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Environmental Impact Assessment Report

Carrig Renewables Wind Farm

Chapter 10 – Air Quality

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Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

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10. AIR QUALITY

10.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the construction, operation and decommissioning of the proposed Carrig Renewables Wind Farm (the "Proposed Development").

The Proposed Development is located approximately 2 kilometres west of Carrig, Co. Tipperary, 5.7 kilometres to the southwest of Riverstown, Co Tipperary and 7 kilometres southwest of Birr, Co. Offaly. It is proposed to access the Proposed Development via a new access track off the L5040 Local road to the southeast of the Proposed Development. The Proposed Development is served by a number of existing agricultural roads and tracks.

The townlands in which the Proposed Development is located are listed in Table 1-1 in Chapter 1 of this EIAR. Current land-use on the Proposed Development comprises coniferous forestry, and agriculture. Current land-use along the grid connection comprises of public road corridor, public open space, discontinuous urban fabric and agriculture. Land-use in the wider landscape of the Proposed Development comprises a mix of agriculture, peat cutting, quarrying, low density residential and commercial forestry.

Due to the non-industrial nature of the Proposed Development and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g. heavy industry) in the vicinity of the site.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power stations. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor short term or temporary indirect emissions associated with the construction of the Proposed Development include vehicular and dust emissions.

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10.1.1.1 Relevant Guidance and Legislation

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

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – June 2022' (EPA, 2022).
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report' (EC, 2017)
- Environmental Protection Agency (2022) Air Quality in Ireland Report 2021.
- Guidance on the Assessment of Dust from Demolition and Construction V1.1 (IAQM 2016);
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII 2011);
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (TII 2009);
- UK Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM.TG (16) (DEFRA 2018);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (UKHA 2019);
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide Global Update 2005 (WHO 2005).

10.1.1.2 Statement of Authority

This section of the EIAR has been prepared by Edward Ryan and Jonathan Fearon, and reviewed by Eoin McCarthy, all of whom are Environmental Scientists with MKO. Edward is an Environmental Scientist with a B.Sc. (Hons) in Environmental Science from the University of Limerick and a M.Sc. (hons) in Environmental Systems from Atlantic Technological University: ATU (formally GMIT). Edward is an Environmental Scientist with over 4 years of consultancy experience. Jonathan is an Environmental Scientist with a B.Sc. (Hons) in Environmental Science and a M.Sc. in Environmental Leadership from NUI Galway, with previous experience in local government and environmental consultancy work. Eoin is a Senior Environmental Scientist, with over 11 years of experience in private consultancy. Eoin holds a B.Sc. (Hons) in Environmental Science from NUI, Galway. He has been involved in the project management of the production of EIARs for over 700MW worth of wind energy projects. Eoin has completed the Air and Climate section for numerous EIARs for wind energy projects.

10.2 Air Quality

10.2.1 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).

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- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009).

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

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

Table 10-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (µg/m^3) and parts per billion (ppb). The notation PM10 is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM2.5 represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 10-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: https://www.epa.ie/air/quality/standards/)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005

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Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of human health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	52	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010

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Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Nitrogen monoxide (NO) and nitrogen dioxide (NO2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM10)	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 2.5 (PM2.5)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 (PM2.5) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	30	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold for the protection of human health	24 hours	20	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 (PM2.5) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1st Jan 2005

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Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1st Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 10-2 presents the limit and target values for ozone.

Table 10-2 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8-hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 mg/m^3.h averaged over 5 years	6,000 mg/m^3.h
Information Threshold	1-hour average	180 mg/m^3	-
Alert Threshold	1-hour average	240 mg/m^3	-

*OT40 is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m3 and is expressed as g/m3 hours

10.2.1.1 Air Quality and Health

The World Health Organisation (WHO) in 2016 estimated that ambient air pollution caused 4.2 million deaths worldwide in 2016 (WHO, 2018). A more recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2021 Report*' highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 373,000 people in Europe in 2019, with regards to deaths relating to $PM_{2.5}$. The estimated impacts on the population in Europe of exposure to NO_2 and O_3 concentrations in 2019 were around 47,700 and 19,070 premature deaths per year, respectively.

Of these numbers, 1,380 deaths due to poor air quality were estimated in Ireland in 2019 with 1,300 Irish deaths attributed to fine particulate matter ($PM_{2.5}$), 30 Irish deaths attributed to nitrogen oxides (NO_2) and 50 Irish deaths attributed to Ozone (O_3). These emissions, along with others including sulphur oxides (SO_x) are produced during fossil fuel-based electricity generation in various amounts, depending on the fuel and technology used, emissions from industry and power plants, vehicles emissions and transport fuels. The findings of this report were reproduced in the more recent report by

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the Environmental Protection Agency (EPA) '*Air Quality in Ireland 2021.*'[1] A 2016 EPA report 'Ireland's Environment – An Assessment' states that the pollutants of most concern are NOx, (the collective term for the gases nitric oxide and nitrogen dioxide, PM (particulate matter) and O3 (ozone). The EPA report goes on to state that:

> *"Ireland has considerable renewable energy resources, only a fraction of which are utilised to address our energy requirements".*

Whilst there is the potential of such emissions to be temporarily generated from the site construction work, mitigation measures discussed below in Sections 10.2.4 will be implemented to reduce the impact from these potential emissions.

10.2.2 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 Cafe Directive, 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.

10.2.3 Existing Air Quality

The air quality in the vicinity of the Proposed Development site is typical of that of rural areas in the West of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2021' was published by the EPA in 2022. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D.

10.2.3.1 Sulphur Dioxide (SO2)

Sulphur dioxide data for Cork Harbour, Kilkitt, Askeaton, Edenderry and Letterkenny in 2021 is presented in Table 10-3.

Table 10-3 Average Sulphur Dioxide Data for Zone D in 2021.

Parameter	Measurement (ug/m^3)
Annual Mean	4.16
Hourly values > 350	0.0
Hourly max	94.794
Daily values > 125	0

[1] *Environmental Protection Agency: Air Quality in Ireland 2021. Available at: https://www.epa.ie/publications/monitoring--assessment/air/EPA-Air_Quality_in-Ireland-Report_2021_-interactive-pdf.pdf*

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Parameter	Measurement (ug/m^3)
Daily max	25.54

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can observed from Table 10-3 the average maximum hourly value recorded during the assessment period was 94.794 µg/m3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO2 values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above.

10.2.3.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. The EPA report[2] provide annual mean PM_{10} concentration for twelve Zone D towns, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh Carrignafoy, Claremorris, Kilkitt, Cavan, Edenderry, Mallow, Longford, Cobh Cork Harbour and Roscommon Town. Particulate matter (PM_{10}) data for 2021 is presented in Table 10-4.

Table 10-4 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2021.

Parameter	Measurement (ug/m3)
Annual Mean	11.94
% Data Capture	91
Values > 50 ug/m3	Max 4
Daily Max	60.6

The daily limit of 50 µg/m^3 for the protection of human health was not exceeded more than 35 times during the monitoring period. It would be expected that PM_{10} values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above. An Osiris Monitor which measures local PM_{10} and PM $_{2.5}$ levels ($PM_{2.5}$ is a finer inhalable particle) was installed at Ballina, Co. Mayo in 2020. This local station provides real time data only. The real time data for PM_{10} and $PM_{2.5}$ at the time of writing indicates that the daily thresholds were not exceeded.

10.2.3.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data for Birr, Castlebar, Carrick-on-Shannon, Edenderry, Emo Court and Kilkitt in 2021 is presented in Table 10-5.

Nitrogen dioxide data for the Castlebar station in the period 19/10/2021 - 19/04/2022 shows that the average measurement for NO_2 for that 6-month period was 5.96 µg/m3 whilst the maximum reading was 20.85 µg/m3.

[2] *EPA (2022). Air Quality in Ireland 2021.*

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Table 10-5 Average Nitrogen Dioxide Data for Zone D Sites in 2021

Parameter	Measurement
Annual Mean	7.5
NO2 Values >200	0
Values > 140 (UAT)	0
Values >100 (LAT)	0
Hourly Max.	63

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. Furthermore, the lower and upper assessment thresholds of 100 and 140 µg/m^3 was not exceeded during the monitoring period. The average hourly max. NO_2 value of 63 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It would be expected that NO_2 values at the Proposed Development site would be similar lower than those recorded for the Zone D sites above.

10.2.3.4 Carbon Monoxide (CO)

The EPA report[2] provide rolling 8-hour carbon monoxide concentrations for Birr a Zone D site. Carbon Monoxide data for 2020 is presented in Table 10-6.

Table 10-6 Carbon Monoxide Data for Birr – Zone D Site in 2020.

Parameter	Measurement
Annual Mean	0.3 mg/m3
Median	0.3 mg/m3
% Data Capture	98.2%
Values > 10	0
Max	1.2 mg/m3

The average concentration of carbon monoxide was 0.3 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/69/EC.

10.2.3.5 Ozone (O_3)

The EPA report[3] provide rolling 8-hour ozone concentrations for seven Zone D sites, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. Ozone (O_3) data for 2021 is presented in Table 10-9. As can be observed there were no exceedances of the maximum daily eight-hour mean limit of 120 µg/m^3. The legislation stipulates that this limit should not be exceeded on more than 25 days.

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Table 10-7 Average Ozone Data for Zone D Sites in 2021

Parameter	Measurement
Annual Mean	60µg/m3
Median	62 µg/m3
% Data Capture	89%
No. of days > 120	11 days

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10.2.3.6 Dust

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m2/day. The EPA recommends a maximum daily deposition level of 350 mg/m2/day when measured according to the TA Luft Standard 2002. [3],[4]

Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e. soil, sand, peat, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

The potential dust-related effects on local air quality and the relevant associated mitigation measures are presented in Sections 10.2.4.3 below.

10.2.4 Likely and Significant Impacts and Associated Mitigation Measures

10.2.4.1 'Do-Nothing' Effect

If the Proposed Development were not to proceed, the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than renewable energy sources such as the Proposed Development. This would result in an indirect, slight, negative impact on air quality nationally.

10.2.4.2 Construction Phase

10.2.4.2.1 Exhaust Emissions

Proposed Development Infrastructure

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

The construction of the proposed substation, widening works along the local road and the grid connection cabling route to the Dallow 110kV substation will require the use of construction machinery, thereby giving rise to exhaust emissions. This is a short-term, slight, negative impact, which will be reduced through use of the best practice mitigation measures as presented below.

[3] *Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emissions Monitoring Guidance Note (AG2), Revision 4 (May 2018). EPA: Wexford, Ireland Available at: http://www.epa.ie/pubs/advice/air/emissions/Emission_Monitoring_Guidance_AG2_May2018.pdf*
[4] *Technical Instructions on Air Quality Control TA Luft (2002) English Translation. Available at: http://www.cement.or.kr/mater_down/UMEG_TA-Luft2002_Englisch.pdf*

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Transport to and from Site

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

Mitigation

- All construction vehicles and plant used onsite during the construction phase will be maintained in good operational order. If a vehicle requires repairs this work will be caried out, thereby minimising any emissions that arise.
- Turbines components will be transported to the Site on specified routes only, unless otherwise agreed with the Planning Authority.
- All machinery will be switched off when not in use.
- Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.
- The majority of aggregate materials for the construction of the Proposed Development will be obtained from the borrow pits on site. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.
- The MRF facility will be as close as possible to the Proposed Development site to reduce the amount of emissions associated with vehicle movements.

Residual Impact

The residual impact from the construction phase and the implementation of the above mitigation measures will result in a short-term, slight negative impact.

Significance of Effects

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

10.2.4.2.2 Dust Emissions

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

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

Table 10-8 details the NRA 2011 assessment criteria[5] used for assessing the impact of dust from construction activities sites of varying scale.

[5] *NRA 2011 Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes Available at: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf*

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Table 10-8 NRA Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	Description	Soiling	PM_{10}a	Vegetation Effects
Major	Large construction sites, with high use of haul roads	100 m	25 m	25 m
Moderate	Moderate construction sites, with moderate use of haul roads	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul roads	25 m	10 m	10 m

a Significance based on the 2005 standard, which allows 35 daily exceedances/year of 50 µg/m^3

Turbines and Other Infrastructure

The construction of turbine foundations and hardstands, substation, anemometry mast, site roads, other onsite infrastructure and borrow pit extraction (as outlined in Chapter 4 of this EIAR) will give rise to dust emissions during the construction phase.

Using the NRA criteria, the Proposed Development is considered to be a Major construction activity with an estimated average dust soiling of 100m from the site, a PM_{10} deposition of 25m with potential effects on vegetation up to a distance of 25m from the site. However, the nearest sensitive receptor to any wind farm site infrastructure is located over 200m west of a proposed new road. Therefore, the potential for impacts on off-site receptors during the construction of the Proposed Development is considered a short term Slight Negative Impact.

Haul Route

In order to accommodate the delivery of turbine components and other abnormal loads, accommodation works will be required at 2 no. locations along the N52 in the townlands of Clohaskin and Ballyloughnane, Co. Tipperary.

Excavation works associated with the accommodation works will give rise to localised dust emissions. It is considered a moderate construction site as it will result in soiling effects which have the potential to occur up to 50m from the source, with PM_{10} deposition and vegetation effects occurring up to 15m from the source.

There is one residential dwelling located 50m from the accommodation works proposed in the townland of Ballyloughnane and no residential dwellings within 50m of the accommodation works in the townland of Clohaskin.

Upon completion of the construction phase of the Proposed Development, the boundary between the local road and the new hardstanding areas at these two locations will be reinstated using stockproof fencing. These works are considered to be temporary and will have a slight negative impact. Mitigation measures to reduce this impact are discussed below.

Grid Connection Cable

The excavation of the grid connection cabling route trench will give rise to localised dust emissions. It is considered a minor construction site as it will result in soiling effects which have the potential to occur up

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to 25m from the source, with PM_{10} deposition and vegetation effects occurring up to 10m from the source. There are a number of residential dwellings along the 13.7km grid connection route. Some houses may experience soiling and deposition of vegetation effects depending on how close to the road corridor they are located. However, due to the nature of construction along the proposed grid connection as described in Chapter 4 of this EIAR which is termed a "rolling" construction site, meaning that these works will not be concentrated in any one area of the route for any considerable length of time Therefore, these effects are considered to be temporary and slight negative impact. Mitigation measures to reduce this impact are presented below.

Transport to Site

The transport construction materials to and waste from the wind farm site will give rise to some localised dust emissions during periods of dry weather. This is a temporary imperceptible negative impact. Mitigation measures to reduce the significance of this effect are presented below.

Mitigation

- A wheel wash facility will be installed on the Proposed Development site and will be used by vehicles before leaving site.
- In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, grid route, road widening sections, substation, and construction compounds and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, such as during periods of dry weather, de-silted water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads, turbine bases, borrow pit and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored by the Ecological Clerk of Woks to avoid, insofar as reasonably possible, increased runoff as outlined in the CEMP.
- Areas of excavation will be kept to a minimum and stockpiling of excavated material will be minimised by coordinating excavation, placement of material in peat placement areas and restoration of borrow pits.
- Turbines components and construction materials will be transported to the site on specified haul routes only, as agreed with the local authority.
- The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as deemed necessary by the construction Site Supervisor/Site Manager.
- The transport of construction materials may have the potential to generate dust in dry weather conditions. Roads will be watered down to suppress dust particles in the air as deemed necessary by the Site Supervisor/Manager.
- The transport of dry excavated material from the on-site borrow pits, which may have potential to generate dust will be minimised. If necessary, such as in periods of dry weather, excavated material will be dampened prior to transport from the borrow pits.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3). The CEMP includes dust suppression measures.

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Residual Impact

Short-term imperceptible negative impact.

Significance of Effects

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

10.2.4.3 Operational Phase

10.2.4.3.1 Exhaust Emissions

Exhaust emissions associated with the operational phase of the Proposed Development will arise from occasional machinery and Light Goods Vehicles (LGV) that are intermittently required onsite for maintenance. This will give rise to a Long-term Imperceptible Negative Impact.

Mitigation

Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order.

Residual Impact

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality from exhaust emissions during the operation of the Proposed Development.

10.2.4.3.2 Air Quality

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Proposed Development will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2). The production of renewable energy from the Proposed Development will have a long-term, significant, positive impact on air quality. Further details on the carbon dioxide savings associated with the Proposed Development are presented in Section 10.3.3.

Residual Impact

Long-term significant positive impact

Significance of Effects

Based on the assessment above there will be a significant positive effect on air quality due to the operation of the Proposed Development.

10.2.4.3.3 Human Health

Exposure to chemicals such as SO_2 and NO_x are known to be harmful to human health. The production of clean renewable energy from the Proposed Development will offset the emission of these harmful chemicals by fossil fuel-powered sources of electricity and, therefore, will have a long term slight positive

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impact on human health. Further information on the impact of the Proposed Development on Human Health is contained in Chapter 5: Population and Human Health.

Residual Impact

Long-term Slight Positive Impact

Significance of Effects

Based on the assessment above there will be a significant positive effect on human health due to the operation of the Proposed Development.

10.2.4.4 Decommissioning Phase

Any impact and consequential effects that occur during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The grid connection route will be left in situ in the public roadway; thus, no works will be required for this during the decommissioning phase. Likewise, the substation will remain on site resulting in no additional truck movements or requirement for demolitions and removal works for this piece of infrastructure. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

10.2.5 Cumulative Effects

Potential cumulative effects on air quality between the Proposed Development and other permitted or proposed projects and plans in the area, (wind energy or otherwise), as set out in Section 2.8 in Chapter 2 of this EIAR, were also considered as part of this assessment.

The nature of the Proposed Development is such that, once operational, it will have a long-term, moderate, positive impact on the air quality.

During the construction phase of the Proposed Development and other permitted or proposed projects in the area as set out in Appendix 2-3 of this EIAR, that are yet to be constructed, there will be minor emissions from construction plant and machinery and potential dust emissions associated with the construction activities. However, once the mitigation proposals, as outlined in Section 10.2.4 are implemented during the construction phase of the Proposed Development, there will be no cumulative negative effect on air quality.

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

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