16.0 Air Quality

16.1 Introduction

This chapter comprises an assessment of the likely effect on air quality associated with the proposed wind farm development and Underground Electricity Export Connection (UEEC) in the townlands of Keerglen, Ballinglen and Ballykinlettragh on a site measuring a combined c.81.88 ha. This report provides a baseline assessment of the setting of the proposed development in terms of air quality and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed development will have. Where required, appropriate mitigation measures to limit any identified likely significant adverse impacts to air quality are recommended.

A full description of the proposed development is presented in Chapter 3.

16.2 Statement of Competence

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16.3 Criteria for Rating of Impacts

16.3.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, National and European statutory bodies, the Department of the Environment, Heritage and Local Government in Ireland and the European Parliament and Council of the European Union, 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. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2022, which incorporate European Commission Directive 2008/50/EC which has set limit values for several pollutants, with the limit values for PM_{10}, and $PM_{2.5}$ being relevant to this assessment. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent

daughter directives (including 1999/30/EC and 2000/69/EC). The applicable limit values for PM_{10} and $PM_{2.5}$ are set out in Table 16.1.

Table 16.1: Ambient Air Quality Standards & TA Luft

Pollutant	Regulation [Note 1]	Limit Type	Value
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust	350 mg/m^2/day
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
Particulate Matter (as $PM_{2.5}$) Stage 1	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$
Particulate Matter (as $PM_{2.5}$) Stage 2 [Note 2]	2008/50/EC	Annual limit for protection of human health	20 µg/m^3 $PM_{2.5}$

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Note 2 Stage 2 indicative limit value to be reviewed by the European Commission in 2013. Due to come into force in January 2020, however, no update from the Commission has been published.

In April 2023, the Government of Ireland published the *Clean Air Strategy for Ireland* (Government of Ireland, 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026, the IT4 targets by 2030 and the final targets by 2040 (shown in Table 16.2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m^3. The strategy also acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2*". Ireland will revise its air quality legislation in line with the proposed EU revisions to the CAFE Directive, which will set interim 2030 air quality standards and align the EU more closely with the WHO targets.

At present, the applicable standards for assessing compliance in relation to air quality are those outlined in Table 16.1.

Table 16.2: WHO Air Quality Guidelines					
Pollutant	**Regulation**	**Limit Type**	**IT3 (2026)**	**IT4 (2030)**	**Final Target (2040)**
NO_2	WHO Air Quality Guidelines	24-hour limit for protection of human health	-	-	25 µg/m^3
		Annual limit for protection of human health	20 µg/m^3	-	10 µg/m^3
PM (as PM_{10})		24-hour limit for protection of human health	75 µg/m^3	50 µg/m^3	45 µg/m^3
		Annual limit for protection of human health	30 µg/m^3	20 µg/m^3	15 µg/m^3
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5 µg/m^3	25 µg/m^3	15 µg/m^3
		Annual limit for protection of human health	15 µg/m^3	10 µg/m^3	5 µg/m^3

16.3.1.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in Section 16.3.1.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regard to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/m^2/day averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled *Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)* (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/m^2/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

16.3.1.3 National Air Emissions Targets

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (hereafter referred to as the National Emissions Reduction Directive) was published in December 2016. The National Emissions Reduction Directive applied the limits set out in *Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants* (hereafter referred to as the National Emission Ceiling Directive) until 2020 and established new national emission reduction commitments which are applicable from 2020 and 2030 for SO_2, NO_X, non- methane volatile organic compounds (NMVOC), ammonia (NH_3), $PM_{2.5}$ and methane (CH_4). In relation to Ireland, the 2020 to 2029 emission targets are 25kt (kilotonnes) for SO_2 (65% reduction on 2005 levels), 65kt for NO_X (49% reduction on 2005 levels), 43kt for NMVOCs (25% reduction on 2005 levels), 108kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 16.3. In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_X, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$, also shown in Table 16.3.

Table 16.3: National Air Emission Targets (Ireland's Air Pollutant Emissions 2020 to 2030)

Pollutant	2020 – 2029 Reduction Commitments		2030 Reduction Commitments	
	kt	% Reduction Compared to 2005 Levels	kt	% Reduction Compared to 2005 Levels
SO_2	25.6	-65%	10.96	-85%
NO_X	66.8	-49%	40.6	-69%
NMVOC	56.3	-25%	51.1	-32%
NH_3	112.1	-1%	107.5	-5%
$PM_{2.5}$	15.6	-18%	11.2	-41%

16.4 Methodology

16.4.1 Construction Phase

16.4.1.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to

the construction phase of this development to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland in their guidance document *'Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106'* (TII, 2022a).

The major dust generating activities are divided into four types within the IAQM guidance (2024) to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined.

16.4.1.2 Construction Phase Traffic Assessment

Construction phase traffic can also impact air quality. The TII guidance *'Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106'* (TII, 2022a), states that road links meeting one or more of the following criteria can be defined as being "affected" by a proposed development and should be included in the local air quality assessment. While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5 m or greater.

The construction stage traffic will not increase by 1,000 AADT or 200 HDV AADT. Therefore, it does not meet the above scoping criteria. In addition, there are no proposed changes to the traffic speeds or road alignment. As a result, a detailed air assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality.

16.4.2 Operational Phase

16.4.2.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact air quality. The TII scoping criteria (TII, 2022a) was used to determine if any road links required a detailed modelling assessment.

The operational phase of the development will involve only very occasional inspection and maintenance vehicles. By definition of the criteria, there are no road links impacted as a result of the proposed development. Therefore, a detailed air assessment of operational stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality as a result of vehicle emissions.

16.4.2.2 Operational Energy Production

The assessment of baseline air quality in the region is conducted to review and ensure that the current levels of key pollutants are significantly lower than their limit values. The indirect impacts to air quality from savings in nitrogen oxides (NO_X) emissions arising from the production of electricity using renewable sources were calculated and compared against those produced using non-renewable sources. The calculations were carried out using SEAI published emission rates from non-renewable energy sources.

The most recent report by the SEAI entitled "*Energy in Ireland 2023 Report*" (SEAI, 2023) estimates that a total of 33.6TWh of electricity was generated nationally in 2022. Renewable energy accounted for 38.9% of the electricity generated in 2022.

The EPA state that a total of 98.2 kt NO_X was emitted in 2021 in their report entitled "*Ireland's Air Pollutant Emissions 1990 – 2030*" (EPA, 2023). These are the most recently published figures for NO_X emissions. Power generation accounted for 8.7% of the total emissions produced in 2021.

The above figures from the SEAI and EPA were used in the current assessment to quantify the NO_X emissions savings from the windfarm development both annually and over the lifespan of the proposed development and the results were compared against the 2030 national air emissions target of 40.6kt (Table 16.3).

16.5 Receiving Environment

16.5.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions.

The nearest representative weather station collating detailed weather records is Belmullet meteorological station, which is located approximately 35 km west of the site. Belmullet meteorological station data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period. The average wind speed over the period 1991 – 2020 is approximately 6.4 m/s. Wind frequency is important as dust can only be dispersed by winds, and deposition of dust is a simple function of particle size, wind speed and distance. The closer the source of dust is to a receptor the higher the potential risk of impact of dust blow. The prevailing winds in the area are westerly to south-westerly in direction, thereby predominantly dispersing any potential dust emissions to the east and north-east of the site (see Figure 16.1).

Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under “wet day” conditions where rainfall greater than 0.2 mm has fallen. Information collected from Belmullet meteorological station, identified that typically 258 days per annum are “wet” (Met Eireann 2024, 30-year averages). Thus, over 70% of the time no significant dust generation will be likely due to natural meteorological conditions.

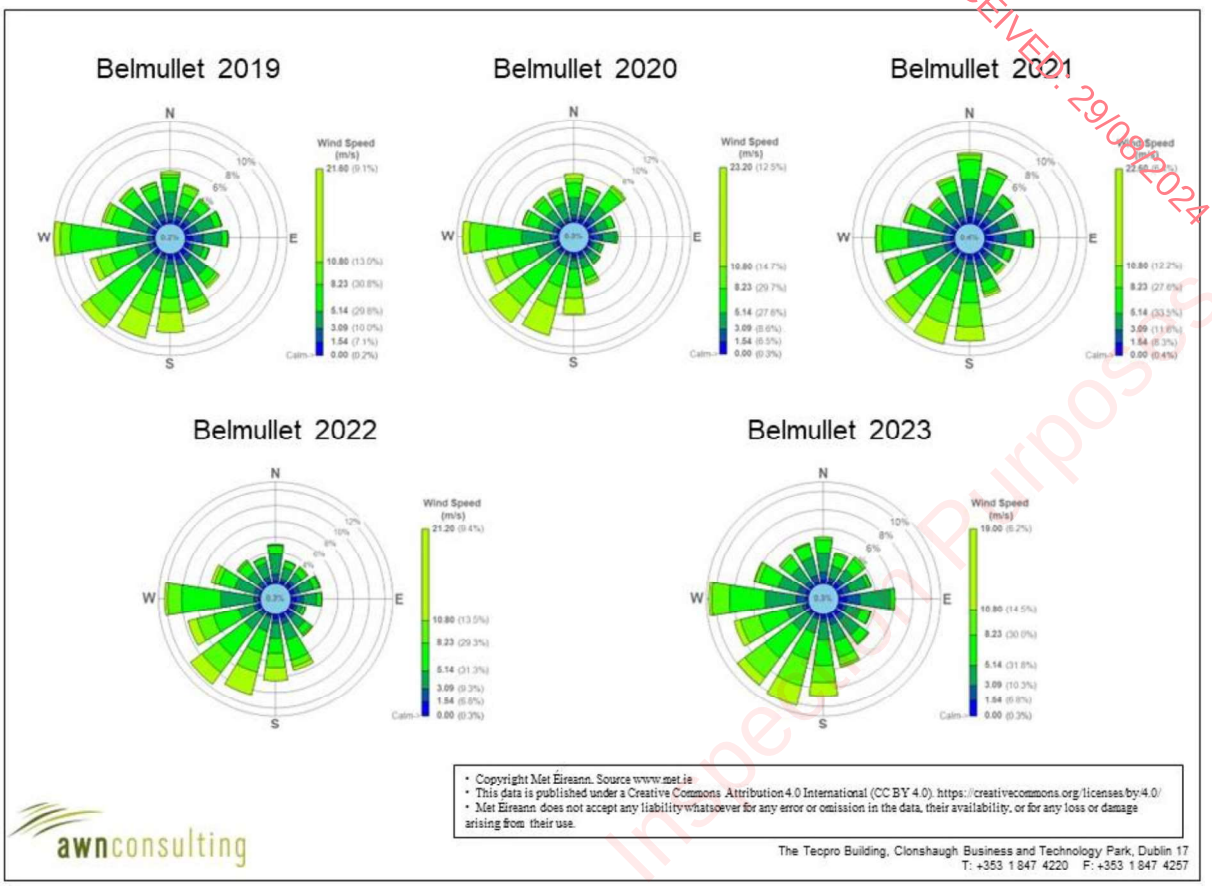

Figure 16.1: Belmullet Windroses 2019 – 2023

16.5.2 Baseline Air Quality

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled *Air Quality in Ireland 2022* (EPA 2023). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the area of the proposed development is categorised as Zone D.

16.5.2.1 Dust Deposition

Dust is present naturally in the air from a number of sources including weathering of minerals, pick-up across open land and dust generated from fires. Monitoring of dust deposition is not undertaken in the area and therefore background levels for the immediate vicinity of the site are not available.

However, a study by the UK ODPM (UK ODPM, 2002) gives estimates of likely dust deposition levels in specific types of environments. In open country a level of 39 mg/m^2/day is typical, rising to 59 mg/m^2/day on the outskirts of towns, and peaking at 127 mg/m^2/day for a purely industrial area. A level of 39 mg/m^2/day can be estimated as the background dust deposition level for the region of the proposed Keerglen Wind Farm due to its rural location.

16.5.2.2 Particulate Matter (PM_{10})

Long-term PM_{10} monitoring was carried out at the suburban background Zone D locations of Castlebar Co. Mayo, and Enniscorthy Co. Wexford and at the rural background locations of Kilkitt Co. Monaghan and Claremorris Co. Mayo over the period 2018 – 2022 (EPA, 2023). Annual mean concentrations range from 10 – 18 µg/m^3 for the urban sites and 7 – 12 µg/m^3 for the rural sites (Table 16.4). Hence, long-term average PM_{10} concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3. The 90.4th percentile of 24-hour values was well below the limit value of 50 µg/m^3 reaching at most 25 µg/m^3 in Enniscorthy in 2020. Data for the rural site at Kilkitt, which is the most representative site to the proposed development location, suggests an upper average annual mean of no more than 9 µg/m^3 as a background value. Based on the above data a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 9 µg/m^3.

Table 16.4: Trends in Zone D Air Quality – PM_{10}

Station	Averaging Period Notes 1, 2	Year				
		2018	2019	2020	2021	2022
Castlebar	Annual Mean PM_{10} (µg/m^3)	11	16	14	10	11
	90th %ile 24-hr PM_{10} (µg/m^3)	20	24	22	22	Note 2
Kilkitt	Annual Mean PM_{10} (µg/m^3)	9	7	8	8	9
	90th %ile 24-hr PM_{10} (µg/m^3)	15	13	14	13	Note 2
Claremorris	Annual Mean PM_{10} (µg/m^3)	12	11	10	10	8
	90th %ile 24-hr PM_{10} (µg/m^3)	20	20	16	13	Note 2
Enniscorthy	Annual Mean PM_{10} (µg/m^3)	-	18	15	14	15
	90th %ile 24-hr PM_{10} (µg/m^3)	-	-	25	23	Note 2

Note 1 Annual average limit value - 40 µg/m^3 and Daily limit value - 50 µg/m^3 measured as a 90.4th percentile (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

Note 2 Hourly data for 2022 not yet available.

16.5.2.3 Particulate Matter ($PM_{2.5}$)

The results of $PM_{2.5}$ monitoring at Claremorris over the period 2018 – 2022 ranged from 4 – 6 µg/m^3 (EPA, 2023). Long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the annual average limit value of 25 µg/m^3. Based on this information, a background $PM_{2.5}$ concentration of 6 µg/m^3 has been used in the assessment.

16.5.2.4 Summary

Based on the above information the air quality in the area of the proposed development is generally good, with concentrations of the key pollutants generally well below the relevant limit values. However, in general terms, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2. There is the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2023).

16.5.3 Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document *'Guidance on the Assessment of Dust from Demolition and Construction'* (2024) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties (where people are likely to spend the majority of their time), schools and hospitals. Commercial premises and places of work are regarded as medium sensitivity and places where people are present for short periods, or do not expect a high level of amenity, are regarded as low sensitivity. The sensitivity of the area is determined using the headings:

- Dust Soiling Effects on People and Property;
- Dust-Related Human Health Impacts; and
- Dust-Related Ecological Impacts.

In terms of receptor sensitivity to dust soiling, there are no sensitive receptors located within 250m of the proposed windfarm development itself. However, there are 18 no. high sensitivity residential properties within 250m of the access road to the site which may be impacted by dust emissions from vehicles travelling along this road (see Figure 16.2). Of these 18 no. receptors, 9 no. properties are within 20m of the access road. Therefore, the area is considered of medium sensitivity to dust soiling impacts based on the IAQM criteria outlined in Table 16.5.

There are also a total of 27 no. residential properties along the public road network within 20m of the UEEC route (see Figure 16.3). However, works will not take place over the entirety of the UEEC route at any single time, works will be undertaken in smaller sections and therefore, a lower number of receptors will be impacted at any one time. Based on the receptors locations it is likely that there would be a maximum of 10 receptors within 20m of the UEEC works at any one time. The sensitivity of the area associated with the UEEC can be classed as medium in relation to dust soiling as per the criteria in Table 16.5.

Table 16.5: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 9 $\mu g/m^3$. There are no high sensitivity receptors within 250m of the proposed windfarm development, however, as noted previously, there are 9 no. properties within 20m of the access road to the site which have the potential to be impacted by dust emissions from vehicles travelling along the road (see Figure 16.2). Additionally, there would be a maximum of 10 no. receptors within 20m of the UEEC route works at any one time (see Figure 16.3). Therefore, the area is considered of low sensitivity to dust-related human health impacts based on the IAQM criteria outlined in Table 16.6.

Table 16.6: Sensitivity of the Area to Dust Related Human Health Effects						
Receptor Sensitivity	**Annual Mean PM_{10} Concentration**	**Number of Receptors**	**Distance from Source (m)**			
			<20	**<50**	**<100**	**<250**
High	< 24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	**Low**	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low

Consideration has also been given to the IAQM document *'A Guide to the assessment of air quality on designated conservation sites 2020'* (IAQM 2020) with respect to ecologically sensitive receptors. Dust deposition impacts on ecology, specifically sensitive vegetation, can occur due to chemical or physical effects. This includes reduction in photosynthesis due to smothering from dust on the plants and chemical changes such as acidity to soils. Often impacts will be reversible once the works are completed, and dust deposition ceases. The IAQM guidance (2024) states that dust impacts to vegetation can occur up to 50m from the site, and 50m from site access roads, up to 250m for the site entrance. The sensitivity of the area is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present.

A section of the Ummerantarry Bog NHA (Site Code: 001570) is located within 20m of the proposed development boundary (see Figure 16.2). The NHA is considered a highly sensitive receptor in relation to dust impacts to ecology. Based on the IAQM criteria outlined in Table 16.7, the area is of high sensitivity to dust-related ecological impacts.

There are no designated ecological sites within 50m of the UEEC route and therefore there is no potential for impacts to sensitive ecology as a result of this element of the proposed development.

Table 16.7: Sensitivity of the Area to Dust-Related Ecology Effects		
Receptor Sensitivity	**Distance from Source (m)**	
	<20	**<50**
High	**High**	Medium
Medium	Medium	Low
Low	Low	Low

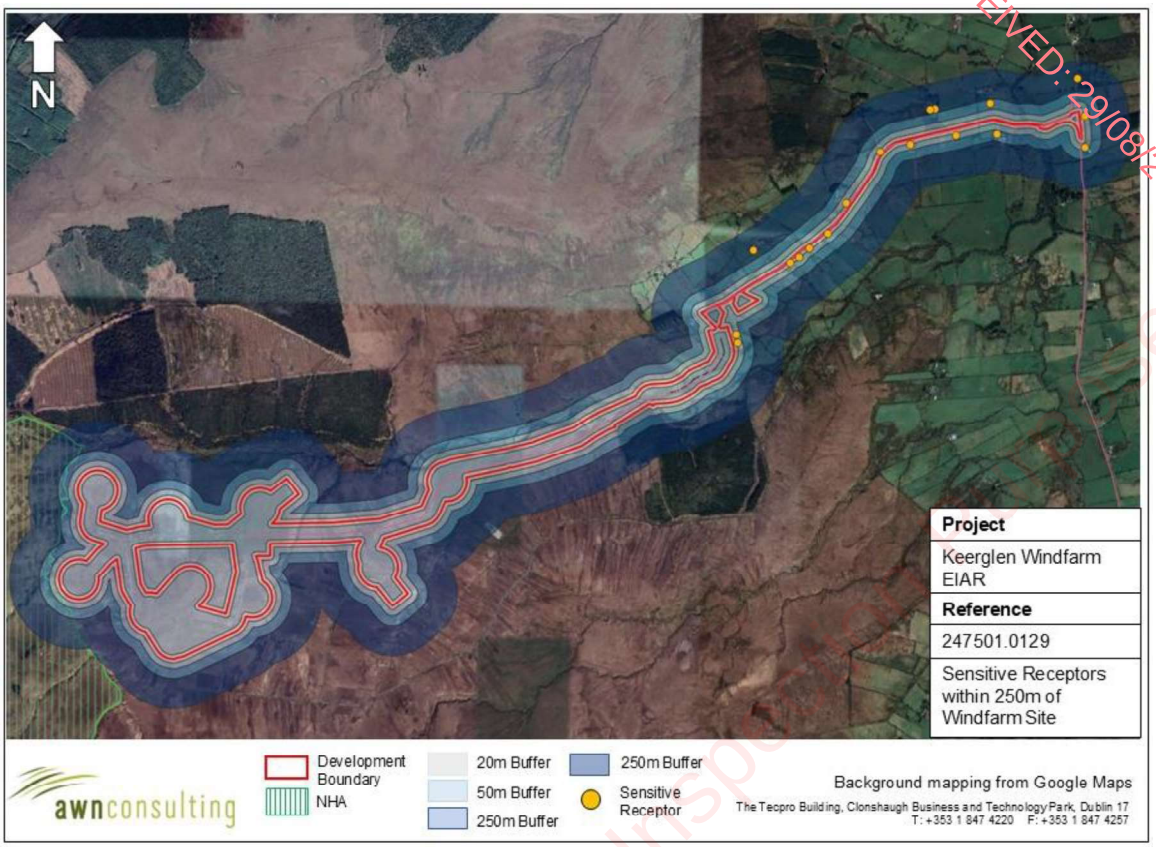

Figure 16.2: Sensitive Receptors within 250m of Windfarm Site

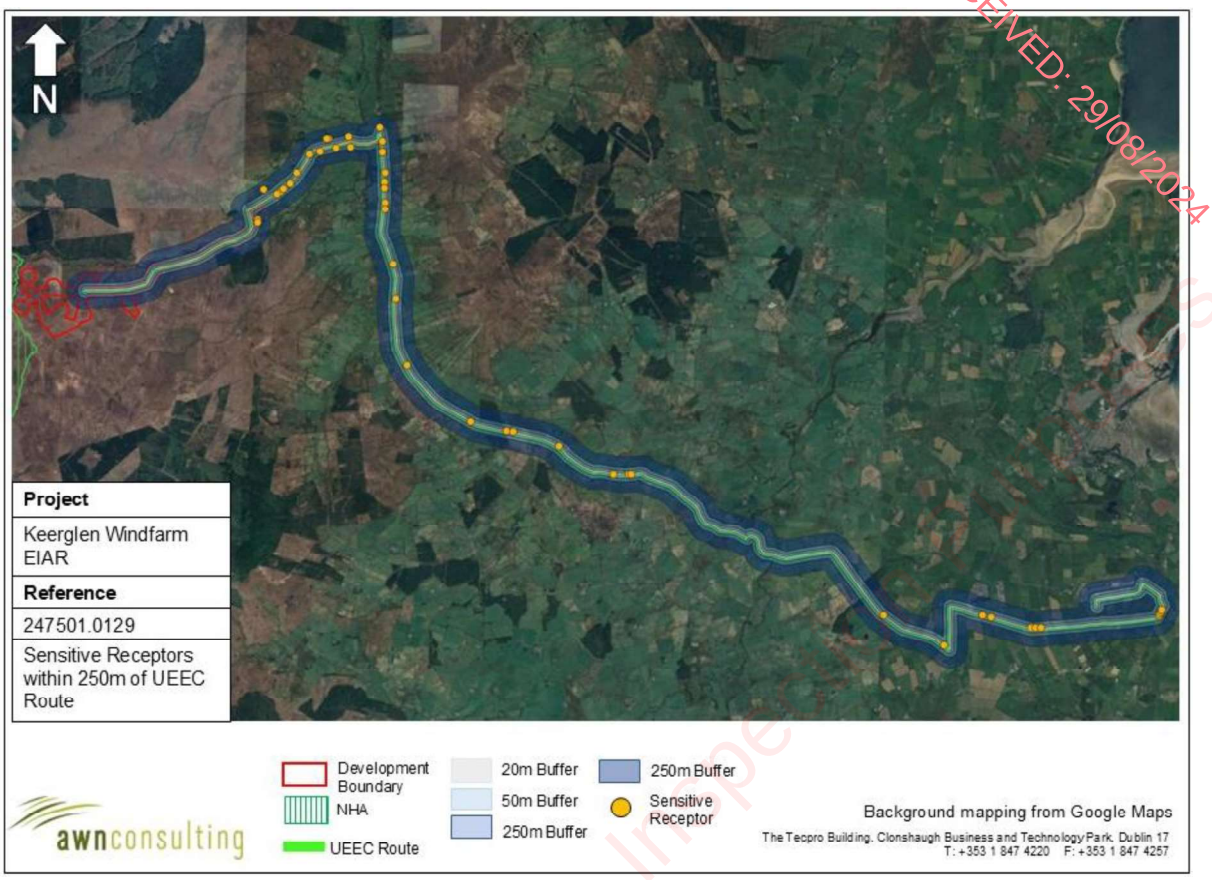

Figure 16.3: Sensitive Receptors within 250m of UEEC Route

16.6 Characteristics of the Proposed Development

The proposed development will involve the construction 8 no. wind turbines, associated turbine foundations, electrical substation building and associated works, underground cabling, and all associated works. The proposed development also includes approximately 22km of 38kV Underground Electricity Export Connection (UEEC) and associated works along public roads and private lands. The proposed development is located in the townlands of Keerglen, Ballinglen and Ballkinlettragh on a site measuring a combined c.81.88 ha. A full description of the development is available in Chapter 3.

16.6.1 Construction Phase

During the construction stage, the main source of air quality impacts will be due to fugitive dust emissions from site activities. Dust emissions will primarily occur as a result of site preparation works, earthworks, construction of turbine foundations and the movement of trucks on site and exiting the site.

16.6.2 Operational Phase

Direct operational phase impacts to air quality are not predicted as there will be no air emissions from the site once constructed. There will be some minor vehicle emissions associated with site maintenance workers but these will be minor and infrequent in nature. There will be indirect benefits to air quality as a result of generating electricity from renewable wind power rather than fossil fuel sources.

16.7 Potential Impacts of the Proposed Development

16.7.1 Construction Phase

16.7.1.1 Construction Dust Assessment

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 250m of a construction site, the majority of the deposition occurs within the first 50m (IAQM, 2024). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of long-term meteorological data from Belmullet meteorological station in Section 16.5.1 has indicated that dust generation will be reduced due to natural meteorological conditions for a large portion of the year. The key works included in this development with the potential for dust emissions include earthworks and excavation activities, creation of borrow pits, construction of hardstanding areas and movement of vehicles on and off site.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 16.5.3). The major dust generating activities are divided into four types within the IAQM guidance (2024) to reflect their different potential impacts.

These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

16.7.1.1.1 Demolition

There are no demolition activities associated with the proposed development, therefore, there is no demolition impact predicted as a result of the works.

16.7.1.1.2 Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large**: Total site area > 110,000m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6m in height;
- **Medium**: Total site area 18,00m^2 – 110,000m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 3 – 6m in height;
- **Small**: Total site area < 18,00m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 3 m in height.

The dust emission magnitude for the proposed earthwork activities for the entirety of the development can be classified as large due to the site area involved. The sensitivity of the area, as determined in Section 16.5.3, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. However, as noted in Section 16.5.3 there are no sensitive human receptors within 250m of the proposed development windfarm site itself. Sensitive human receptors are only located within 250m of the site access roads, therefore the construction of the new site access and upgrade works along the existing local road need only be taken into consideration when considering the potential for dust soiling and dust-related human health effects for the windfarm site. The magnitude of the road works can be classed as small. In relation to dust-related ecological effects, the magnitude of works must include the full site clearance works, creation of borrow pits etc., therefore the dust emission magnitude in relation to ecology is classed as large.

The risk of dust impacts from the proposed earthworks activities is summarised in Table 16.9 for each category.

In relation to the windfarm site, as the area is of medium sensitivity to dust soiling effects there is a low risk of dust soiling using the criteria in Table 16.8. The surrounding area is of low sensitivity to dust-related human health effects and therefore there is an overall negligible risk of human health effects

from the proposed earthwork activities. There is a high risk of dust-related ecological effects within a section of the Ummerantarry Bag NHA as per the criteria in Table 16.8 as the area is considered high sensitivity to dust-related ecological effects.

In relation to the UEEC route along the public roads, these works can be classified as medium as a conservative approach due to the site area involved however, works will not take place over the entirety of the UEEC route at one time therefore the magnitude of dust emissions will be lesser for smaller sections. However, as a conservative approach and the ensure the highest level of risk is accounted for the works have been assessed as being of medium magnitude. This results in a medium risk of dust soiling effects and a low risk of dust-related human health effects as a result of the UEEC route (Table 16.9). There are no sensitive ecological sites in close proximity to the UEEC route and therefore there are no ecological impacts predicted.

Table 16.8: Criteria for Rating Risk of Dust Impacts – Earthworks (IAQM, 2024)

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

Table 16.9: Risk of Dust Impacts – Earthworks

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Earthworks Windfarm Site	Risk of Dust-Related Impacts – Windfarm Site	Dust Emission Magnitude – Earthworks UEEC Route	Risk of Dust-Related Impacts – UEEC Route
Dust Soiling	Medium	Small (access road works only)	Low Risk	Medium	Medium Risk
Human Health	Low		Negligible Risk		Low Risk
Ecology	High	Large	High Risk	N/A	N/A

16.7.1.1.3 Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume > 75,000 m^3, on-site concrete batching, sandblasting;
- **Medium:** Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;

- **Small:** Total building volume < 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as medium when the full suite of works are taken into consideration. However, as noted in Section 16.5.3 there are no sensitive human receptors within 250m of the proposed development windfarm site itself. Receptors are only located within 250m of the site access roads, therefore the construction of the new site access and upgrade works along the existing local road need only be taken into consideration when considering the potential for dust soiling and dust-related human health effects. The magnitude of works can be classed as small. In relation to the windfarm site and dust-related ecological effects, the magnitude of works must include the construction of the turbine foundations, substation building and access roads, therefore the dust emission magnitude in relation to ecology is classed as medium. Using the criteria in Table 16.10 and the previously established sensitivity of the area from Section 16.5.3; this results in a low risk of dust soiling, a negligible risk of dust-related human health effects and a medium risk of dust-related ecological effects. The risk of dust impacts from the proposed construction activities is summarised in Table 16.11 for each category.

In relation to the UEEC route along the public roads, these construction works can be classified as small however, works will not take place over the entirety of the UEEC route at one time therefore the magnitude of dust emissions will be lesser for smaller sections. This results in a low risk of dust soiling effects and a negligible risk of dust-related human health effects as a result of the UEEC route (Table 16.11). There are no sensitive ecological sites in close proximity to the UEEC route and therefore there are no ecological impacts predicted.

Table 16.10: Criteria for Rating Risk of Dust Impacts – Construction (IAQM, 2024)

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

Table 16.11: Risk of Dust Impacts – Construction					
Receptor	**Receptor Sensitivity**	**Dust Emission Magnitude – Construction Windfarm Site**	**Risk of Dust-Related Impacts – Windfarm Site**	**Dust Emission Magnitude – Earthworks UEEC Route**	**Risk of Dust-Related Impacts – UEEC Route**
Dust Soiling	Medium	Small (access road works only)	Low Risk	Small	Low Risk
Human Health	Low		Negligible Risk		Negligible Risk
Ecology	High	Medium	Medium Risk	N/A	N/A

16.7.1.1.4 Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium:** 20 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small:** < 20 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout activities can be classified as small for both the windfarm site and UEEC, as on average there will be less than 20 outward HGV movements per day. Using the criteria in Table 16.12 and the previously established sensitivity of the area from Section 16.5.3; this results in a medium risk of dust soiling and a low risk of dust-related human health effects associated with the windfarm site works and the UEEC. There is a medium risk of dust-related ecological effects associated with the windfarm site. There are no sensitive ecological sites in close proximity to the UEEC route and therefore there are no ecological impacts predicted. The risk of dust impacts from the proposed construction activities is summarised in Table 16.13 for each category.

Table 16.12: Criteria for Rating Risk of Dust Impacts – Trackout (IAQM, 2024)			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 16.13: Risk of Dust Impacts – Trackout					
Receptor	**Receptor Sensitivity**	**Dust Emission Magnitude – Trackout Windfarm Site**	**Risk of Dust-Related Impacts – Windfarm Site**	**Dust Emission Magnitude – Earthworks UEEC Route**	**Risk of Dust-Related Impacts – UEEC Route**
Dust Soiling	Medium	Small	Low Risk	Small	Low Risk
Human Health	Low		Negligible Risk		Negligible Risk
Ecology	High		Low Risk	N/A	N/A

16.7.1.1.5 Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 16.14 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

There is a worst case high risk of dust-related ecological effects, a medium risk of dust soiling effects and a low risk of dust-related human health effects associated with the proposed works. Therefore, best practice dust mitigation measures appropriate for high risk sites will be implemented during the proposed earthworks activities to ensure there are no impacts at nearby sensitive receptors. During the construction works and trackout activities dust mitigation measures appropriate for medium risk site will be required. When the dust mitigation measures detailed in the mitigation section of this chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. In the absence of mitigation there is the potential for short-term, localised, direct, negative and slight impacts to air quality from dust emissions.

Table 16.14: Summary of Dust Impact Risk used to Define Site-Specific Mitigation				
Potential Impact	**Dust Emission Magnitude**			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	Medium Risk	Low Risk	Low Risk
Human Health	N/A	Low Risk	Negligible Risk	Negligible Risk
Ecology	N/A	High Risk	Medium Risk	Low Risk

16.7.1.2 Construction Phase Traffic Assessment

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase, particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out. None of the road links impacted by the proposed development satisfy the TII scoping assessment criteria in Section 16.4.1.2. It can, therefore, be determined that the construction stage traffic will have a short-term, direct, negative and imperceptible effect on air quality.

16.7.2 Operational Phase

16.7.2.1 Operational Stage Traffic

Vehicles accessing the site for maintenance works have the potential to impact on air quality. However, the volume of vehicles accessing the site will be significantly below the 1,000 AADT stipulated in the TII guidance in Section 16.4.1.2 and thus, a modelling assessment is not required and effects are considered long-term, direct, negative and imperceptible.

16.7.2.2 Operational Phase Indirect Air Quality Impacts from Renewable Electricity Production

The generation of electricity due to the installation of the wind farm will lead to indirect net savings in terms of NO_X emissions. The wind farm will have an export capacity of approximately 40 MW and an assumed capacity factor of 32%, therefore the power generation from the development is expected to be approximately 112 GWh per annum.

The supply of 112 GWh of renewable electricity to the national grid will lead to a net saving in terms of NO_X emissions which may have been emitted from fossil fuels to produce electricity. Results, outlined in Table 16.15, indicate that the impact of the wind farm on Ireland's obligations under the National Emissions Reduction Directive are positive. The annual impact of the development is to decrease annual NO_X emission levels by 0.11% of the 2030 ceiling of 40.6kt (relative to the NO_X emissions associated with power generation in Ireland 2021 (EPA, 2023)). The total NO_X emissions savings over lifespan will amount to over 1,497 tonnes of NO_X which is equivalent to 17.5% of the total NO_X emissions from power generation in 2021 or 1.5% of the total Irish NO_X emissions in 2021. This is considered an indirect, long-term, slight, positive effect on air quality.

Table 16.15: Predicted Impact of Keerglen Wind Farm Project on Ireland's National Emissions Ceiling Obligations	
Scenario	**NO_X (tonnes/annum)**
Emissions Saved Due To Wind Farm Note 1	42.8
National Emission Ceiling 2020 – 2029 Note 2	68,410
Positive Impact of Wind farm (%) (as a percentage of National Emission Ceiling on an annual basis)	0.11%
Total NO_X Saving (%) Over 35 Years Relative To NO_X Emissions From Power Generation in 2021	17.5%

Note 1 For NO_X emissions associated with power generation in Ireland (taken from EPA (2023) Ireland's Air Pollutant Emissions 1990 – 2030)

Note 2 National Emission Ceiling (EU Directive 2016/2284)

16.7.3 Decommissioning Stage

The decommissioning phase will involve the removal of the turbines and associated infrastructure from the site. Vehicles and generators associated with the removal of the turbines have the potential to cause a temporary negative impact on local air quality in the short term. However, due to the short term nature of any associated works and low background pollutant concentrations in the vicinity of the site (see Section 16.5.2) it is predicted to have an short-term, direct, negative and imperceptible effect on local air quality.

16.7.4 Do Nothing Scenario

Under the Do Nothing Scenario no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from new developments in the surrounding area, changes in road traffic, etc.). Therefore, this scenario can be considered neutral in terms of air quality.

16.8 Cumulative Impacts

The most significant potential cumulative impact relates to dust. According to the IAQM guidance (2024), if the construction phase of the proposed development coincides with the construction phase of any other permitted projects within 500m of the site, there is a possibility of cumulative dust impacts occurring at any nearby sensitive receptors. Should simultaneous construction phases occur, it would

lead to cumulative dust soiling and dust-related impacts on human health, specifically localised to the works area associated with the proposed works.

However, should the construction phases of the development and any localised permitted developments coincide, it is predicted that once the mitigation measures outlined in Section 16.9.1 are put in place impacts will not be significant. Impacts will be short-term, direct, localised, negative and not significant.

No significant cumulative impacts to air quality are predicted for the construction or operational phases.

16.9 Remedial and Mitigation Measures

16.9.1 Construction Phase

In terms of mitigation, only potential impacts associated with dust emissions on site require mitigation measures to be implemented. The proactive control of fugitive dust emissions, rather than an inefficient attempt to control them once they have been released will ensure the prevention of significant emissions. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of a Dust Management Plan. The key aspects of controlling dust are listed below which will be incorporated into the post planning Construction Environmental Management Plan (CEMP) for the site. These measures are appropriate for sites with a high to medium risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors, including ecology. The mitigation measures draw on best practice guidance from Ireland (DCC, 2018), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement involves explaining the nature and duration of the works to local residents and businesses.

Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension. Therefore, mitigations must be implemented if undertaking dust generating activities during these weather conditions.

- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Avoid site runoff of water or mud.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site use dust suppression/mitigation measures will be utilised.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 30 kph haul roads and work areas. If long haul routes are required these speeds may be increased, with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

The following measures must be implemented in areas in close proximity to the ecologically sensitive areas that have been assessed as having a high risk of impacts. These measures are also recommended for other areas of the site earthworks.

- Re-vegetate earthworks and exposed areas/soil to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate. This is to ensure moisture content is high enough to increase the stability of the soil and, therefore, suppress dust.

Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out. If this is required for a particular process, then ensure that appropriate additional control measures are in place.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- A speed restriction of 30 kph will be applied as an effective dust control measure for on-site vehicles.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Install hard surfaced haul routes which are regularly damped down, with fixed or mobile sprinkler systems, or mobile water bowsers, and regularly cleaned.
- Access gates to be located at least 10 m from receptors where possible.

Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust. This should include regular visual dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary. Cleaning is to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

16.9.2 Operational Phase

During the operational phase of the proposed development, the works onsite will be limited to maintenance associated with the wind farm components. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.

16.10 Residual Impacts of the Proposed Development

16.10.1 Construction Phase

When the dust mitigation measures detailed in the mitigation section of this report are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be short-term, direct, localised, negative and not significant in nature and will pose no nuisance at nearby receptors.

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The proposed development has been assessed as having a negligible risk of dust-related human health effects. The mitigation measures that will be put in place during construction of the proposed development will further ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of construction of the proposed development will be short-term, direct, negative and not significant with respect to human health.

16.10.2 Operational Phase

There are no predicted direct impacts to air quality during the operational phase of the proposed development. Emissions from infrequent maintenance vehicles have been assessed as having a long-term, direct, localised, negative and imperceptible effect on air quality.

There will be indirect beneficial impacts to air quality from the generation of renewable electricity from the proposed development. There will be NO_X emission savings which may otherwise have been generated from fossil fuels. The generation of 112 GWh of renewable electricity will result in a decrease in annual NO_X emission levels by 0.11% of the 2030 National Air Emissions Target of 40.6kt. This is an indirect, long-term, slight, positive effect on air quality.

16.11 References

BRE (2003) Controlling Particles, Vapours & Noise Pollution from Construction Sites

Department of the Environment, Heritage and Local Government (DEHLG) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities

Dublin City Council (DCC) (2018) Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition

Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

Environmental Protection Agency (2023) Air Quality in Ireland 2022 Report (& previous annual reports)

Environmental Protection Agency (2023) Ireland's Transboundary Gas Emissions 1990 – 2030

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

Government of Ireland (2023) Clean Air Strategy for Ireland

Institute of Air Quality Management (IAQM) (2024) Guidance on the Assessment of Dust from Demolition and Construction Version 2.2

Met Éireann (2024) Met Éireann website: https://www.met.ie/

SEAI (2023) Energy In Ireland 2023 Report

The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings

Transport Infrastructure Ireland (2022a) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

World Health Organisation (2021) Air Quality Guidelines 2021