAFE Directive 2008/50/EC (Source: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value
Sulphur Dioxide (SO_2)	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of vegetation	Calendar Year	20	7.5	Annual mean
Sulphur Dioxide (SO_2)	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean
Nitric oxide (NO) + Nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value
PM ₁₀	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year
PM ₁₀	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 (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene (C ₆ H ₆)	Protection of human health	Calendar year	5	1.5	Annual mean

Table 18.2 presents the limit and target values for ozone as per the Ambient Air Quality and Cleaner Air for Europe (CAFÉ) Directive (2008/50/EC).

Table 18.2: Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value from 2010	Target Value from 2020 onwards
Protection of human health	Maximum daily 8- hour mean	120 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 25 days per calendar year averaged over 3 years	120 $\mu\text{g}/\text{m}^3$
Protection of vegetation	*AOT ₄₀ calculated from 1- hour values from May to July	18,000 $\mu\text{g}/\text{m}^3\text{h}^{-1}$ averaged over 5 years	6,000 $\mu\text{g}/\text{m}^3\text{h}^{-1}$
Information Threshold	1-hour average	180 $\mu\text{g}/\text{m}^3$	180 $\mu\text{g}/\text{m}^3$
Alert Threshold	1-hour average	240 $\mu\text{g}/\text{m}^3$	240 $\mu\text{g}/\text{m}^3$

*AOT₄₀ is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 $\mu\text{g}/\text{m}^3$ and is expressed as $\mu\text{g}/\text{m}^3$ hours.

18.3.2 Air Quality & Health

Environmental Protection Agency (EPA, 2020)⁵, European Environmental Protection Agency (EEA, 2020)⁶ and World Health Organisation (WHO, 2014) reports estimated that poor air quality accounted for premature deaths of approximately 600,000 people in Europe in 2012, with 1,300 Irish deaths predominantly due to fine particulate matter (PM_{2.5}) in 2020 and 30 Irish deaths attributable to Ozone (O₃) in 2016⁷. Air pollution concentration in 2021 remained well above the levels recommended by the World Health Organization (WHO). A more recent study (2023) of air pollution across Europe⁹ has shown that despite ongoing overall improvements in air quality, the levels of air pollutants are above the EU standards across Europe, with air pollution remaining a major health concern for Europeans.

Fine particulate matter, ozone, along with others including carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulphur oxides (SO_x) are produced during the burning of fossil fuels for energy generation, transport or home heating. There are no such emissions associated with the operation of wind turbines.

18.3.3 Air Quality Zones

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Air Quality Framework Directive and Daughter Directives. The site of the Proposed Development lies within Zone D, which represents rural areas located away from large population centres, although is located approx. 4.2km from Drogheda which is within Zone C.

⁵ EPA 2020 Ireland's Environment – An Integrated Assessment 2020, Available at: <https://www.epa.ie/our-services/monitoring--assessment/assessment/state-of-environment-report/> [Accessed 04/09/2024]

⁶ European Environmental Agency 2020, Air Quality in Europe 2020, Available at <https://www.eea.europa.eu/publications/air-quality-in-europe-2020-report> [Accessed 04/09/2024]

⁷ WHO 2014, News release 25 March 2014, Available at: <https://www.who.int/europe/news/item/25-03-2014-almost-600-000-deaths-due-to-air-pollution-in-europe-new-who-global-report> [Accessed 29/08/2024]

⁸ EPA 2016, Ireland's Environment An Assessment 2016, Available at: <https://epawebapp.epa.ie/ebooks/soe2016/files/assets/basic-html/page-1.html> [Accessed 28/08/2024]

⁹ EEA 2023, Harm to human health from air pollution in Europe: burden of disease 2023, Available at: <https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution> [Accessed 29/08/2024]

18.3.4 Existing Air Quality Conditions

18.3.4.1 Existing Air Quality Conditions in Ireland

Generally, Ireland is recognised as having some of the best air quality in Europe. However, from time to time, and under certain weather conditions, it is possible to experience some air pollution in the larger towns and cities. The EPA published the 'Air Quality in Ireland 2022' report in 2023¹⁰. This report provides an overview of the ambient air quality in Ireland in 2022. It is based on monitoring data from 87 stations across Ireland. The measured concentrations are compared with both EU legislative standards and WHO air quality guidelines¹¹ for a range of air pollutants.

Results from the monitoring campaign across Ireland during 2022 show¹²:

- No levels above the EU limit value (CAFÉ Directive) as shown in **Table 18.1** were recorded at any of the ambient air quality network monitoring sites in Ireland in 2022.
- WHO guideline values were exceeded at a number of monitoring sites for fine particulate matter (PM_{2.5}) and (PM₁₀), ozone (O₃), Nitrogen Dioxide (NO₂). WHO guideline values for Sulphur dioxide (SO₂) were exceeded at one monitoring station. PAHs exceeded the European Environment Agency reference at 3 monitoring sites.

18.3.4.2 Existing local Air Quality Conditions

The closest air quality monitoring site to the Proposed Development within the same air quality zone is Kilkitt, Co. Monaghan (station 58). Kilkitt indicative monitoring site is located approximately 46.6km northwest of the Proposed Development. The Kilkitt site is located in a rural setting with little traffic or other influences on air quality. Monitoring is done using continuous monitors for nitrogen oxides, sulphur dioxide and ozone. The results for these pollutants for the year 2022 are shown in **Table 18.3** and compared with the CAFÉ Directive limits.

Given the distance from the Proposed Development and the nearest national/local monitoring site, a second monitoring station was considered. The Drogheda monitoring site, Co. Louth (station 84) is located approximately 6.2km southeast of the Wind Fram Site. It should be noted the Drogheda monitoring site is located within Air Quality Zone C (urban area with population greater than 15,000) versus the Zone D (rural areas) in which the

¹⁰ EPA 2023, Air Quality in Ireland Report 2022, Available at: https://www.epa.ie/publications/monitoring--assessment/air/Air_Quality_Report_22_v8v2.pdf [Accessed 04/08/2024]

¹¹ WHO global air quality guidelines: particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide <https://www.who.int/publications/i/item/9789240034228> [Accessed 05/09/2024]

¹² EPA 2023, Air quality in Ireland 2022, Available at: <https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2022.php> [Accessed: 22/08/2024]

Proposed Development is sited. The Drogheda monitoring station automatically monitors and reports particulate matter (PM₁₀ and PM_{2.5}) in the surrounding environment. The results for these pollutants for the year 2022 are shown in **Table 18.3** and compared with the CAFÉ Directive limits.

Table 18.3: Air Quality data for 2022 compared to Limit values of CAFE Directive 2008/50/EC

Sulphur Dioxide (SO₂) - Kilkitt air quality monitoring station (station no. 58)			
Objective	Limit CAFE Directive 2008/50/EC	Results for (for calendar year 2023)	Summary
Protection of human health	must not exceed 350µg/m ³ (1 hourly data) 24 times a year	Did not exceed 350µg/m ³ (1 hourly data) on any occasion within the year	Within allowable Limit
	must not exceed 125µg/m ³ (24 hourly data) 3 times in a calendar year	Did not exceed 125µg/m ³ within any 24-hourly period in the year	Within allowable Limit
Protection of vegetation	Annual mean must not exceed 20µg/m ³	Annual mean of 1.86µg/m ³	Within allowable Limit
Protection of vegetation	Winter mean (1 Oct to 31 Mar) must not exceed 20µg/m ³	Winter mean of 3.25µg/m ³	Within allowable Limit
Nitrogen Dioxide (NO₂) Kilkitt air quality monitoring station (station no. 58)			
Protection of human health	1 hourly data must not exceed 200µg/m ³ more than 18 times in a calendar year *	Did not exceed 200µg/m ³ within any 1 hourly period in the year	Within allowable Limit
	Annual mean must not exceed 40 ug/m ³	Annual mean of 2.04µg/m ³	Within allowable Limit
Ozone (O₃) Kilkitt air quality monitoring station (station no. 58)			
Information threshold	1-hour average target value of 180µg /m ³	59.29 µg /m ³	Within allowable Target
Alert threshold	1-hour average target value of 240µg /m ³	59.29 µg /m ³	Within allowable Target
PM₁₀ - Drogheda air quality monitoring station (station no. 84)			
Protection of human health	must not exceed 50µg/m ³ (24 hourly data) 35 times in a calendar year	Did not exceed 50µg/m ³ within any 24-hourly period in the year	Within allowable Limit

	Annual mean must not exceed 40µg/m ³	Annual mean of 11.9µg/m ³	Within allowable Limit
PM_{2.5} Drogheda air quality monitoring station (station no. 84)			
Protection of human health	Stage 1 - Must not exceed annual mean of 25µg/m ³	Annual mean of 6.9µg/m ³	Within allowable Limit
	Stage 2 - Must not exceed annual mean of 20µg/m ³	Annual mean of 6.9µg/m ³	Within allowable Limit

From the 2022 local air quality results, shown in **Table 18.3**, it is evident that

- the 1-hourly, 24-hourly, annual means and winter mean values for SO₂ at Kilkitt station were well within the CAFÉ Directive acceptable limit.
- The 1-hourly and annual mean values for NO₂ at Kilkitt station were well within the CAFÉ Directive acceptable limit.
- The 1-hourly threshold for O₃ at Kilkitt station were well within the CAFÉ Directive target.
- the 1-hourly, 24-hourly, annual means and winter mean values for SO₂ at Kilkitt station were well within the CAFÉ Directive acceptable limit.
- The 24-hourly and annual mean values for PM₁₀ at Drogheda station were well within the CAFÉ Directive acceptable limit.
- The stage 1 and stage 2 annual mean values for PM_{2.5} at Drogheda station were well within the CAFÉ Directive acceptable limit.

The 2022 local air quality was also compared to the WHO Air Quality Guidelines (AQG) for information purposes, as shown

- The NO₂ annual level of 2.04µg/m³ (Kilkitt station) is well within the AQG level of 10µg/m³
- The maximum NO₂ 24-hourly recording of 12.7µg/m³ (Kilkitt station) does not exceed the AQG level of 25µg/m³
- The SO₂ maximum 24-hourly level of 10.2µg/m³ (Kilkitt station) is well within the AQG level of 40µg/m³
- The PM_{2.5} annual average of 6.9µg/m³ (Drogheda station) is above the AQG level of 5µg/m³, however this value is within the most stringent of interim target level (target level 4)¹³ of 10µg/m³.

¹³ WHO 2021, Executive Summary of WHO global air quality guidelines Available at: <https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf> [Accessed 17/09/2024]

- The PM_{2.5} AQG allows for exceedance of 15µg/m³ on 3 occasions over a 24 hour period. This was exceeded on 23 occasions, with exceedances ranging from 15.6-38.3µg/m³. Against the most stringent of interim target level (IT4) the level of 25µg/m³ is exceeded on 5 occasions. The PM_{2.5} exceedances over a 24 hour period meets the IT3; the level of 37.5µg/m³ is marginally exceeded on only 1 occasion.
- The PM₁₀ annual average of 11.9µg/m³ (Drogheda station) is above the AQG level of 15µg/m³.
- The PM₁₀ AQG allows for exceedance of 45µg/m³ on 3 occasions over a 24 hour period. This was exceeded on 1 occasion (49.7µg/m³), meeting the AQG.

The World Health Organisation (WHO) published new Air Quality Guidelines (AQG) in 2021 based on the impact of pollutants on health. There are four Interim Targets (IT) identified (IT1, IT2, IT3, IT4) towards achieving the final AQG levels. As per the Clean Air Strategy for Ireland¹⁴, Ireland has committed to achieving the interim IT3 target by 2026. For 5 of the 7 pollutants (reported in above bullet points) the final AOG level was achieved. For the other 2 pollutants, where the final AOG level was not met, one (PM_{2.5} annual) met the IT4 limit and one (PM_{2.5} 24-hour) met the IT3 limit, therefore meeting Ireland's commitment to achieving the interim IT3 target by 2026.

The EPA Air Quality Index for Health (AQIH) applied to both Kilkitt station (Zone D) station and Drogheda Station (Zone C) is '1'. The index ranges from 1-10 (Good to Very poor)¹⁵, indicating good quality air in this region.

The Proposed Development site surrounds an existing Quarry 'Kilsaran Quarry'. Kilsaran Quarry is a large modern quarry which produces a wide range of aggregates, concrete products, asphalt and macadam, hard-core and fill materials. An existing poultry farm 'Crayvall Egg Production' is located approximately 930m northeast of the Proposed Development. Crayvall Egg production is a large poultry farm producing eggs and organic manure for the Irish market. Details of both developments and their impact on air quality are outlined below in **Section 18.3.4.3** and **18.3.4.4**.

¹⁴ Government of Ireland, 2023 Clean Air Strategy For Ireland

¹⁵ EPA, Air Quality Index for Health, Available at <https://airquality.ie/information/air-quality-index-for-health> [Accessed 04/09/2024]

18.3.4.3 Existing Air Quality Conditions – Kilsaran Quarry

Quarrying activities typically emit dust. Dust is characterised as encompassing particulate matter with a particle size of between 1 and 75 microns (1 - 75µm). Deposition typically occurs in close proximity to each site and potential impacts generally occur within 500 metres of the dust generating activity as dust particles fall out of suspension in the air. Larger particles deposit closer to the generating source and deposition rates will decrease with distance from the source. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is either expected to stop or move on. The potential for dust to be emitted will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds, wind direction and dust prevention measures in place.

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors may be considered. The applicable standards in Ireland include the Air Quality standards Regulations, which incorporates EU Directive 2008/50/EC. The ambient air quality standards applicable for NO₂, SO₂, PM₁₀ and PM_{2.5} outlined in this Directive (CAFÉ Directive). **Table 18.3** outlines the 2022 results for these pollutants compared to the CAFÉ directive limit for the local air quality stations.

There are no statutory limits on dust deposition and the focus is on the prevention of nuisance and minimising air borne dust emissions where practicable. Although coarse dust is not regarded as a threat to health, it can create a nuisance by deposition on surfaces. No statutory or official air quality criterion for dust annoyance has been set in Ireland, UK, Europe or at World Health Organisation level. The most commonly applied guideline¹⁶ is the *German TA Luft* (German VDI, 2002)¹⁷ guideline of 350mg/(m²day) as measured using Bergerhoff type dust deposition rate (VDI 2119). This is commonly applied to ensure that no nuisance effects will result from specified industrial activities. Below these thresholds dust problems are considered less likely. Dust deposition is normally measured by gravimetrically determining the mass particulates and dust deposited over a specified area over a period of one month (30 days +/- 2 days).

¹⁶ Department of Housing, Local Government and Heritage, 2004 Quarries and Ancillary Activities Guidelines for Planning Authorities Available at: <https://www.opr.ie/wp-content/uploads/2019/08/2004-Quarries-and-Ancillary-Activities.pdf> [Accessed 17/09/2024]

¹⁷ German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft.

Recommendations outlined by the Department of the Environment, Heritage and Local Government (2004)¹⁵, apply the Bergerhoff limit of 350mg/m²day to the land ownership boundary of quarries. This standard can be applied to the Proposed Development in regard to dust deposition.

The Air Quality Standards used in the EIAR assessment of the Kilsaran Quarry extension (Planning Application Reference No. 22/190 to Louth County Council), assessed the potential impact of PM₁₀ and PM_{2.5} emissions from the Quarry extension on air quality. In addition, the limit values for NO₂, SO₂ and PM₁₀/PM_{2.5} have been used to determine the impact of the asphalt plant on air quality.

For the prevention of air pollution, the planning conditions (specified in the notification of grant of permission from Louth County Council, dated 27/11/2022) for the operation of Kilsaran quarry specified:

- Proposals for the suppression of dust on site and on the site access tracks
- Proposals for the cleaning of the public road.
- Monitoring of air emissions (including a monthly survey of dust and particulate emissions)
- Dust levels at site boundary shall not exceed 350mg per m²/day averaged over a continuous period of 30 days.

Quarry Dust Deposition

Quarry dust deposition assessed in the chapter 9 (Air and Climate) of the Kilsaran Quarry extension EIAR¹⁸, is discussed in this section. Emissions from the site under existing operations lead to a dust deposition levelled average over the full year of at most 118.3mg/(m²day) at the land ownership boundary to the quarry. Based on worst case background dust deposition of 80mg/(m²day) in the region of the site, the combined dust deposition level peaks at 198.3mg/(m²day) which is 57% of the TA Luft Limit Value of 350mg/(m²day)¹⁹. However, operational activities from the quarry contributes a maximum of 34% of the TA-Luft Limit Value.

If the continued extraction and extension of the Quarrying facilities is to be granted dust deposition levels are likely to increase. Based on a worst-case background dust deposition of 80mg/(m²day) in the region of the site, the combined dust deposition level peaks at

¹⁸Tom Philips Associates 2022, Environmental Impact Assessment Report for Quarry at Gallstown, Grangebellew, Co. Louth <https://apps.louthcoco.ie/idswebDPSS/ViewFiles.aspx?docid=1012263&format=djvu> [Accessed 17/09/2024]

¹⁹ TA-Luft as interpreted by DEHLG (2004)

203.1mg/(m²day) which is 58% of the TA Luft Limit Value of 350mg/(m²day). However, operational activities if permission is granted, the quarry will contribute a maximum of 35% of the TA-Luft Limit Value.

The dust deposition level decreases with increasing distance from the Quarry. The worst-case dust deposition at the closest sensitive receptor to the site peaks at 32.3% of the TA Luft limit value, including background concentrations. The impact of dust deposition from the Quarry (as assessed in Chapter 9 of the Kilsaran Quarry extension EIAR) is considered imperceptible, negative, localised and long-term.

PM₁₀

Predicted PM₁₀ concentrations are significantly lower than the ambient air quality standards at the worst-case residential receptor due to the background concentrations and existing operations. For emissions from existing operations the predicted 24-hour and annual mean concentrations (excluding background) at the worst-case receptor peak at 8.23µg/m³ and 3.14µg/m³ respectively. Based on an annual mean background PM₁₀ concentration of 9µg/m³ in the region of the Quarry development, the combined annual background PM₁₀ concentration including the site peaks at 12.14µg/m³. This predicted level equates to at most 30% of the annual limit value of 40µg/m³. The predicted 24-hour PM₁₀ concentration (including background) peaks at 18.14µg/m³ which is 36% of the 24-hour limit value of 50µg/m³ (measured as a 90.4th%ile). Operational activities from the quarry contribute a maximum of 7.8% of the PM₁₀ annual mean limit value.

If the continued extraction and extension of the Quarrying facilities is to be granted levels of PM₁₀ concentration are likely to increase. The predicted 24-hour PM₁₀ concentration (including background) peaks at 18.54µg/m³ which is 37% of the 24-hour limit value of 50µg/m³ (measured as a 90.4th%ile). Operational activities if permission is granted, the quarry will contribute a maximum of 8.9% of the PM₁₀ annual mean limit value²⁰.

The impact of PM₁₀ is considered imperceptible, negative, localised and long-term.

PM_{2.5}

Predicted PM_{2.5} concentrations at the worst-case receptor are significantly lower than the limit value of 25µg/m³ for the existing operations. The predicted annual concentration (excluding background) at the worst-case receptor peaks at 0.87µg/m³. Based on the background PM_{2.5} concentration including the operations peaks at 6.72µg/m³. This peak

²⁰ Air Quality Standards 2011 (from EU Directive 2008/50/EC)

level equates to 27% of the annual limit value of $PM_{2.5}$ ²¹. Operational activities from the quarry contribute a maximum of 3.5% of the $PM_{2.5}$ annual mean limit value.

If the continued extraction and extension of the Quarrying facilities is to be granted, levels of $PM_{2.5}$ concentration are likely to increase. Operational activities if permission is granted, the quarry will contribute a maximum of 5.84% of the $PM_{2.5}$ annual mean limit value.

The impact of $PM_{2.5}$ is considered imperceptible, negative, localised and long-term.

NO₂

The NO_2 modelling results for the Do-Nothing scenario based on the operational hours of the asphalt plant as currently permitted. The results indicate that the ambient ground level are below the relevant air quality standards for all modelled years for NO_2 . For the worst-case year, emissions from the quarry site led to an ambient NO_2 concentration (including background) which is 39% of the maximum ambient 1-hour limit value (measure as a 99.8thile) and 22% of the annual limit value at the worst-case off-site location.

If the continued extraction and extension of the Quarrying facilities is to be granted levels of NO_2 concentration are likely to increase. Operational activities if permission is granted, the worst-case year, emissions from the site lead to an ambient NO_2 concentration (including background) which is 42% of the maximum ambient 1-hour limit value (measured as a 99.8thile) and 30% of the annual limit value at the worst-case off-site location.

SO₂

The SO_2 modelling results for the Do-Nothing scenario based on the operational hours of the asphalt plant as currently permitted. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for all modelled years of SO_2 . For the worst-case year, emissions from the site lead to an ambient SO_2 concentration (including background) which is 30% of the ambient 1-hour limit value (measured as a 99.7thile) at the worst-case off-site location.

If the continued extraction and extension of the Quarrying facilities is to be granted levels of SO_2 concentration are likely to increase. Operational activities if permission is granted, the worst-case year, emissions from the site lead to an ambient SO_2 concentration (including background) which is 55% of the maximum ambient 1-hour limit value (measured

²¹ Air Quality Standards 2011 (from EU Directive 2008/50/EC)

as a 99.7th%ile) and 72% of the maximum daily limit value (measured as a 99.2nd%ile) at the worst-case off-site location.

The above outlines the existing Kilsaran quarry and the surrounding environments current baseline air quality. The assessment involved modelling emissions from the existing and proposed quarrying operations as well as the proposed operational hour extension for the asphalt plant, concrete block plant and ready-mix concrete plant. In addition, the increased tonnage of waste to the waste recovery facility was also included within the assessment. The proposed development at Kilsaran Quarry will not lead to a significant impact on either air quality or climate.

Modelled emissions from the proposed development at Kilsaran Quarry lead to ambient concentrations which are within the relevant ambient air quality standards for dust, PM10 and PM2.5, NO₂ and SO₂. CO₂ emissions associated with vehicle emissions are also predicted to be minor. Thus, the impact on air quality and climate of the proposed development at Kilsaran Quarry is not significant and no residual impact is anticipated.

18.3.4.4 Existing Air Quality Conditions - Crayvall Egg Production Poultry Farm

A poultry farm (Crayvall Egg Production) is located approximately 930m northeast of the Wind Farm Site. Poultry farming enterprises emit odours associated with day-to-day operations such as silage feeding, manure agitation and manure spreading. The poultry farm is comprised of 1 no. free range hen house and 2 no. poultry manure storage sheds which provide for 60,000 birds for the function of barn and free-range egg production and a by-product of organic manure. An EIAR was submitted as part of the planning application for the Crayvall egg Production development (Planning Reference No.19/231) and is available on Louth's County Council Planning website²²²³.

18.3.5 Do Nothing Impact

If the Proposed Development were not to proceed, the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen and sulphur dioxide 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 Development. This would result in an indirect, negative impact on air quality.

²² <https://www.eplanning.ie/LouthCC/AppFileRefDetails/19231/0> [Accessed 22nd August 2024]

²³ <https://apps.louthcoco.ie/docswwebDPSS/ViewFiles.aspx?docid=929278&format=djvu> [Accessed 22nd August 2024]

The likely evolution of the baseline environment may be continued forestry and farming/ agricultural in the area of the Proposed Development. It is likely that the adjacent Quarry at Kilsaran will be developed/ extended, as permission was granted by Louth County Council (under Planning Application Reference No.22/190). Potentially, other developments in the region may be extended, such as the poultry farm (Crayvall Egg Production).

18.3.6 Potential Impacts of the Project

18.3.6.1 Construction Phase

Dust Emissions

The main potential source of impacts on air quality during construction is dust. There is potential for the generation of dust from excavations and from construction of Access Roads and hardstands and the trench for the cable ducting for the Grid Connection. The potential nuisance dust issues arising from the Proposed Development can worsen with weather conditions (i.e., dry and windy conditions). Dust from cement can cause ecological damage if allowed to migrate to water courses, though it is proposed that ready-mix concrete will be used with no on-site batching taking place, and therefore this will not be a potential source of emissions.

Potentially dust generating activities are as follows:

- Earth moving and excavation plant and equipment for handling and storage of soils and subsoils;
- Transport and unloading of stone materials for Access Road construction;
- Rock will be extracted from Turbine Foundation construction and this will be used for subsequent use in construction of Access Roads and hardstands as needed; and
- Vehicle movements over dry surfaces such as Access Roads.

Friable dust cannot remain airborne for a very long time. The distance it can travel depends on the particle sizes, disturbance activities and weather conditions. Larger dust particles tend to travel shorter distances than smaller particles. Particle sizes greater than 30µm will generally deposit within approximately 100m of its source, while particles between 10-30µm travel up to approximately 250-500m and particle sizes of less than 10µm can travel up to approximately 1km²⁴.

The 235 sensitive receptors (Dwellings and one school) located within 1km of all Wind Farm Site infrastructure. Of these 235 receptors, 108 within 1km of the proposed turbines locations and the 127 within 1km of new/ upgraded site Access Roads and buildings).

²⁴ <http://www.dustscan.co.uk/Dust-Info/Definitions> [Accessed 7th July 2024]

Generally (depending on the conditions outlined), dust nuisance is most likely to occur at sensitive receptors within approximately 100m of the source of the dust, IAQM (2024). It is considered that the principal sites of friable dust generation will be the turbine bases and hardstands, and to a lesser extent for a shorter duration, along new site Access Roads. All turbines are situated >500m away from dwelling houses and therefore these principal sites of dust generation are greater than 100m distant from these sensitive receptors.

Dust may also settle temporarily on vegetation. Any effects of dust on vegetation during the construction phase is considered **not significant, negative and short term**.

Receptors (school, dwellings, road users) within 1km of the Proposed Development may be impacted as a result of dust landing on cars, clothing on washing lines, outdoor furniture and windows etc. For road users, moving vehicles may pick up settling dust. The potential impact from dust generations from turbine base and hardstand construction becoming friable and being a nuisance to workers, residents and local road users is considered, a **slight, negative and short-term**, direct impact during the construction phase.

There are 9 houses within 100m of proposed new or upgraded Access Roads, therefore there is some potential for nuisance dust at these receptors. As outlined in the indicative construction programmes in Chapter 2 of the EIAR, the new and upgraded Access Roads will be built in approximately half the time period required to construct the turbine bases and hardstands. Furthermore, a section of road is laid in a relatively short time and once laid the construction will move on and the impact nuisance dust will subside. The potential impact from dust becoming friable and being a nuisance to dwellings and residents within 100m of the new/ upgrades access track is considered, a **slight, negative and temporary**, direct impact during the construction phase.

Exhaust Emissions

Emissions from plant and machinery, including trucks, during the construction of the Proposed Development are a potential impact. The engines of these machines produce emissions such as carbon dioxide (CO₂), carbon monoxide (CO), Nitrogen Oxides (NO_x), and Particulate Matter (PM₁₀ and PM_{2.5}).

Particulate Matter ("PM") less than ten micrometres in size (PM₁₀) can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders. PM₁₀ arises from direct emissions of primary particulate such as black smoke and formation of secondary PM in the atmosphere by reactions of gases such as sulphur dioxide and

ammonia. The main sources of primary PM₁₀ are incomplete burning of fossil fuels such as coal, oil and peat and emissions from road traffic, in particular diesel engines. Other sources of particulates include re-suspended dust from roads. Natural PM includes sea-salt and organic materials such as pollens. The diverse sources and impacts of PM make it one of the most challenging issues to address.

Nitrogen oxides (NO_x), includes the two pollutants, nitric oxide (NO) and nitrogen dioxide (NO₂). Power-generation plants and motor vehicles are the principal sources of NO_x, through high temperature combustion. NO_x contributes to the formation of acid rain and is also a recognised ozone precursor. Short-term exposure to NO₂ is associated with reduced lung function and airway responsiveness, and increased reactivity to natural allergens. Long-term exposure is associated with increased risk of respiratory infection in children.

As outlined in **Chapter 16: Traffic and Transport**, it is estimated that there will be in the region of 6,677 delivery / removal loads of material to/ from the Proposed Development during the construction phase. The majority of HGV movements to and from site will occur during the first ten months of the construction period and will be associated with site Access Road construction, Turbine Hardstand construction and Turbine Foundation construction.

As a result of the construction phase, it is likely that the impact on air quality from an increase in exhaust emissions will lead to small localised emission level increases, having a **slight, negative** and **short-term** effect.

18.3.6.3 Operational Phase

Dust Emissions and Exhaust Emissions

There will be a small number of light vehicles accessing the Wind Farm Site during the operational phase. This could lead to some localized dust being generated though this will be small and sporadic as only approximately one to two site visits per week will occur at the Proposed Development. In the unlikely event that a turbine or elements of a turbine need to be replaced during the lifetime of the wind farm, there would be significantly less traffic than during the initial construction phase. Site Access Roads and other site infrastructure will already have been established. Therefore, the operational phase will have an **imperceptible, negative and long-term** impact on dust effects.

As there is expected to be only a small number of light vehicles accessing the Site during the operational phase, the operational phase will have an **imperceptible, negative and long-term** impact on exhaust emissions

18.3.6.4 Decommissioning Phase

Dust Emissions and Exhaust Emissions

As outlined in **Chapter 16 Traffic and Transport**, during Decommissioning it is envisaged that the total volume of HGV traffic will be relatively small compared to the construction period (5 – 10 HGV per day) on the basis that the site Access Roads will remain in place to serve ongoing forestry and agriculture activity and the Turbine Hardstands will be allowed to revegetate into the surrounding habitat with only the turbines being removed from the Wind Farm Site for recycling/reconditioning. The turbine blades can be cut into manageable lengths on Decommissioning and hauled off site. The Decommissioning phase is expected to last approximately 12-24 weeks.

As site Access Roads and other site infrastructure will be left in place, and dust generation will be limited to that generated from a low volume of HGV traffic, the Decommissioning phase will have a **not significant, negative and temporary** impact on dust effects.

The exhaust emissions associated with the low volume of HGV traffic during the Decommissioning phase will have a **not significant, negative and temporary** impact on exhaust emissions.

18.3.7 Mitigation Measures and Residual Effects

18.3.7.1 Construction Phase Mitigation

The main potential impact during the construction phase of the Proposed Development will be from dust nuisance at sensitive receptors close to the site. Good practice site procedures will be followed by the appointed contractor to prevent dirt and dust being transported onto the local road network and to minimise vehicle exhaust emissions. Good practice site control measures will comprise the following:

- Site Access Roads will be upgraded and built in the initial construction phases. These roads will be finished with graded aggregate which compacts, preventing dust.
- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Wind Farm Site and onto the public road network.
- Wheel wash facilities will be provided near the Wind Farm Site entrance to prevent mud/dirt being transferred from the site to the public road network.
- Public roads along the construction haul route will be inspected and cleaned daily. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated, and the problem fixed to prevent this from happening again.
- During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (wind turbine area and Grid Connection Route) and haul roads to suppress dust migration from the site.
- Vehicles delivering materials to the site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand.
- 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.
- All machinery when not in use will be turned off.
- Ready-mix concrete will be delivered to the site and no batching of concrete will take place on the site. Only washing out of chutes will take place on site and this will be undertaken at a designated concrete washout facility at the contractor's compound. The concrete wash water will be disposed of at a licensed facility as outlined in the Construction

Environment Management Plan (CEMP) – **Management Plan 5 Waste Management Plan (Appendix 2.1)**

- Speed restrictions of 15km/h on Access Roads will be implemented to reduce the likelihood of dust becoming airborne. Consideration will be given to how on-site speed limits are policed by the Contractor and referred to in the toolbox talks.
- Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it.
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the Project and geotechnical services and will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer.
- A complaints procedure will be implemented on site where complaints will be reported, logged and appropriate action taken.

The appointed contractor responsible for the detailed design of the Project will provide details to the planning authority for agreement in writing prior to the commencement of development of environmental safety methodology including best practice procedures to manage construction activities. The methodology statement will be signed off by a suitably qualified geotechnical engineer/engineering geologist. An independent, qualified geotechnical engineer/engineering geologist will be contracted for the detailed design stage of the Project and geotechnical services will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis.

18.3.7.2 Operational Phase Mitigation

As the operation of the proposed wind farm will have positive impacts on air quality, mitigation measures are considered unnecessary. Where turbine components are being replaced the same mitigations measures as per the construction phase will apply.

18.3.7.3 Decommissioning Phase Mitigation

Mitigation measures during the Decommissioning phase will be the same as those employed during the construction phase as outlined above, where applicable. The Decommissioning Plan (**Management plan no. 6** to the CEMP, **Appendix 2.1**) is a live document and outlines the mitigation measures required during Decommissioning.

18.3.8 Residual Impacts of the Project

The use of plant and machinery will impact air quality in the area, both in terms of dust generation and exhaust emissions. In this section the impact of the Proposed Development on air quality is re-assessed given the mitigation measures prescribed in **Section 18.3.7**.

Construction phase

With mitigation measures in place, any effects of dust on vegetation during the construction phase will be reduced **short term** and **imperceptible**.

With mitigation measures in place, any effects of dust emissions during the turbine base and hardstand construction will reduce the impact to **not significant, negative, short-term**.

With mitigation measures in place, any effects of nuisance dust during the construction of new/ upgraded Access Roads will reduce the impact to **imperceptible, negative, short-term**.

With mitigation measures in place, the effects of exhaust emissions during the construction phase, will remain **short-term, slight negative** effect.

Operational phase

During the operational phase of the Project exhaust emissions will arise from occasional machinery use and Light-Good Vehicles (LGV) that will be required for occasional onsite maintenance works. The impact on dust emission during the operational phase will remain **imperceptible, negative** and **long-term**. The impact on exhaust emissions during the operational phase will remain **imperceptible, negative** and **long-term**.

The wind energy created by the Project once it goes into operation, will avoid the production of electricity from coal, oil or gas-fired power stations resulting in emission savings of carbon dioxide (CO₂), nitrogen oxides (NO_x), and sulphur dioxide (SO₂). This will lead to a **Slight, Positive** and **Long-term** Impact on air quality.

Decommissioning phase

With mitigation measures in place, any effects of dust emissions during the Decommissioning phase will be reduced to **Imperceptible, negative** and **temporary**. Mitigated, any effects of exhaust emissions during the Decommissioning phase will remain **not significant, negative** and **temporary**.

18.3.9 Cumulative Effects

All large developments (operational and in the planning process) within a 20km of the Proposed Development (shown in **Appendix 2.4** of the EIAR), in conjunction with the Proposed Development, are assessed to determine the potential cumulative effects on Air Quality and Climate.

Air quality concerns related to wind farms primarily arise during construction and Decommissioning, with potential impacts influenced by proximity to sensitive receivers. In terms of cumulative impacts, negative cumulative impacts in relation to air quality could occur if a large development with the potential to impact air quality was located in the vicinity of the Wind Farm Site. The developments considered as part of the cumulative effect assessment are described in **Appendix 2.4**. There are four (no. 5) operational wind energy developments within 20km of the Wind Farm Site (between 11.4km and 17km). Operational wind farms generally pose minimal threats to air quality, mainly attributable to dust emissions from site Access Roads. Unlike fossil fuel-based power stations, wind turbines for energy production have no direct emissions, contributing to a reduction in harmful emissions and environmental impact.

During the construction phase, temporary dust and exhaust emissions may increase due to construction vehicles and transport. A cumulative rise in dust emissions with a neighbouring quarry development is anticipated, along with an increase in vehicle exhaust emissions among the Proposed Development, neighbouring Kilsaran Quarry, and Crayvall Egg Production farm. However, the air quality impact during this period is expected to be **short-term** with a **slight negative** effect.

It's noteworthy that during the operational phase, there are no predicted cumulative dust or exhaust emissions between the Proposed Development, Crayvall Egg production facility, and Kilsaran Quarry, highlighting the distinct nature of their operations.

It is possible that this Quarry will be developed/ extended, as permission was granted by Louth County Council (under Planning Application Reference No. 22/190).

This worst case scenario i.e., the Proposed Development construction phase is planned within the same/ overlapping construction period as the permitted Quarry extension. It is very unlikely that this will occur, as the traffic management plans (specifying traffic routes, traffic system and timing) for both the Proposed Development and Quarry extension would

need to be synchronised and pre-agreed by the Louth County Council roads section. This is unlikely to happen due to the potential impact on road traffic and flow and on road users. However, as outlined in **Section 18.3.4.3**, the increase in dust and exhaust emission due to the Quarry extension is considered Imperceptible.

Dust Emissions and Exhaust Emissions

In the unlikely event that the construction phases of these projects (the Proposed Development and the Quarry extension) overlapped, unmitigated, there would be a **slight, negative** and **short-term** cumulative effect on the air quality (dust emissions and exhaust) during the construction phase.

If the construction phase of the Quarry extension, overlapped with the operational phase of the Proposed Development, there would be an expected **not significant, negative** and **long-term** cumulative effect on the air quality (dust emissions and exhaust) during the operational phase

If the any future construction phases of the Quarry extension, overlapped with the Decommissioning phase of the Proposed Development, there would be an expected **slight, negative** and **temporary** cumulative effect on the air quality during the Decommissioning phase.

18.3.10 Summary of Significant Effects

This assessment has identified no potentially significant effects, given the mitigation measures embedded in the design and that will be implemented as part of the Proposed Development.

18.3.11 Statement of Significance

The Project has been assessed as having no significant direct or indirect effects on air quality during the construction, operation or Decommissioning phases of the Project.

The significance of potential effects of the Proposed Development on air quality has been assessed. The Proposed Development has been assessed as having the potential to result in **slight, negative** and **temporary/short-term** effects on Air Quality during construction and Decommissioning.

The avoidance of the production of electricity from coal, oil or gas-fired power stations, will lead to a **slight, positive and long-term** effect on air quality.

Potential cumulative effects were assessed as being of a **slight, negative and short-term** impact.

Given that only effects of significant impact or greater are considered "significant" in terms of the EIA Regulations, the potential effects of the Proposed Development on air quality are considered not significant.

18.4 CLIMATE AND GREENHOUSE GASES

Greenhouse gases (GHGs) constitute a group of gases contributing to global warming and climate change. GHGs with the most global warming potential are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Other greenhouse gases are 'F-Gases' (hydrofluorocarbons and perfluorocarbons), sulphur hexafluoride (SF₆) and man-made gases used in refrigeration and air conditioning appliances.

Greenhouse gases produced by human activities are changing the composition of the earth's atmosphere. Human activities that produce greenhouse gases include:

- Carbon dioxide emissions through burning fossil fuels such as coal, oil and gas and peat
- Methane and nitrous oxide emissions from agriculture
- Emissions through land use changes such as deforestation, reforestation, urbanization, desertification

Current projections indicate that continued emissions of greenhouse gases, including the burning of fossil fuel to produce electricity, will cause further warming and changes to our climate. Climate is predicted to have indirect and direct impacts on Ireland including:

- Rising sea-levels threatening habitable land and particularly coastal infrastructure;
 - Extreme weather, including more intense storms and rainfall affecting our land, coastline and seas;
 - Further pressure on our water resources and food production systems with associated impacts on fluvial and coastal ecosystems;
 - Increased chance and scale of river and coastal flooding;
- Giving rise to:
- Greater political and security instability;
 - Displacement of population and climate refugees;
 - Heightened risk of the arrival of new pests and diseases;
 - Poorer water quality, and

- Changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans²⁵.

Climate change means a significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. Earth's climate has changed naturally many times during the planet's existence. However, currently human activities are significantly contributing to climate change through greenhouse gas emissions. The global average temperatures have increased by more than 1°C since pre-industrial times, and there is an 80% chance that the annual global average temperature will temporarily exceed 1.5°C above pre-industrial levels for at least one of the next five years²⁶.

At the Paris climate conference (COP21) in 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 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.

The Glasgow Climate Pact (COP26) of 2021 aims to limit the rise in global temperature to 1.5°C and finalise the outstanding elements of the Paris Agreement. The Glasgow Climate Pact is manifested across three United Nations climate treaties, including the United Nations Framework Convention on Climate Change (the COP), the Kyoto Protocol (the CMP), and the Paris Agreement (the CMA).

The United Nations Climate Change Conference (COP 28) held in November 2023 was particularly momentous as it marked the conclusion of the first 'global stocktake' of the world's efforts to address climate change under the Paris Agreement. Having shown that progress was too slow across all areas of climate action – from reducing greenhouse gas emissions, to strengthening resilience to a changing climate, to getting the financial and technological support to vulnerable nations – countries responded with a decision on how to accelerate action across all areas by 2030. This includes a call on governments to speed

²⁵ Climate Action Plan 2019 – To Tackle Climate Breakdown, Department of Environment, Climate and Communications, <https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/>, [Accessed 14/11/2022]

²⁶ World Meteorological Organisation (WMO) Press Release, 05 June 2024, Available at: <https://wmo.int/news/media-centre/global-temperature-likely-exceed-15degc-above-pre-industrial-level-temporarily-next-5-years> [Accessed 23/09/2024]

up the transition away from fossil fuels to renewables such as wind and solar power in their next round of climate commitments.

The Climate Action Plan 2024 as set out by the Department of the Environment, Climate and Communications provides a detailed plan for Ireland. It plans for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050, as committed to in the Programme for Government and set out in the Climate Act 2024. This Plan makes Ireland one of the most ambitious countries in the world on climate.

The provision of the Project will have a long-term positive impact by providing a sustainable energy source. Should the Project not proceed, 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. It will also hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions as agreed at the Paris climate conference (COP21) in 2015, Glasgow Climate Pact (COP26) in November 2021 and COP28 in November 2023.

18.4.1 Relevant Legislation and Guidance

Greenhouse gases are the subject of international agreements, such as the United Nations Framework Convention on Climate Change, Kyoto Protocol and the Paris Agreement. The Glasgow Climate Pact is manifested across these three United Nations climate treaties. These agreements along with International and National Policy and Legislation are discussed in **Chapter 4: Planning Policy**

18.4.2 Assessment Methodology

As outlined in **Section 18.2** of this chapter:

- An assessment of climate will be carried out by means of a desk study of the climate in the area of the Project and nationally (Baseline description)
- The climate impact of the Project will be assessed using the Carbon Calculator Tool (version 1.8.1, released date 11 Dec 2023). This carbon calculator specifically designed for assessing the climate impact of wind farms was developed under the guidance of the Scottish Government, Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Forestry Research (impact assessment). Commonly used guidance produced by SNH in 2003 (in a technical guidance note) has been used to determine carbon payback in the absence of any more detailed methods to determine the impacts on soil carbon stocks. The use of the Scottish carbon calculator in

assessing the climate impact and determining carbon payback for this Proposed Development is acceptable, as the peat habitat of Scotland is similar to Ireland and at similar latitudes, the simulated land-atmosphere interactions are applicable.

The methodology approach taken to evaluate the 'do nothing scenario', 'significance of effects', 'mitigation measures' and 'assessment of cumulative effect' is outlined in **Section 18.2**.

18.4.3 Existing Climate

The Köppen climate classification divides regions of the globe based on seasonal precipitation and temperature patterns. The five main groups are tropical, dry, temperate, continental, and polar. The Irish climate is defined as a temperate oceanic climate on the Köppen climate classification system²⁷. Ireland's climate is mild, moist and changeable with abundant rainfall and a lack of temperature extremes. The country generally receives cool summers and mild winters and it is considerably warmer than other areas on the same latitude. Ireland's land mass is warmed by the North Atlantic Current all year and as a result does not experience a great annual range of air temperatures.

The annual mean air temperature for Ireland over the climate period 1991-2020 is 9.8°C and range from 8.5 and 10.8 °C. Due to the moderating influence of the sea, areas closest to the coast are generally warmest. Comparing the 1991-2020 annual mean air temperature for Ireland with that of the 1961-1990 period, there has been an average annual mean temperature increase of approximately 0.7°C²⁸.

Nationally, annual average rainfall over the period 1991-2020 is approximately 1,288mm. There is large variation in rainfall. Annual average rainfall ranges from 878mm in regions along the east coast to 2,044mm in the southwest mountainous regions. December is the wettest month with average rainfall of approximately 142mm over the same period. The driest months are April and May with average rainfall of 82mm and 79mm, respectively. The highest number of rain days and wet days are observed in elevated western and northwest regions. The average annual number of very wet days²⁹ observed over the period 1991-2020 again shows that these events are more frequent in the west of the country than in eastern and midland regions. Annual rainfall totals on the west coast generally average between 1,000mm and 1,400mm with the wettest months being December and January

²⁷ IPCC, 2022, IPCC sixth Assessment, Chapter 13, Figure 13.7 <https://www.ipcc.ch/report/ar6/wg2/figures/chapter-13/> [Accessed 09/09/2024]

²⁸ Met Éireann 2023, Ireland's Climate Averages 1991-2020, Available at: https://www.met.ie/cms/assets/uploads/2023/09/Irelands-Climate-Averages_1991-2020.pdf [Accessed 09/09/2024]

²⁹ a very wet day is defined as being greater than the 95th percentile of "wet days" ($R \geq 1\text{mm}$) during the 1961-1990 reference period

and April being the driest month. The annual average rainfall for Ireland has increased by approximately 7% between the period 1961-1990 and 1991-2020 climate periods³⁰.

The prevailing wind direction is between south and west. Average wind speed ranges from 3m/s in south Leinster to 8m/s in the extreme north of the country. On average there are less than 2 days with gales each year at some inland places like Carlow, but more than 50 a year at northern coastal locations such as Malin Head³¹

Dublin Airport, Co. Dublin, is the closest Met Éireann meteorological station to the Proposed Development with at least 30 years (climate period) of historical data. For the purpose of the climate assessment, meteorological data from Dublin Airport over the period of 1994–2023 is shown in **Table 8.4**³². Dublin Airport is located 40km south of the Proposed Development.

As shown in **Table 8.4**, the mean annual air temperature between 1994 and 2023 was 9.7°C. Mean monthly temperatures ranged from 5.2°C in January to 15.2°C in July. Mean annual rainfall over this period was 778.7mm, with a maximum monthly mean rainfall of 82.8mm in October and a minimum monthly mean rainfall of 51.2mm in March and April.

³⁰ Met Éireann 2024 Climatological Note 22 <https://www.met.ie/education/publications/climatological-notes> [Accessed 09/09/2024]

³¹ Met Éireann, Wind, Available at: <https://www.met.ie/climate/what-we-measure/wind> [Accessed 09/09/2024]

³² <https://www.met.ie/climate/available-data/historical-data> [Accessed: 22nd August 2024]

Table 18.4: Dublin Airport Meteorological Station Data Averages (1994–2023)

Month	Mean Air Temperature (°C)	Maximum Air Temperature (°C)	Minimum Air Temperature (°C)	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Precipitation Amount (mm)	Gross Minimum Temperature (°C)	Mean Wind Speed (knot)	Highest Gust (knot)	Sunshine Duration (hours)
January	5.2	13.1	-4.0	8.1	2.3	62.4	-7.7	12.0	52.1	62.0
February	5.5	13.1	-3.6	8.7	2.2	53.8	-7.7	12.1	51.2	82.2
March	6.4	14.9	-3.5	10.2	2.5	52.1	-7.5	11.2	48.0	121.4
April	7.9	17.4	-2.1	12.3	3.6	52.1	-5.8	10.0	43.7	166.5
May	10.6	20.7	0.6	15.1	6.2	55.9	-2.7	9.7	40.4	198.2
June	13.4	23.3	3.7	17.9	8.9	58.2	0.3	9.1	38.2	181.8
July	15.2	24.2	6.2	19.5	10.9	65.0	2.8	8.9	36.2	157.5
August	15.0	23.2	5.8	19.2	10.8	75.6	2.4	9.1	36.7	153.6
September	13.1	21.8	3.4	17.2	9.1	65.3	-0.1	9.4	40.8	131.1
October	10.5	18.4	0.5	14.0	7.0	82.8	-3.2	10.5	46.0	106.1
November	7.4	15.2	-1.8	10.5	4.4	82.1	-5.3	10.9	46.0	73.7
December	5.6	13.6	-3.6	8.5	2.7	73.4	-6.9	11.5	50.8	56.8
Annual	9.7	25.1	-5.8	13.4	5.9	778.7	-9.6	10.4	60.9	1490.9

18.4.4 Calculating Carbon Losses and Savings

18.4.4.1 Carbon Calculator

To assess the impact of the Proposed Development on the climate, the carbon emitted or saved as a result of the Proposed Development was determined using a carbon calculator, as discussed in **Section 18.4.2**. The online carbon calculator which aims to assess, in a comprehensive and consistent way, the carbon impact of wind farm developments. This is done by comparing the carbon costs of wind farm developments with the carbon savings attributable to the wind farm. The carbon calculation takes into account the carbon released from a number of sources during the construction, operational and Decommissioning stages. These include the effects of drainage works on peat soils, forestry felling, losses associated with harvesting and transport of felled trees, changes in land use and wind turbine manufacture, transportation and construction. Peat disturbance is factored into the assessment tool. Although no peat was encountered during site ground investigations, peaty topsoil was observed to a maximum depth of 0.4m (**Chapter 10: Soils and Geology**). The Proposed Development will not directly or indirectly disturb any peat.

Assessments are also carried out to estimate the carbon saving over the lifetime of the wind farm, compared to electricity produced using fossil fuel. The assessment of carbon savings relates to the capacity of the wind farm over the number of years for which it is operational, site improvement works, (i.e., peatland improvement, habitat creation, etc.), forestry felling, and site restoration works, (i.e., removal of infrastructure and restoration of previous site conditions), when the wind farm will be Decommissioned.

The completed worksheet, including the assumptions used in the model, is provided in **Appendix 18.1** of this EIAR. The model calculates the total carbon emissions associated with the Proposed Development including manufacturing of the turbine technology, transport, construction of the Development and tree felling. The model, which is assessed for both the lower range (28.5MW) and the higher range (36MW), accounts for the years taken for the site to return to its original characteristics but does not factor in the potential re-use of turbine components. All metal components can be recycled, while there is limited potential for the recycling/reuse of the fibreglass blades.

The model also calculates the carbon savings associated with the Proposed Development against three comparators:

- i. Coal fired Electricity Generation
- ii. Grid mix of Electricity Generation

iii. Fossil fuel mix of Electricity Generation (oil, gas and coal)³³.

This is to compare this renewable source of electricity generation to traditional methods of electricity generation to assess the carbon savings and losses.

18.4.4.2 Carbon Losses

The potential carbon losses were assessed for the Proposed Development.

The main CO₂ losses due to the Proposed Development are summarised in **Table 18.5**. A copy of the input and output data is provided in the completed worksheet in **Appendix 18.1**.

Table 18.5: Carbon Losses

Origin of Losses	Total CO ₂ Losses (tonnes CO ₂ equivalent)	
	Lower Range Output 28.5MW	Higher Range Output 36MW
Losses due to Turbine life e.g., manufacture, construction and decommissioning	25,796	32,803
Losses due to Backup	18,525	23,400
Losses due to reduced carbon fixing potential	906	906
Losses from soil organic matter	5,044	5,044
Losses due to DOC and POC leaching	4,036	4,036
Felling of Forestry	4,347	4,347
Total Expected Losses	58,654	70,537

During the site investigation work in **Chapter 10: Soils and Geology** it was concluded that no peat was onsite. There was a peaty soil onsite which averaged 0.1m in depth across the development site (maximum depth of 0.4m). The carbon calculator has been run with an average depth of 0.1m of peat across the site.

³³ SEAI, 2016, Energy Security in Ireland :A Statistical Overview <https://www.seai.ie/publications/Energy-Security-in-Ireland-2015.pdf> [Accessed 18 Sep 24]

The worksheet model calculated that the Proposed Development is expected to give rise to up to 58,654 tonnes of CO₂ equivalent losses at the lower range (26.5MW) and 70,537 tonnes of CO₂ equivalent losses at the higher range (36MW) over its 35-year life. The range in the megawatt output is related to the turbine dimensions as outlined in **Description of Proposed Development - Section 2.6.2**. Of this total figure, the proposed wind turbines directly account for 25,796 tonnes, or 44% at the lower range and 32,803 tonnes or 47% at the higher range.

Of the expected total CO₂ losses, losses due to back up³⁴ account for 18,525 tonnes, or 32% at the lower range and 23,400 tonnes or 33% at the higher range.

Combined losses from soil organic matter, reduced carbon fixing potential, DOC and POC leaching and the felling of forestry accounting for the remaining 14,333 tonnes, which is equivalent to 24% at the lower range and 20% at the higher range.

The estimated CO₂ arising from ground activities associated with the Proposed Development is calculated based on the entire Proposed Development footprint being "Fen", as this is one of only two choices, the other being Acid Bog. The habitat that will be impacted by the Project footprint comprises agricultural grassland, commercial forestry and a small area of fen which has predominantly dried out rather than the acid bog assumed by the model. The actual CO₂ losses are expected to be lower than the modelled value. The carbon calculator estimates there to be no overall carbon losses from soil organic matter and is predicted to lock in carbon over the duration of the project. This is partly due to revegetation and habitat restoration on the site during the operation phase, these figures are included in **Appendix 18.1**.

The main difference between a fen and a bog is that fens have greater water exchange and are less acidic, so their soil and water are richer in nutrients. Fens are often found near bogs and over time most fens become bogs. There are two identified wetlands within the planning boundary which are provisionally classified as fen habitats.

The figures discussed above are based on the assumption that the hydrology of the site and habitats within the site are not restored on Decommissioning after its expected 35-year useful life. However, at the end of the 35-year lifespan of the Proposed Development, the turbines may be replaced with newer models subject to a consent for the same being

³⁴ CO₂ loss due to back up is calculated from the extra electricity production baseload capacity required for backup of the wind farm to meet net generation demands when the wind farm is non-generating.

obtained. This would mean the carbon losses associated with not restoring the habitats hydrology at the site would be offset by the carbon-neutral energy that the new turbines would generate.

18.4.4.3 Carbon Savings

The habitat that will be impacted by the Proposed Development footprint comprises predominantly agricultural land, commercial forestry and a small section of fen which has largely dried out (160m²) will be affected.

However, the carbon calculator is pre-loaded with information specific to the CO₂ emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from proposed wind farm projects in the UK and similar data was not available for the Irish electricity generation plant. Therefore, these CO₂ emissions savings from the Proposed Development were calculated separately from the worksheet.

According to the model described above, the Proposed Development will give rise to total losses of 58,654 (lower range) or 70,537 (higher range) tonnes of carbon dioxide.

A simple calculation is used to determine carbon dioxide emission reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$\text{CO}_2 \text{ (in tonnes)} = \frac{\text{A} \times \text{B} \times \text{C} \times \text{D}}{1000}$$

where:

A = The maximum capacity of the wind energy development in MW

B = The capacity or load factor, which takes into account the availability of wind turbines and array losses etc³⁵.

C = The number of hours in a year

D = Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid³⁶.

For the purposes of this calculation, the rated capacity of the Proposed Development is assumed to be approximately 28.5 MW at the lower range and 36 MW at the higher range. A load factor of 0.35 (or 35%) has been used for the Proposed Development.

³⁵EirGrid, 2022, Enduring Connection Policy 2.2 Constraints Report for Area B Solar and Wind Available at: <https://cms.eirgrid.ie/sites/default/files/publications/ECP-2-2-Solar-and-Wind-Constraints-Report-Area-B-v1.0.pdf> [Accessed 23/09/2024]

³⁶ SEAI, ENERGY IN IRELAND 2023 Report, Available at: <https://www.seai.ie/publications/Energy-in-Ireland-2023.pdf> [Accessed 23/09/2024]

There has been a strong reduction in the CO₂ intensity of electricity supply in the last 2 decades, with more sharper reductions occurring between 2016 and 2020, falling to its lowest in 2020. These falls are due to increased use of higher-efficiency gas turbines, increased electricity generated from zero-carbon renewable sources, especially wind. In 2021 and 2022, the CO₂ intensity of electricity supply increased marginally, due an increase in emissions from coal and, to a lesser extent, oil. The most recent emission factor for electricity supply in Ireland in 2022 was 332g CO₂/kWh³⁷.

The calculation for carbon savings at the lower range and higher range are therefore as follows:

$$\text{CO}_2 \text{ (in tonnes)} = \frac{(28.5 \times 0.35 \times 8,760 \times 332)}{1000}$$

= **29,010** tonnes per annum at the lower range

$$\text{CO}_2 \text{ (in tonnes)} = \frac{(36 \times 0.35 \times 8,760 \times 332)}{1000}$$

= **36,645** tonnes per annum at the higher range

Based on this calculation, approximately 29,010 (lower range) or 36,645 (higher range) tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development.

In total, it is estimated that 1,015,367 tonnes (lower range) or 1,282,569 tonnes (higher range) of carbon dioxide will be displaced over the proposed 35-year lifetime of the wind farm.

The Scottish Government carbon calculator as presented above calculated 58,654 (lower range) and 70,537 (higher range) tonnes of CO₂ will be lost to the atmosphere due to the construction and operation of the Project. This represents 5.8% (lower range) and 5.5% (higher range) of the total amount of carbon dioxide emissions that will be offset by the Project. Given the calculated carbon savings over the expected 35 year period of the wind farm, the carbons losses due to the construction and operation of the Project will be offset by the Project in approximately 24 months of operation at the lower range and 23 months of operation at the higher range.

³⁷ SEAI, 2023 Energy in Ireland 2023, Available at: <https://www.seai.ie/publications/Energy-in-Ireland-2023.pdf> [Accessed 24/09/2024]

18.4.5 Do Nothing Impact

If the Project was not to proceed, greenhouse gas emissions, e.g., carbon dioxide, carbon monoxide and nitrogen oxides associated with construction and Decommissioning works would not arise. However, the greenhouse gas savings that would arise from the operation of the Project would also be lost leading to a **moderate, negative and long-term** impact.

The likely evolution of the baseline environment may be continued forestry and farming/ agricultural in the area of the Proposed Development. It is likely that the adjacent Quarry at Kilsaran will be developed/ extended, as permission was granted by Louth County Council (under Planning Application Reference No. 22/190). It is also possible that other developments in the region, may be extended, such as the poultry farm (Crayvall Egg Production) which is located approximately 930m northeast of the Proposed Development.

18.4.6 Potential Impacts of the Project

18.4.6.1 Construction Phase

The main greenhouse gas produced by vehicles is carbon dioxide (CO₂). Smaller quantities nitrous oxide (N₂O) and methane (CH₄) gas are also produced (and emitted) by the fuel consumption process. The potency of these GHGs are very high, with 1Kg of N₂O releasing the equivalent of 298kg of CO₂ into the atmosphere and 1kg of CH₄ releasing the equivalent of 25kg CO₂.

Given, that (in 2021) there were 2.25 million registered cars in Ireland³⁸ and 5 million kilometers is covered daily by trucks in order to keep Ireland serviced³⁹, the impact of the delivery / removal loads (6,677) of material to/ from the Proposed Development during the construction phase is relatively very small. The relatively insignificant quantity of greenhouse gases that will be emitted over the short duration of the construction phase, will have at worst, a **slight, negative and short-term** potential impact. Mitigation measures to reduce this impact are outlined in **Section 18.4.7**.

18.4.6.2 Operation Phase

The Project is a renewable energy project in that it will generate electricity from a renewable source. This energy generated will be in direct contrast to traditional energy and the

³⁸ Statista, 2023 Registered passenger cars in Ireland 2010-2021, Available at: <https://www.statista.com/statistics/452305/ireland-number-of-registered-passenger-cars/> [Accessed 19/09/2024]

³⁹ Oireachtas 2021 Haulage Industry, Dáil Éireann Debate, Available at: <https://www.oireachtas.ie/en/debates/question/2021-11-04/85/> [Accessed 19/09/2024]

associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive impact on the climate.

The operational phase of the Proposed Development does not contain any element which will produce greenhouse gaseous emissions or odorous emissions. The Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Project. The Project will assist in reducing carbon dioxide (CO₂) emissions (29,010 tonnes per annum at the lower expected capacity or 36,645 tonnes per annum at the lower expected capacity) that would otherwise arise if the same energy that the Project will generate were otherwise to be generated by conventional fossil fuel plants. This is expected to have a **moderate, positive and long-term** effect on the climate.

Table 18.5 shows the number of homes that can be powered each year from the electrical energy produced by the Proposed Development. This was calculated at the minimum and maximum expected capacity of 28.5 – 36MW, using a figure of 4.459 MWh of electrical energy per home (In 2022 the average home used 17.15 MWh of energy 26% of which was from electric sources⁴⁰, equivalent to 4.459 MWh of energy). The CO₂ offset from the electricity generated (tonnes per annum) is also shown in **Table 18.5**, using the most recent SEAI emission factor (0.332 kg of CO₂ per kWh)⁴¹.

The approximate emission savings that can be achieved each year at a running capacity of 35%, instead of the equivalent output from the current mix of generating fuel in Ireland. This assessment assumes a scenario of a 28.5MW – 36MW output for the Proposed Development.

Table 18.5: Statistics relating to Emissions Avoidance of the EIA Development

Factor	Contribution (28.5 MW – 36 MW)
Energy Produced (MWh per annum) 28.5MW x 0.35 x 365 x 24 36 MW x 0.35 x 365 x 24 (35% capacity factor)	87,381 – 110,376 MWh per annum
Number of Homes Powered (per annum) (at 4.459 MWh/ house of electrically sourced energy)	19,597 – 24,754 homes per annum

⁴⁰ Sustainable Energy Authority of Ireland (2022) Available at: <https://www.seai.ie/data-and-insights/seai-statistics/residential/> [Accessed 23/09/2024]

⁴¹ SEAI, Emission factors for electricity for 2023 (provisional value) <https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/> [Accessed 23/09/2024]

Factor	Contribution (28.5 MW – 36 MW)
CO ₂ offset of electricity generated (tonnes per annum) (0.332 Kg of CO ₂ per kWh)	29,010- 36,645 tonnes per annum

These calculations show that the annual electrical needs for 19,597 – 24,754 homes can be met by the electricity produced from the Proposed Development. In terms of CO₂ offset of electricity generated, between 29,010- 36,645 tonnes of CO₂ will be offset annually. This will have a **slight, positive** and **long-term** impact in helping Ireland reduce its greenhouse gas emissions and meet its international obligations.

18.4.6.3 Decommissioning Phase

Any impacts and consequential effects that occur during the Decommissioning phase are similar to that which occur during the construction phase, albeit to a substantially lesser extent. The turbines will be dismantled and removed from site and the reinforced concrete bases and hardstands will be left in situ, covered in topsoil and revegetated. The site Access Roads will also be left in-situ; however, they will not be covered in topsoil and remain in use for local residents. Keeping the Turbine Foundations, buildings and site Access Roads in-situ will greatly reduce the impact on GHGs; there will be no delivery loads associated with turbine and substation foundations and site Access Roads. Additionally, there will be no removal loads due to forestry clearance. The impact from this phase is expected to be **slight, negative** and **temporary** impact.

18.4.7 Mitigation Measures

18.4.7.1 Construction Phase Mitigation

Mitigation measures for reduction of GHGs are:

- All machinery when not in use will be turned off.
- 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.
- Use of local quarries, materials suppliers and waste facilities will be used, as outlined in **Chapter 16 Traffic and Transport**, minimising travel distances
- A robust Traffic Management Plan (**Appendix 2.1, CEMP, Management Plan No. 7**) has been developed, utilising the most direct routes where possible. This plan will be updated to reflect project needs.

18.4.7.2 *Operational Phase Mitigation*

The operation phase of the Project will have a positive impact on the climate due to the displacement of fossil fuels and therefore no mitigation is necessary for this phase. Where turbine components are being replaced the same mitigations measures as per the construction phase will apply.

18.4.7.3 *Decommissioning Phase Mitigation*

Mitigation measures during the Decommissioning phase will be the same to those employed during the construction phase as outlined in **Section 18.4.7.1**. The Decommissioning Plan (**Management Plan No. 6** to the CEMP, **Appendix 2.1**) is a live document and outlines the mitigation measures required during Decommissioning.

18.4.8 **Residual Impacts of the Project**

18.4.8.1 *Construction Phase*

With mitigation measures in place, the effects of the construction phase on GHG emissions will be reduced to a **not significant, negative** and **short-term** impact.

18.4.8.2 *Operational Phase*

There will be a **moderate, positive** and **long-term**, impact on Climate as a result of reduced greenhouse gas emissions.

18.4.8.3 *Decommissioning Phase*

With mitigation measures in place, the effects of the Decommissioning phase on GHG emissions will be reduced to **not-significant, negative** and **temporary**.

18.4.9 **Cumulative Effects**

Operational phase

GHG emissions, namely CO₂, NO_x and SO₂ concerns related to wind farms primarily arise during construction and decommissioning, with potential impacts influenced by proximity to sensitive receivers. Negative cumulative impacts could occur if a large development with the potential to impact GHG emissions was located in the vicinity of the Wind Farm Site. The developments considered as part of the cumulative effect assessment are described in **Appendix 2.4**. There are five (no. 5) operational wind energy developments within 20km of the Wind Farm Site (between 11.4km and 17km). Operational wind farms pose minimal increases to GHG emissions. Unlike fossil fuel-based power stations, wind turbines for energy production have no direct emissions, contributing to a reduction in harmful emissions and environmental impact.

During the construction phase, there may be temporary cumulative rise in GHG emissions due to construction vehicles and transport, as a result of cumulative emissions anticipated due to on-going operation of the neighbouring Kilsaran Quarry and Crayvall Egg Production farm. It is also a possibility that the Kilsaran Quarry extension (granted by Louth County Council (under Planning Application Reference No. 22/190) will be developed/ extended in the near future, as permission was granted by Louth County Council (under Planning Application Reference No. 22/190). In **Section 18.3.9** of the EIAR assessment for Kilsaran Quarry, it is concluded that the residual impact of the existing and proposed works at Kilsaran Quarry will not lead to a significant impact on either air quality or climate. The increased tonnage of waste to the waste recovery facility was also included within the assessment.

The cumulative impact of GHG emissions is expected to increase from **not significant, negative and short-term**, for the Proposed Development to a cumulative impact of **slight, negative and short-term**.

Given existing and proposed works at Kilsaran quarry, and on-going operation of Crayvall Egg Production farm, the cumulative impact of GHG emissions is expected to change from **moderate, positive and long-term** for the operational phase of the Proposed Development to a cumulative impact of **slight, positive and long-term**.

Cumulative impacts during the Decommissioning phase of the Proposed Development, may result in an increase in GHG emissions impact from **not-significant, negative and temporary** for the Proposed Development to **slight, negative and temporary** cumulative effect.

18.4.10 Summary of Significant Effects

This assessment has identified no potentially significant effects, given the mitigation measures embedded in the design and the measures that will be implemented as part of the Proposed Development.

The nature of the Project is such that, once operational, it will have a moderate, positive and long-term, impact on the air climate. It is considered that the cumulative impact will be positive in terms of carbon reduction and the climate also.

18.4.11 Statement of Significance

This chapter section has assessed the significance of potential effects of the Proposed Development on climate. The Proposed Development has been assessed as having the potential to result in slight, negative, temporary/short-term effects during construction and Decommissioning. There will be a slight, positive, long-term effect in terms of helping Ireland meet its international obligations to reduce greenhouse gas emissions.

Potential cumulative effects were assessed as being of a slight, negative, short-term impact during the construction and Decommissioning phases.

Given that only effects of significant impact or greater are considered “significant” in terms of the EIA Regulations, the potential effects of the Proposed Development on both air quality (See **Section 18.3.11**) and climate are considered not significant.