# 8 AIR QUALITY AND CLIMATE

## 8.1 Introduction

This Chapter will describe and assess the potential impacts on air quality and climate associated with the Proposed Development at Bannagagole, Old Leighlin, Co. Carlow.

Taking into account Ambient Air Quality Standards, the baseline air quality of the proposed facility will be examined along with the potential impacts of the Proposed Development on the existing environment. This Chapter will also describe and assess the potential impacts on micro and macro-climate as a result of the Proposed Development; attention will be focused on Ireland's obligations under the Kyoto Protocol in the context of the overall climatic impact of the presence and absence of the Proposed Development

### 8.1.1 Quality Assurance

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### 8.1.2 Ambient Air Quality Standards

For the protection of health and ecosystems, EU directives apply air quality standards in Ireland and other EU member states for a range of pollutants. These rules include requirements for monitoring, assessment and management of ambient air quality. The first major instrument in tackling air pollution was the Air Quality Framework Directive 96/62/EC and its four daughter Directives. Each of these instruments was repealed with the introduction of Directive 2008/50/EC on ambient air quality and cleaner air for Europe in 2008 (as amended by Decision 2011/850/EU and Directive 2015/1480/EC) (the CAFE Directive), save for the "Fourth Daughter Directive" (Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air).

The CAFE Directive lays down measures aimed at:

1) defining and establishing objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole;
2) assessing the ambient air quality in Member States on the basis of common methods and criteria and, in particular, assessing concentrations in ambient air of certain pollutants;
3) providing information on ambient air quality in order to help combat pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures;
4) ensuring that such information on ambient air quality is made available to the public;
5) maintaining air quality where it is good and improve it in other cases;

6) promoting increased cooperation between the Member States in reducing air pollution.



Ambient air quality monitoring and assessment in Ireland is carried out in accordance with the requirements of the CAFE Directive. The CAFE Directive has been transposed into Irish legislation by the Air Quality Standards Regulations (S.I. No. 180 of 2011). The CAFE Directive requires EU member states to designate 'Zones' reflective of population density for the purpose of managing air quality. Four zones were defined in the Air Quality Standards Regulations (2011) and subsequently amended in 2013 to account for 2011 census population counts and to align with coal restricted areas in the Air Pollution Act (Marketing, Sale, Distribution and Burning of Specified Fuels) Regulations 2012. (S.I. No. 326 of 2012) (the 2012 Regulations).

The main areas defined in each zone are:

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

The site of the Proposed Development is located in Bannagagole, Old Leighlin, Co. Carlow and falls under the 'Zone D' category based on the EPA CAFE Directive.

The CAFE Directive outlines certain limit or target values specified by the five published directives that apply limits to specific air pollutants. These limits, outlined in Table 8-1, will be referred to as part of the Proposed Development assessment with respect to air quality.

*Table 8-1: Limit Values of Cleaner Air for Europe (CAFE) Directive 2008/50/EC (Source: EPA, 2020)*

| Pollutant | Limit Value Objective | Averaging Period | Limit Value µg/m3 | Limit Value ppb | Basis of Application of the Limit Value | Limit Value Attainment Date |
|---|---|---|---|---|---|---|
| $SO_2$ | Protection of Human Health | 1 hour | 350 | 132 | Not to be exceeded more than 24 times in a calendar year | 1 Jan 2005 |
| $SO_2$ | | 24 hours | 125 | 47 | Not to be exceeded more than 3 times in a calendar year | 1 Jan 2005 |
| $SO_2$ | Protection of vegetation | Calendar year | 20 | 7.5 | Annual mean | 19 July 2001 |
| $SO_2$ | | 1 Oct to 31 Mar | 20 | 7.5 | Winter mean | 19 July 2001 |
| $NO_2$ | Protection of human health | 1 hour | 200 | 105 | Not to be exceeded more than 18 times in a calendar year | 1 Jan 2010 |

| Pollutant | Limit Value Objective | Averaging Period | Limit Value µg/m3 | Limit Value ppb | Basis of Application of the Limit Value | Limit Value Attainment Date |
|---|---|---|---|---|---|---|
| **$NO_2$** | | Calendar year | 40 | 21 | Annual mean | 1 Jan 2010 |
| **$NO + NO_2$** | Protection of ecosystems | Calendar year | 30 | 16 | Annual mean | 19 July 2001 |
| **PM10** | Protection of human health | 24 hours | 50 | - | Not to be exceeded more than 35 times in a calendar year | 1 Jan 2005 |
| **PM10** | | Calendar year | 40 | - | Annual mean | 1 Jan 2005 |
| **PM2.5 - Stage 1** | | Calendar year | 25 | - | Annual mean | 1 Jan 2015 |
| **PM2.5 - Stage 2** | | Calendar year | 20 | - | Annual mean | 1 Jan 2020 |
| **Lead** | | Calendar year | 0.5 | - | Annual mean | 1 Jan 2005 |
| **Carbon Monoxide** | | 8 hours | 10,000 | 8,620 | Not to be exceeded | 1 Jan 2005 |
| **Benzene** | | Calendar year | 5 | 1.5 | Annual mean | 1 Jan 2010 |

The EPA is the competent authority for the purpose of the CAFE Directive and is required to send an annual report to the Minister for Environment and the European Commission. The regulations further provide for the distribution of public information. This includes information on any exceedances of target values, the reasons for exceedances, the area(s) in which they occurred, and the relevant information regarding effects on human health and environmental impacts.

### 8.1.3 Climate Agreements

Climate change is recognised as one of the most serious global environmental problems and arguably the greatest challenge facing humanity today. While natural variations in climate over time are normal, anthropogenic activities have interfered greatly with the global atmospheric system by emitting substantial amounts of greenhouse gases (GHGs). This has caused a discernible effect on our global climate system, with continued change expected due to current and predicted trends of GHG emissions. In Ireland this is demonstrated by rising sea levels, changes in the ecosystem, and extreme weather events.

In March 1994, the United Nations Framework Convention on Climate Change (UNFCCC) was established as an intergovernmental effort to tackle the challenges posed by climate change. The Convention membership is almost universal, with 197 countries having ratified. Under the Convention, governments gather and share information on GHG emissions, national policies, and best practices. This information is then utilised to launch national strategies and international agreements to address GHG emissions. Following the formation of the UNFCCC, two major international climate change agreements were adopted: The Kyoto Protocol, and the Paris Agreement.

In April 1994, Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) and subsequently signed the Kyoto Protocol in 1997. The Kyoto Protocol is an international agreement linked to the UNFCCC which commits its parties to legally binding emission reduction targets. In order to ensure compliance with the protocol, the Intergovernmental Panel on Climate Change (IPCC) has outlined detailed guidelines on compiling National Greenhouse Gas Inventories. These are designed to estimate and report on national inventories of anthropogenic GHG emissions and removals. Under Article 4 of the Kyoto Protocol, Ireland agreed to limit the net anthropogenic growth of the six named GHGs to 13% above the 1990 level, during the period 2008 to 2012.

The second commitment period of the Kyoto Protocol was established by the Doha amendment which was adopted *in extremis* on the 8th of December 2012, to impose quantified emission limitation and reduction commitments (QELRCs) to Annex I (developed country) Parties during a commitment period from 2013 to 2020. 38 developed countries, inclusive of the EU and its 28 member states, are participating. Under the Doha amendment, participating countries have committed to an 18% reduction in emissions from 1990 levels. The EU has committed to reducing emissions in this period to 20% below 1990 levels. Ireland's QELRCs for the period 2013 to 2020 is 80% of its base year emissions. Ireland's compliance with the Doha amendment will be assessed based on the GHG inventory submission in 2022 for 1990-2020 data. As of October 2020, the Doha Amendment has received the required number of ratifications to enter into force. Once in force, the emission reduction commitments of participating developed countries and economies in transition (EITs) become legally binding.

In December 2015, the Paris Climate Change Conference (COP21) took place and was an important milestone in terms of international climate change agreements. The Paris Agreement sets out a global action plan to put the world on track to mitigate dangerous climate change by setting a global warming limit not to exceed 2°C above pre-industrial levels, with efforts to limit this to 1.5°C. As a contribution to the objectives of the agreement, countries have submitted comprehensive national climate action plans (nationally determined contributions, NDCs). Under this agreement, governments agreed to come together every 5 years to assess the collective progress towards the long-term goals and inform Parties in updating and enhancing their nationally determined contributions. Ireland will contribute to the Agreement through the NDC tabled by the EU on behalf of Member States in 2020, which commits to a 55% reduction in EU-wide emissions by 2030 compared to 1990. This is considered to be the current NDC maintained by the EU and its Member States under Article 4 of the Paris Agreement.

The EU has set itself targets for reducing its GHG emissions progressively up to 2050, these are outlined in the 2020 climate and energy package and the 2030 climate and energy policy framework. These targets are defined to assist the EU in transitioning to a low-carbon economy, as detailed in the 2050 low carbon roadmap. The 2020 package is a set of binding legislation to ensure that the EU meets its climate and energy targets for the year 2020. There are three key targets outlined in the package which were set by the EU in 2007 and enacted in legislation in 2009:

- 20% reduction in GHG emissions from 1990 levels;
- 20% of EU energy to be from renewable sources;
- 20% improvement in energy efficiency.

The 2030 climate and energy framework builds on the 2020 climate energy package and was adopted by EU leaders in October 2014. The framework sets three key targets for the year 2030:

- At least 40% cuts in GHG emissions from 1990 levels;
- At least 32% share for renewable energy;
- At least 32.5% improvement in energy efficiency.

The EU has acted in several areas in order to meet these targets, including the introduction of the Emissions Trading System (ETS). The ETS is the key tool used by the EU in cutting GHG emissions from large-scale facilities in the power, industrial, and aviation sectors. Around 45% of the EU's GHG emissions are covered by the ETS.

As part of the European Green Deal, the Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55% compared to 1990. The European Climate Law came into force in July 2021 and writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

#### *8.1.3.1 National Policy Position in Ireland*

National climate policy in Ireland recognises the threat of climate change to humanity and supports mobilisation of a comprehensive international response to climate change, and global transition to a low-carbon future.

The Climate Action and Low Carbon Development (Amendment) Act 2021 was adopted in 2021 and sets Ireland on a legally binding path to net-Zero emissions no later than 2050, and to a 51% reduction in emissions by the end of this decade. The Act provides the framework for Ireland to meet its international and EU climate commitments and to become a leader in addressing climate change.

The Climate Action Plan 2023 (CAP23) is the second annual update to Ireland's Climate Action 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings.

The plan was launched on 21 December 2022. The supplementary Annex of Actions will be published early in 2023.

The plan implements the carbon budgets and sectoral emissions ceilings and sets out a roadmap for taking decisive action to halve our emissions by 2030 and reach net zero no later than 2050, as committed to in the Programme for Government. Climate Action Plan 2023 sets out how Ireland can accelerate the actions that are required to respond to the climate crisis, putting climate solutions at the centre of Ireland's social and economic development.

Ireland's latest greenhouse gas (GHG) emissions 1990-2021 are provisional figures based on the SEAI's final energy balance released in June 2022 (EPA, 2022). In 2021, Ireland's GHG emissions are estimated to be 61.53 million tonnes carbon dioxide equivalent (Mt $CO_2$eq), which is 4.7% higher (or 2.76 Mt $CO_2$eq) than emissions in 2020 (58.77 Mt $CO_2$eq). There was a decrease of 3.4% in emissions reported for 2020 compared to 2019. Emissions are over 1% higher than pre-pandemic 2019 figures.



In 2021, national total emissions excluding Land Use, Land Use Change and Forestry (LULUCF) increased by 4.7%, emissions in the stationary ETS sector increased by 15.2% and emissions under the ESR (Effort Sharing Regulation) increased by 1.6%. When LULUCF is included, total national emissions increased by 5.5%. The energy industries, transport and agriculture sectors accounted for 71.9% of total GHG emissions. Agriculture is the single largest contributor to the overall emissions, at 37.5%. Transport, energy industries and the residential sector are the next largest contributors, at 17.7%, 16.7% and 11.4%, respectively (EPA, 2022).

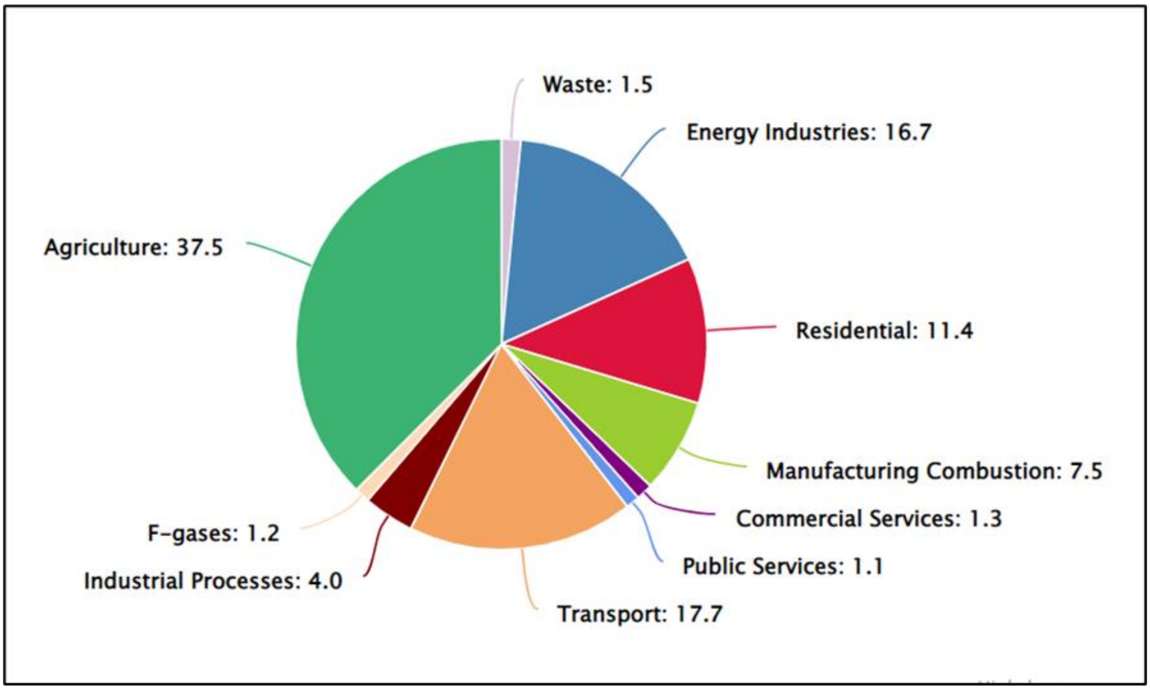


*Figure 8-1: Ireland's Greenhouse Gas Emissions by Sector for 2021 (Source: EPA, 2023)*

## 8.2 Study Methodology

A desktop study involving various national and international documents on climate change and analysis of synoptic meteorological data was carried out in order to compile this Chapter. Furthermore, a semi-quantitative assessment of fugitive dust emissions from operations of the Proposed Development was undertaken and sets out to:

- Assess the existing $PM_{10}$ concentrations and dust deposition rates;
- Identify the potential sources of impacts on air quality and climate;
- Identify the local sensitive receptors;
- Identify the pathway and distance of sensitive receptors relative to the site; and
- Analysis of weather data to assess impacts caused by weather events.

Impacts from the Construction and Operational Phase traffic have been assessed using information from the Traffic Chapter and following the relevant guidance (TII, 2011; HA, 2007; EPA; UK DEFRA; IAQM) and it is considered unlikely for significant air quality impacts to occur as a result of increased traffic flow and therefore, a detailed air quality assessment is not required.

The primary air quality impacts associated with quarrying activities is dust accumulation resulting from deposition of dispersed particles. Quarrying activities and ancillary facilities, by their nature, generate dust. The dust arises mainly from inert soil and rock materials.The impact of dust is generally monitored by measuring rates of dust deposition. According to the EPA Guideline Document *Environmental Management in the Extractive Industry* (2006), there are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. There are a number of methods to measure dust deposition, however only the German TA Luft Air Quality Standards (TA Luft, 1986) specify a method of measuring dust deposition – The Bergerhoff Method (German Standard VDI 2119, 1972) – with dust nuisance. It is the only enforceable method available. On this basis, it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries associated with quarry developments:

- Total dust deposition (soluble and insoluble): **350 mg/m$^2$/day** when averaged over a 30-day period.

*Table 8-2: Dust Deposition Limit Values*

| Measures | Monitoring Frequency | Standard |
|---|---|---|
| Dust Emissions | Monthly | 350 mg/m$^2$/day – Bergerhoff Method |

Impacts from the Construction and Operational Phase traffic have been assessed using information from the Traffic Chapter and following the relevant guidance (TII, 2011; HA, 2007; EPA; UK DEFRA; IAQM).

## 8.3 The Existing and Receiving Environment (Baseline Situation)

The Proposed Development site at Bannagagole, Old Leighlin Co. Carlow is located ca. 1.3km south of the village of Old Leighlin, County Carlow and ca. 3.2km southwest of the town of Leighlinbridge. The lands surrounding the site are largely agricultural in nature with several one-off houses located within a 1km radius. The site lies immediately to the south of an existing limestone bedrock quarry at Bannagagole (Old Leighlin Quarry) which is operated by Kilkenny Limestone Quarries Ltd. Rock extraction, processing, and surplus rock storage is carried out at the existing quarry.

### 8.3.1 Air Quality

According to the 2012 Regulations (S.I. No. 326 of 2012) the proposed site falls into ‘Zone D’ of Ireland which is described by the EPA as ‘Rural Ireland’. It is expected that existing ambient air quality in the vicinity of the site is characteristic of a rural location with the primary source air emissions (such as particulate matter (dust), $NO_2$, and hydrocarbons) likely to be of local domestic and agricultural origin. Local agricultural activities may exert a higher or lower influence on dust generation in the vicinity of the site on a seasonal basis.

In conjunction with individual local authorities, the EPA undertakes ambient air quality monitoring at specific locations throughout the country in the urban and rural environment; an Air Quality Report based on data from 30 monitoring stations and a number of mobile air quality units is developed on an annual basis. The EPA's most recent publication 'Air Quality in Ireland, 2020' reports the quality of the air in Ireland based on the data from the National Ambient Air Quality Monitoring Network throughout the year 2020.

When assessing air quality, the EPA focuses on two main pollutants: particulate matter and nitrogen oxides. Measured concentrations of $NO_2$ for the years 2020 and 2021 are presented in Table 8-3 for Zone D monitoring stations. These results show that current levels of $NO_2$ are well below the annual mean and 1-hour maximum limit values. In the year 2020, annual mean concentrations of $NO_2$ ranged from 2 - 17 ug/m$^3$ across all Zone D stations, with no exceedance of the maximum hourly limit (EPA, 2021). In the year 2021, annual mean concentrations of $NO_2$ ranged from 3.6 – 12.8 ug/m$^3$ across all Zone D stations, with no exceedance of the maximum hourly limit (EPA, 2022).

During 2020, the restriction of movement in Ireland due to the COVID-19 Pandemic had an impact on air quality nationally with a large-scale reduction in vehicular traffic. It is noted that the decrease in $NO_2$ levels during that year is a direct result of the restrictions placed on movements and construction due to COVID-19.

Based on the EPA data, a conservative estimate of the current background $NO_2$ concentration in the region of the Proposed Development is 7.5 µg/m$^3$.

*Table 8-3: Concentrations of $NO_2$ at Zone D Monitoring Stations*

| Station | Objective | Concentration (µg/m$^3$) | | Limit or Threshold Value |
|---|---|---|---|---|
| | | 2020 | 2021 | |
| **Emo Court** | Annual Mean $NO_2$ | 4 | 3.6 | 40 µg/m$^3$ |
| | Days >200µg/m$^3$ | 0 | 0 | 35 days |
| **Birr** | Annual Mean $NO_2$ | 9 | 12.8 | 40 µg/m$^3$ |
| | Days >200µg/m$^3$ | 0 | 0 | 35 days |
| **Castlebar** | Annual Mean $NO_2$ | 6 | 6.3 | 40 µg/m$^3$ |
| | Days >200µg/m$^3$ | 0 | 0 | 35 days |
| **Carrick-On-Shannon** | Annual Mean $NO_2$ | 17 | 11.2 | 40 µg/m$^3$ |
| | Days >200µg/m$^3$ | 0 | 0 | 35 days |
| **Kilkitt** | Annual Mean $NO_2$ | 2 | 2.4 | 40 µg/m$^3$ |
| | Days >200µg/m$^3$ | 0 | 0 | 35 days |

Measured concentrations of $PM_{10}$ for the years 2020 and 2021 are presented in Table 8-3 for Zone D monitoring stations. As is evident from these results, current levels of $PM_{10}$ are well below the annual mean limit value. In the year 2020, annual mean concentrations of $PM_{10}$ ranged from 7 – 15 $ug/m^3$ across all Zone D stations, with no exceedance of short-term limit values (EPA, 2021). In the year 2021, annual mean concentrations of $PM_{10}$ ranged from 7.8 – 17.8 $ug/m^3$ across all Zone D stations, with no exceedance of short-term limit values (EPA, 2022).

Based on the EPA data, a conservative estimate of the current background $PM_{10}$ concentration in the region of the Proposed Development is 11.5 $\mu g/m^3$.

*Table 8-4: Concentrations of $PM_{10}$ at Zone D Monitoring Stations*

| Station | Objective | Concentration ($\mu g/m^3$) | | Limit or Threshold Value |
|---|---|---|---|---|
| | | 2020 | 2021 | |
| **Tipperary Town** | Annual Mean $PM_{10}$ | 12 | 12.7 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 1 | 3 | 35 days |
| **Carrick-On-Shannon** | Annual Mean $PM_{10}$ | 10 | 9.4 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 0 | 0 | 35 days |
| **Enniscorthy** | Annual Mean $PM_{10}$ | 15 | 13.7 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 4 | 1 | 35 days |
| **Birr** | Annual Mean $PM_{10}$ | 10 | 12.2 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 0 | 2 | 35 days |
| **Askeaton** | Annual Mean $PM_{10}$ | 7 | 8.7 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 0 | 0 | 35 days |
| **Macroom** | Annual Mean $PM_{10}$ | 15 | 14.6 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 5 | 2 | 35 days |
| **Castlebar** | Annual Mean $PM_{10}$ | 14 | 9.8 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 2 | 0 | 35 days |
| **Cobh Carrignafoy** | Annual Mean $PM_{10}$ | - | 12 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | - | 1 | 35 days |
| **Claremorris** | Annual Mean $PM_{10}$ | 10 | 9.5 | 40 $\mu g/m^3$ |
| | Days >50$\mu g/m^3$ | 0 | 1 | 35 days |
| **Kilkitt** | Annual Mean $PM_{10}$ | 8 | 7.8 | 40 $\mu g/m^3$ |

| Station | Objective | Concentration (µg/m³) | | Limit or Threshold Value |
|---|---|---|---|---|
| | | 2020 | 2021 | |
| | Days >50µg/m³ | 0 | 0 | 35 days |
| Cavan | Annual Mean $PM_{10}$ | 9 | 10.6 | 40 µg/m³ |
| | Days >50µg/m³ | 0 | 0 | 35 days |
| Roscommon Town | Annual Mean $PM_{10}$ | 11 | 10.3 | 40 µg/m³ |
| | Days >50µg/m³ | 0 | 0 | 35 days |
| Edenderry | Annual Mean $PM_{10}$ | - | 17.8 | 40 µg/m³ |
| | Days >50µg/m³ | - | 4 | |
| Mallow | Annual Mean $PM_{10}$ | - | 14.7 | 40 µg/m³ |
| | Days >50µg/m³ | - | 2 | 35 days |
| Longford | Annual Mean $PM_{10}$ | - | 13.9 | 40 µg/m³ |
| | Days >50µg/m³ | - | 1 | 35 days |
| Cobh Cork Harbour | Annual Mean $PM_{10}$ | - | 13.4 | 40 µg/m³ |
| | Days >50µg/m³ | - | 1 | 35 days |

### 8.3.2 Macroclimate

Ireland has a typical maritime climate, largely due to its proximity to the Atlantic Ocean and the presence of the Gulf Stream. Due to the moderating effects of the Gulf Stream, Ireland does not suffer the temperature extremes that are experienced by many other countries at a similar latitude. Mean annual temperatures generally range between 9°C and 10°C. Winters tend to be cool and windy while summers are mostly mild and less windy. The prevailing wind direction is between the south and west with average annual wind speeds ranging between 6 knots in parts of south Leinster to over 15 knots in the extreme north. Rainfall in Ireland occurs throughout the year with reasonable frequency. The highest rainfall occurs in the western half of the country and on high ground; and generally, decreases towards the northeast. As the prevailing winds are from the west-southwest, the west of Ireland experiences the largest number of wet days. The area of least precipitation is along the eastern seaboard of the country.

### 8.3.3 Microclimate

The synoptic meteorological station in Oak Park, Co. Carlow is located approximately 16.25km north-east of the Proposed Development; and for the purposes of this chapter, weather data collected here may be considered similar to that which is experienced in the area of the subject site.

The weather in the area of the subject site is generally dominated by cool oceanic air masses, with cool winters, mild humid summers, and a lack of temperature extremes. Based on meteorological data at Oak Park over the last 3 years, the mean January temperature is 5.1°C, while the mean July temperature is 15.6°C. The prevailing wind direction is from a quadrant centred on the southeast. The expected annual rainfall for the eastern half of the country ranges between 750 and 1000mm. Easterly winds are less frequent, weaker, and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer.

#### *8.3.3.1 Rainfall*

Rainfall is a key indicator of changes in climate, as measurements of rainfall are fundamental to assessing the effects of climate change on the water cycle and water balance. Table 8-5 illustrates the monthly and annual rainfall data collected over a 3-year period (2020-2022) at Oak Park Weather Station. The annual rates of precipitation ranged from 784.8 mm in 2021 to 910.1 mm in 2020 with distribution of the highest monthly rainfall values falling in the autumn and winter months. The long-term average annual rainfall is 840.2mm; this is within the expected range of the eastern half of the country.

*Table 8-5: Monthly Rainfall Values (mm) for Oak Park Weather Station from January 2020 to December 2022 (Source: Met Eireann)*

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2022** | 28.0 | 82.5 | 58.6 | 43.3 | 36.0 | 62.5 | 25.4 | 36.5 | 153.2 | 153.1 | 93.5 | 68.0 | **840.6** |
| **2021** | 86.0 | 110.9 | 37.0 | 14.4 | 123.6 | 16.3 | 61.8 | 59.2 | 39.9 | 112.2 | 20.9 | 102.6 | **784.8** |
| **2020** | 61.4 | 172.8 | 51.8 | 29.7 | 12.9 | 40.5 | 76.6 | 100.1 | 57.0 | 96.6 | 87.9 | 123.2 | **910.1** |
| **LTA[4]** | **80.4** | **57.3** | **63.4** | **55.9** | **59.8** | **60.8** | **58.7** | **71.9** | **69.6** | **92.9** | **85.9** | **83.6** | **840.2** |

#### *8.3.3.2 Wind*

Wind at a particular location can be influenced by a number of factors, such as obstructions by trees or buildings, the nature of the terrain, and deflection by nearby mountains or hills. Wind blows most frequently from the south and west for open sites while winds from the northeast and north occur less often. The analysis of hourly weather data from Oak Park synoptic weather station over a period of 17 years suggests that the predominant wind direction blows from the southeast, with windspeeds of between 7 and 10 knots occurring most frequently.

[4] The 'LTA' is average for the climatological long-term-average (LTA) reference period 1981-2010

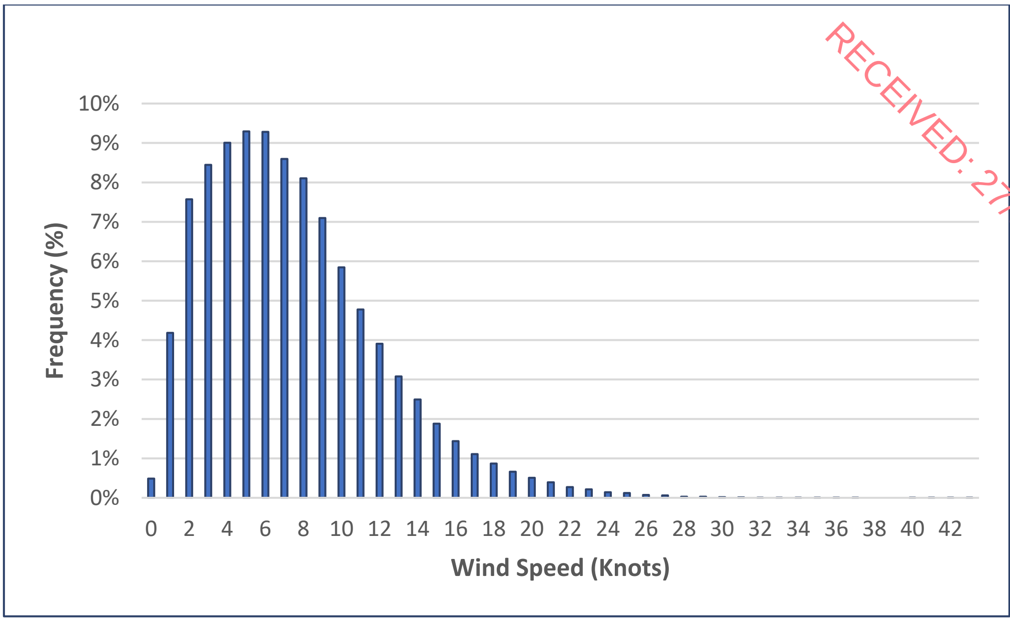




*Figure 8-2: Wind Speed Frequency Distribution at Oak Park Synoptic Weather Station over 17 years (2004-2021)*

Figure 8-3 provides a wind rose of the predominant wind directions and associated wind speeds at Oak Park Synoptic Weather Station. As is visible from Figure 8-3, the prevailing winds are from a south-easterly direction, with an annual incidence of 20.44% for winds between 110 and 160 degrees, and a north-westerly direction, with an annual incidence of 20.11% for winds between 290 and 360 degrees. The most frequent wind speed associated with this wind direction is between 4 and 6 knots which is considered a ‘light breeze’ in terms of the Beaufort scale, this wind direction and wind speed occurs in combination approximately 7.25% of the time. The overall most common windspeed is between 7 and 10 knots, occurring in 29.49% of incidences, and wind speeds of between 4 and 6 knots occurring in 25.54% of incidences.

The lowest frequency is for winds blowing from the eastern quadrant at approximately 2.73% of the time. The incidence of wind between 1 and 6 knots is about 47.37% with wind speeds of above 17 knots (8.7 m/s) occurring in just 4.50% of incidences. This wind rose is broadly representative of the prevailing conditions experienced at the subject site.

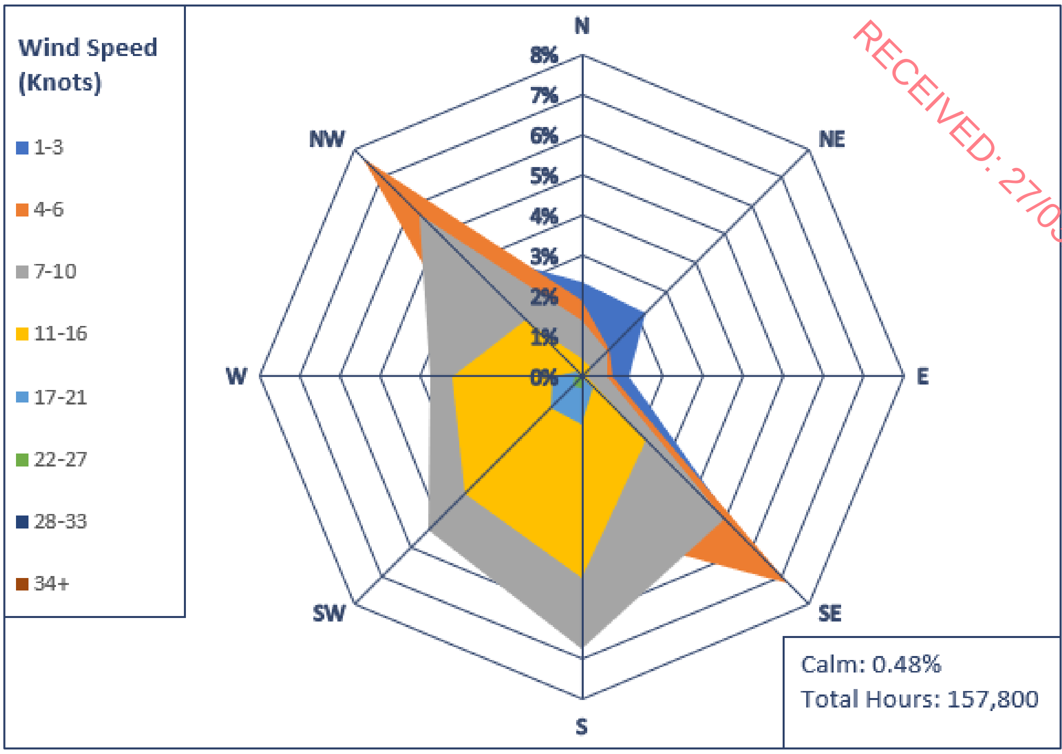


*Figure 8-3: 17-year Windrose at Oak Park Synoptic Weather Station 2004-2021 (Developed using Met Eireann Hourly Data)*

## 8.4 Characteristics of the Proposed Development

The proposed quarry void will be extracted to a depth of 2 no. benches of c. 10m from top of bedrock, with a final floor level of c. 56.5m AOD with a proposed rate of rock extraction of c.30,000 cubic metres (84,000 tonnes) per annum. A proposed working area of c. 1.2 hectares to the south of the extraction zone will provide for the crushing / processing of the unusable stone and storage of dimensional stone and will include machinery storage shed, staff welfare, wastewater holding tank, weighbridge, and parking area.

The Proposed Development will also include for earthen screening berms to a height of c. 3 m, a wheelwash facility; Installation of surface water attenuation and settlement ponds for the treatment of suspended solids in the floor of the quarry; soil storage area with an average storage depth of c. 3.85 m and all other site development works above and below ground including the restoration of the final quarry void (extractive area).

Access to the Proposed Development will be facilitated by a HGV site entrance from the Local Road to the east of the proposed site via a proposed access haul road.

## 8.5 Potential Impact of the Proposed Development

### 8.5.1 Potential Impacts on Air Quality

#### *8.5.1.1 Construction Phase*

There is potential for construction related air emissions to impact on local air quality as a result of the Proposed Development. Potential impacts are expected to be short-term and of a temporary nature. The main air quality impacts that may arise during construction activities are:

- Dust deposition;
- Elevated particulate matter concentrations ($PM_{10}$ and $PM_{2.5}$) as a result of dust generating activities on site; and
- An increase in concentrations of airborne particles, volatile organic compounds, nitrogen oxides, and sulphur oxides due to exhaust emissions from diesel powered vehicles and equipment on site (non-road mobile machinery) and vehicles accessing the site.

The greatest potential impact on air quality during this phase is from construction dust emissions and the potential for nuisance dust. The dust emissions from a construction site that may result in air quality impacts generally depend on:

- Site activities and duration;
- The size of the site;
- The meteorological conditions;
- The proximity of receptors to the activities;
- The adequacy of applied mitigation measures; and
- The sensitivity of receptors to dust.

The primary sources of dust identified include soil excavation works, bulk material transportation, loading and unloading, stockpiling materials, cutting and filling, and vehicular movements (HGVs and on-site machinery).

#### *8.5.1.2 Operational Phase*

The primary air quality impacts associated with quarrying activities is dust accumulation resulting from deposition of dispersed particles. Quarrying activities and ancillary facilities, by their nature, generate dust. The dust arises mainly from inert soil and rock materials.

##### 8.5.1.2.1 Dust

The main potential impact on ambient air quality from soil and stones processing activities will be that associated with the deposition of dust generated by mechanical processing and transfer operations. The primary sources of dust identified include stockpiling, handling, and placement of materials. They are generally dispersed sources rather than specific point sources, which dictates the measures required to mitigate potential dust-related impacts. Furthermore, the movement of vehicles and use of machinery during this phase will potentially generate exhaust fumes and consequently potential emissions of volatile organic compounds, nitrogen oxides, sulphur oxides, and particulate matter ($PM_{2.5}$ and $PM_{10}$).

Dust emissions associated with vehicular movements are largely due to the resuspension of particulate materials that are present on road surfaces. The movement of vehicles within the facility and to and from the facility to the external road network has potential to cause dust due to deposition from the vehicles themselves if appropriate mitigation measures are not considered.

The potential for dust generation depends on site activity, particle size, the moisture content of materials, and meteorological conditions. The type of material being processed can also have a significant influence on potential emissions. Soil and stone deposits may possess an inherently high moisture content, which can cause particles to adhere and thereby affords a high degree of natural mitigation. However, this does not negate the potential for fugitive emissions from this material if it dries out, especially during high wind conditions. The prevailing meteorological conditions have the largest impact on the rate of dust dispersion. During periods of prolonged dry weather, there is the potential for dust dispersion rates to be higher than average. Where rainfall has or is occurring, dust emissions can be dramatically reduced.

Potential dust arising from the infill site can reduce amenity in the local community if dust soiling takes place. The coarser dust associated with these effects may be referred to as 'nuisance dust'. Smaller dust particles remain airborne for longer and have the potential to increase local ambient air concentrations of suspended particulate matter ($PM_{10}$ and $PM_{2.5}$) which can be associated with a range of health concerns (IAQM, 2016). It is further noted that ambient air quality limit values for these pollutants are rarely exceeded in rural areas where traffic pollution is significantly less than in urban areas.

According to Institute of Air Quality Management Guidance on the Assessment of Mineral Dust Impacts for Planning (IAQM, 2016), the experience of the IAQM Working Group together with published studies and anecdotal evidence on the change in both airborne concentrations and the rate of deposition with distance, suggests that dust impacts will occur mainly within 400m of the operation, even at the dustiest of sites. Adverse impacts from dust generating activities are uncommon beyond 250m, and continuous or stark concerns about dust are most likely to be experienced within 100m of the dust source; the greatest potential for high rates of dust deposition and elevated $PM_{10}$ concentrations occurs within this distance.

The significant potential impacts associated with dust emissions from the Proposed Development are outlined in Table 8-6:

*Table 8-6: Potential Impacts Associated with Dust Emissions*

| Element | Description | Potential Risk |
|---|---|---|
| Source | Stockpiling of materials | Particulate matter on surface of stockpiles |
| | Unloading of materials | Particulate matter being handled and re-suspended |

| Element | Description | Potential Risk |
|---|---|---|
| | Traffic movements | Resuspension of particulate matter and deposition due to facility vehicles |
| Pathway | Dry days with wind speeds >5m/s | Potential for particulate suspension and deposition |
| | Distance between sensitive receptor and dust source <400m | Potential for particulate deposition |
| Receptors | Human sensitive receptors | Health impacts<br>Visual impacts |

According to IAQM Guidance (2016), the primary factor influencing the Pathway is the distance between the sensitive receptor and the dust sources. However, other factors can cause a higher or a lower category to be assigned then would be the case based on distance alone. These factors include:

- Orientation of receptors relative to the prevailing wind direction; and
- Topography, terrain and physical features.

Meteorological conditions greatly affect the level of dust emissions and subsequent deposition downwind of the source; the most predominant being rainfall and wind speed. Relatively high levels of moisture in the surrounding air, soils, and precipitation helps to suppress dust due to the cohesive properties of water between dust particles. The least favourable meteorological conditions for dust generation would typically be warm days with strong winds and low precipitation.

Table 8-7 outlines the hourly percentage distribution of wind speed and direction at Oak Park synoptic weather station over a period of 17 years. This data suggests that the most frequent wind directions prevail from the southeast and northwest with similar frequencies for both. The corresponding most frequent wind speed is between 4 and 6 knots which is considered a 'light breeze' in terms of the Beaufort scale. This corresponds with the wind speed frequency distribution shown in Figure 8-2.

*Table 8-7: Percentage Distribution of Wind Speeds and Direction at Oak Park Weather Station (January 2004 - December 2021)*

| Wind speed (Knots) | | <1 | 1 - 3 | 4 - 6 | 7 - 10 | 11-16 | 17-21 | 22-27 | 28-33 | 34+ | % Dry Days |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wind Direction | Degrees | | | | | | | | | | |
| North | 350 - 10 | 0.48 | 2.34 | 1.88 | 1.42 | 0.43 | 0.01 | 0.00 | 0.00 | 0.00 | 36.7% |
| North-east | 20 - 70 | | 2.23 | 0.99 | 0.92 | 0.34 | 0.01 | 0.00 | 0.00 | 0.00 | |
| East | 80 - 100 | | 1.16 | 0.78 | 0.63 | 0.15 | 0.01 | 0.00 | 0.00 | 0.00 | |
| South-east | 110 - 150 | | 5.54 | 7.25 | 4.99 | 2.24 | 0.36 | 0.06 | 0.00 | 0.00 | |

| Wind speed (Knots) | | <1 | 1 - 3 | 4 - 6 | 7 - 10 | 11-16 | 17-21 | 22-27 | 28-33 | 34+ | % Dry Days |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wind Direction | Degrees | | | | | | | | | | |
| South | 170 - 190 | | 1.30 | 3.78 | 6.76 | 4.99 | 1.16 | 0.28 | 0.02 | 0.00 | |
| South-west | 200 - 250 | | 1.37 | 2.74 | 5.36 | 4.13 | 1.10 | 0.35 | 0.04 | 0.00 | |
| West | 260 - 280 | | 1.38 | 2.35 | 3.74 | 3.24 | 0.71 | 0.18 | 0.03 | 0.00 | |
| North-west | 290 - 340 | | 4.61 | 7.66 | 5.69 | 1.97 | 0.18 | 0.01 | 0.00 | 0.00 | |

Sensitive receptors, as noted in Table 8-8, in the vicinity of the Proposed Development are described as one-off rural housing and farm buildings of low density. The Institute of Air Quality Management (IAQM) (2016) propose that the majority of dust deposition will typically occur within 100m of the operational area. Figure 8-4 indicates that closest sensitive receptors (SR) are outside the site line boundary and, with the exception of SR15 which lies 70m east of the site, are all at a distance which is greater than 100m from the operational area.

A Disamenity Dust Assessment has been carried out in order to determine the overall impact of the Proposed Development on nearby sensitive receptors and is presented in the following Section 8.5.1.2.1.1.

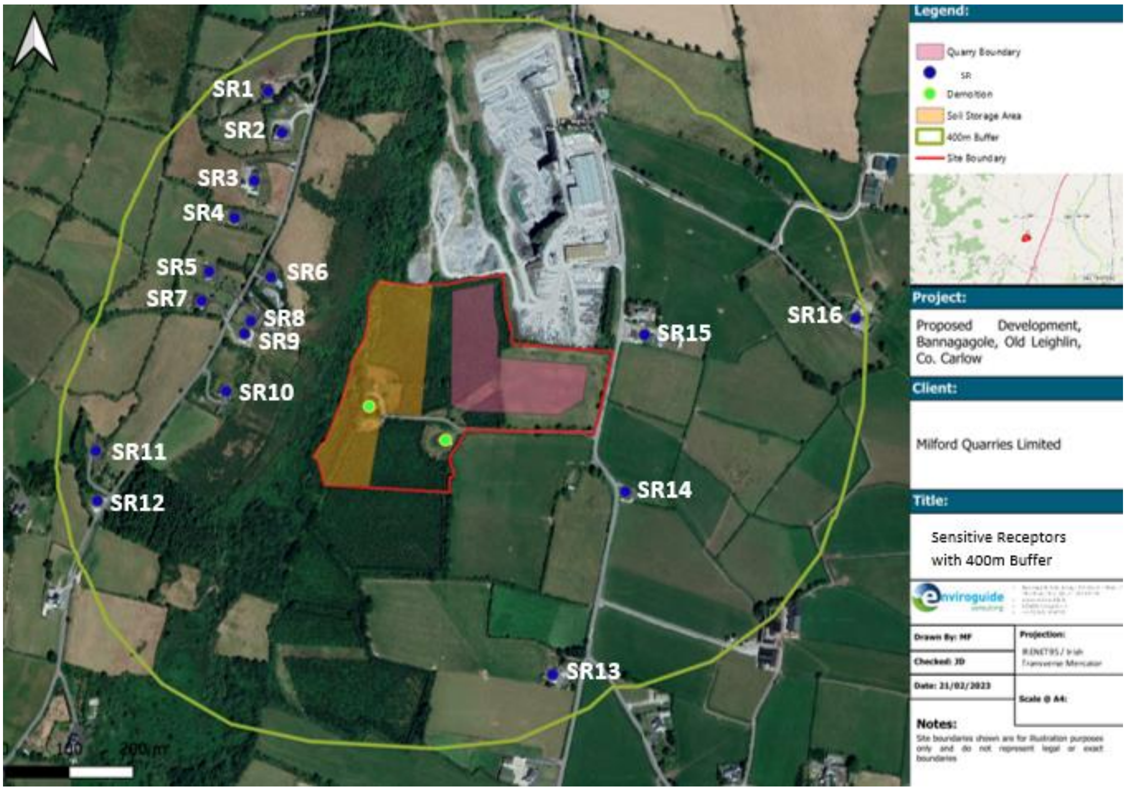


*Figure 8-4: Location of Sensitive Receptors (SRs) in relation to the Proposed Development Site*

*8.5.1.2.1.1 Disamenity Dust Assessment*

In line with IAQM Guidance (2016), the following section provides a series of assessment matrices which have been used to estimate the Dust Impact Risk, the Pathway Effectiveness and the Likely Magnitude of Disamenity Effects at each of the nearest sensitive receptors to the Proposed Development. The latter is used to determine whether there is a possibility of significant effects on the surrounding area.

*8.5.1.2.1.1.1 Estimation of Residual Source Emissions*

According to IAQM Guidance (2016), residual source emissions are based on the scale of the anticipated operations and can be classified as **Small, Medium**, or **Large**.

An example of a large potential dust magnitude from mineral extraction may include a working area >100 hectares, drilling and blasting frequently used, dusty mineral of small particle size and/or low moisture content, a 1,000,000 tonnes per annum extraction rate. A small potential magnitude may include working area <20 hectares, use of a hydraulic excavator, coarse material and/or high moisture content, a <200,000 tonnes per annum extraction rate.

The operational site of the Proposed Development is ca. c. 2.45 hectares in size and the materials to be extracted is dimensional stone. The primary sources of dust associated with the Proposed Development include extraction of materials, stockpiling, handling, and loading of materials, and traffic movements on internal and external haul routes. Having regard to the criteria outlined above, residual source emissions from the Proposed Development have been classified as **Small;** however, a **Medium** scale has been applied in the current study in order to assess the worst-case scenario.

*8.5.1.2.1.1.2 Estimation of Pathway Effectiveness*

According to IAQM (2016), in the case of hard rock quarry sites, impacts beyond 400m are uncommon; and continuous or stark concerns about dust are most likely to be experienced within 100m of the dust source. It is noted that distances refer to ‘dust generating activities’ rather than the site boundary and this may refer to extraction and processing areas.

All sensitive receptors positioned within a 400m radius of the site boundary area have been identified in Table 8-8. The closest sensitive receptor to site operations, as indicated in Table 8-8, is SR15 which is situated ca. 70m east of the extraction and processing area.

*Table 8-8: Sensitive Receptors located within a 400m Radius of the Extraction and Processing Area*

| Sensitive Receptor ID | Coordinates | Distance from site (m) | Orientation relative to site | Receptor Type | Sensitivity |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **SR1** | 52.728292, -7.026599 | 350m | North-west | Residential | High[5] |
| **SR2** | 52.727703, -7.026321 | 280m | North-west | Residential | High |
| **SR3** | 52.727073, -7.026900 | 260m | North-west | Residential | High |
| **SR4** | 52.726590, -7.027478 | 260m | West | Residential | High |
| **SR5** | 52.725875, -7.028016 | 270m | West | Residential | High |
| **SR6** | 52.725711, -7.026651 | 170m | West | Residential | High |
| **SR7** | 52.725376, -7.028308 | 270m | West | Residential | High |
| **SR8** | 52.725147, -7.027127 | 190m | West | Residential | High |
| **SR9** | 52.724964, -7.027272 | 190m | West | Residential | High |
| **SR10** | 52.724154, -7.027746 | 190m | West | Residential | High |
| **SR11** | 52.723339, -7.030664 | 360m | West | Residential | High |
| **SR12** | 52.722622, -7.030668 | 350m | West | Residential | High |
| **SR13** | 52.720124, -7.020240 | 375m | South | Residential | High |
| **SR14** | 52.722672, -7.018518 | 120m | South-east | Residential | High |
| **SR15** | 52.724882, -7.018281 | 70m | East | Residential | High |
| **SR16** | 52.725006, -7.013222 | 400m | East | Residential | High |

The site-specific factors considered in determining the effectiveness of the pathway are the distance and direction of receptors relative to the prevailing wind directions. There are no. 16 identified receptors within 400m of the extraction and processing area. For each receptor within 400m of the extraction and processing area, the wind direction from the dust source was calculated. The frequencies of wind in each direction, in conjunction with the number of dry days, were then calculated based on meteorological data at Oak Park Weather Station. Moderate to high windspeeds (above 5m/s (7-10 knots)) have been utilised in this assessment as these conditions are most likely to result in fugitive dust emissions.

Table 8-9 provides a summary of all events of hourly wind speeds above 5m/s and corresponding directions from Oak Park. Approximately 47.37% of all hourly data featured

[5] Users can reasonably expect an enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land (IAQM, 2016).

winds of below 5m/s; these measurements have been excluded for the purposes of this assessment. Data displayed in Table 8-9 shows south as the prevailing wind direction. In light of this data, in combination with distances relative to the operational area, sensitive receptors were assessed and those with potential to be affected by fugitive dust emissions were identified.

*Table 8-9: Summary of Prevailing Wind Directions at Dunsany Weather Station above 5m/s (7-10 knots)*

| Wind direction pre-vailing | Frequency (%) | Sensitive Receptor likely to be affected (ID) | % Dry days (2004-2021) |
|---|---|---|---|
| **North** | 1.86 | SR13 | 36.7% |
| **North-east** | 1.27 | - | |
| **East** | 0.79 | SR4, SR5, SR6, SR7, SR8, SR9, SR10, SR11, SR12 | |
| **South-east** | 7.64 | SR1, SR2, SR3 | |
| **South** | 13.21 | - | |
| **South-west** | 10.97 | - | |
| **West** | 7.89 | SR15, SR16 | |
| **North-west** | 7.84 | SR14 | |

As is evident from Table 8-9, there are no sensitive receptors within 400m of the operational area which are downwind of the prevailing wind conditions. SR15 and SR16 are located to the east of the Proposed Development Site and would require prevailing winds from the west to be potentially impacted in this regard; these winds are uncommon at <8% frequency. At these receptors, the frequency of winds (>5 m/s) occurring from the direction of the dust source on dry days is 2.9%. SR14 could potentially be impacted by winds which blow from the north-west; these winds are uncommon at <8% frequency. At this receptors, the frequency of winds (>5 m/s) occurring from the direction of the dust source on dry days is 2.88%. SR1, SR2 and SR3 could potentially be impacted by winds which blow from the south-east; these winds are uncommon at <8% frequency. At these receptors, the frequency of winds (>5 m/s) occurring from the direction of the dust source on dry days is 2.8%. SR4, SR5, SR6, SR7, SR8, SR9, SR10, SR11 and SR12 would require prevailing winds from the east to potentially be impacted in this regard; these winds are uncommon at <1% frequency. At these receptors, the frequency of winds (>5 m/s) occurring from the direction of the dust source on dry days is 0.29%. SR13 is located to the south of the Proposed Development site and would require prevailing winds from the north to be potentially impacted in this regard; these winds are uncommon at <2% frequency. At this receptor, the frequency of winds (>5 m/s) occurring from the direction of the dust source on dry days is 0.69%.

All identified sensitive receptors are located more than 100m from the site boundary, aside from SR15. As SR15 is not located downwind of prevailing conditions, appropriate mitigation measures are likely to eradicate the risk of potential impacts. Furthermore, the trees and hedgerows which are currently present on the site boundary will further act as a natural buffer for dust deposition for all sensitive receptors. It can therefore be concluded that dust emissions associated with the Proposed Development will not have a significant impact on the local sensitive receptors.

The resulting frequency of moderate to high wind speeds with the potential of carrying airborne dust towards receptors were then assigned to the categories in Table 8-10. It has been determined that the frequency of appropriate conditions for fugitive emissions to occur at these receptors is <5% and therefore considered 'Infrequent' as per Table 8-10.

*Table 8-10: Categorisation of Frequency of Potentially Dusty Winds (Source: IAQM 2016)*

| Frequency Category | Criteria |
|---|---|
| Infrequent | Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5% |
| Moderately Infrequent | The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12% |
| Frequent | The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20% |
| Very Frequent | The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20% |

The categorisation in Table 8-11 was applied to the distance from each receptor to the source. As per Table 8-8, SR15 is located 70m from the Proposed Development site and therefore is considered 'Close' as per Table 8-11. SR6, SR8, SR9, SR10 and SR14 are situated between 100m and 200m from the extracting and processing area and are therefore considered 'Intermediate' as per Table 8-11. SR1, SR2, SR3, SR4, SR5, SR7, SR11, SR12, SR13 and SR16 are located between 200m and 400m from the extracting and processing area and are therefore considered 'Distant' as per Table 8-11. Table 8-12 summarises this information.

*Table 8-11: Categorisation of Receptor Distance from Source (Source: IAQM 2016)*

| Category | Criteria |
|---|---|
| Distant | Receptor is between 200m and 400m from the dust source |
| Intermediate | Receptor is between 100m and 200m from the dust source |
| Close | Receptor is less than 100m from the dust source |

*Table 8-12:Categorisation of Sensitive Receptors*

| Category | Sensitive Receptor |
|---|---|
| Distant | SR1, SR2, SR3, SR4, SR5, SR7, SR11, SR12, SR13 and SR16 |
| Intermediate | SR6, SR8, SR9, SR10 and SR14 |
| Close | SR15 |

The pathway effectiveness was then classified using the Frequency of Potentially Dusty Winds from Table 8-10 and the Receptor Distance from Source from Table 8-11. The frequency of potentially dusty winds has been determined as 'Infrequent' and the receptor distance from source has been categorised as 'Close' for SR15. Therefore, having regard to the results of both assessments, the pathway of effectiveness can be determined as 'Ineffective', as per Table 8-13. The frequency of potentially dusty winds has been determined as 'Infrequent' and the receptor distance from source has been categorised as 'Intermediate' for SR6, SR8, SR9, SR10 and SR14. Therefore, having regard to the results of both assessments, the pathway of effectiveness can be determined as 'Ineffective', as per Table 8-13. The frequency of potentially dusty winds has been determined as 'Infrequent' and the receptor distance from source has been categorised as 'Distant' for SR1, SR2, SR3, SR4, SR5, SR7, SR11, SR12, SR13 and SR16. Therefore, having regard to the results of both assessments, the pathway of effectiveness can be determined as 'Ineffective', as per Table 8-13.

*Table 8-13: Pathway Effectiveness (Source: IAQM 2016)*

| | | Frequency of potentially dusty winds | | | |
|---|---|---|---|---|---|
| | | Infrequent | Moderately Frequent | Frequent | Very Frequent |
| Receptor Distance Category | Close | Ineffective | Moderately Effective | Highly Effective | Highly Effective |
| | Intermediate | Ineffective | Moderately Effective | Moderately Effective | Highly Effective |
| | Distant | Ineffective | Ineffective | Moderately Effective | Moderately Effective |

*8.5.1.2.1.1.3 Estimation of Dust Impact Risk*

The Residual Source Emissions and the Pathway Effectiveness were then combined to predict the overall Dust Impact Risk as shown in Table 8-14. It can be determined from Table 8-14, having regard to the outcome of the preceding assessments, that the overall Dust Impact Risk at sensitive receptors resulting from the Proposed Development is 'Negligible'.

*Table 8-14: Estimation of Dust Impact Risk (Source: IAQM 2016)*



| | | **Residual Source Emissions** | | |
|---|---|---|---|---|
| | | Small | Medium | Large |
| **Pathway Effectiveness** | Highly Effective Pathway | Low Risk | Medium Risk | High Risk |
| | Moderately Effective Pathway | Negligible Risk | Low Risk | Medium Risk |
| | Ineffective Pathway | Negligible Risk | Negligible Risk | Low Risk |

*8.5.1.2.1.1.4 Estimation of Likely Magnitude of Disamenity Effects*

The magnitude of the disamenity effect at each receptor was determined from the Dust Impact Risk as shown in Table 8-14 and the Receptor Sensitivity as shown in Table 8-8. In light of this, and having regard to the procedure outlined in Table 8-15, it can be concluded that the overall magnitude of disamenity effects is 'Negligible' at each of the sensitive receptors.

*Table 8-15: Descriptors for magnitude of dust effects (Source: IAQM 2016)*

| | | **Receptor Sensitivity** | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| **Dust Impact Risk** | High Risk | Slight Adverse Effect | Moderate Adverse Effect | Substantial Adverse Effect |
| | Medium Risk | Negligible Effect | Slight Adverse Effect | Moderate Adverse Effect |
| | Low Risk | Negligible Effect | Negligible Effect | Slight Adverse Effect |
| | Negligible Risk | Negligible Effect | Negligible Effect | Negligible Effect |

The dust disamenity effects predicted at each receptor within 400m of the Proposed Development have been summarised in Table 8-16:

*Table 8-16: Summary of Disamenity Dust Assessment*

| Receptor ID | Irish Grid Reference | Location Relative to Site | Residual Source Emissions | Pathway Effectiveness | Dust Impact Risk | Receptor Sensitivity | Magnitude of Dust Effect |
|---|---|---|---|---|---|---|---|
| SR1 | 52.728292, -7.026599 | 350m North-west | Medium | Ineffective | Negligible | High | Negligible |

| Receptor ID | Irish Grid Reference | Location Relative to Site | Residual Source Emissions | Pathway Effectiveness | Dust Impact Risk | Receptor Sensitivity | Magnitude of Dust Effect |
|---|---|---|---|---|---|---|---|
| SR2 | 52.727703, -7.026321 | 280m North-west | Medium | Ineffective | Negligible | High | Negligible |
| SR3 | 52.727073, -7.026900 | 260m North-west | Medium | Ineffective | Negligible | High | Negligible |
| SR4 | 52.726590, -7.027478 | 260m West | Medium | Ineffective | Negligible | High | Negligible |
| SR5 | 52.725875, -7.028016 | 270m West | Medium | Ineffective | Negligible | High | Negligible |
| SR6 | 52.725711, -7.026651 | 170m West | Medium | Ineffective | Negligible | High | Negligible |
| SR7 | 52.725376, -7.028308 | 270m West | Medium | Ineffective | Negligible | High | Negligible |
| SR8 | 52.725147, -7.027127 | 190m West | Medium | Ineffective | Negligible | High | Negligible |
| SR9 | 52.724964, -7.027272 | 190m West | Medium | Ineffective | Negligible | High | Negligible |
| SR10 | 52.724154, -7.027746 | 190m West | Medium | Ineffective | Negligible | High | Negligible |
| SR11 | 52.723339, -7.030664 | 360m West | Medium | Ineffective | Negligible | High | Negligible |
| SR12 | 52.722622, -7.030668 | 350m West | Medium | Ineffective | Negligible | High | Negligible |
| SR13 | 52.720124, -7.020240 | 375m South | Medium | Ineffective | Negligible | High | Negligible |
| SR14 | 52.722672, -7.018518 | 120m South-east | Medium | Ineffective | Negligible | High | Negligible |

| Receptor ID | Irish Grid Reference | Location Relative to Site | Residual Source Emissions | Pathway Effectiveness | Dust Impact Risk | Receptor Sensitivity | Magnitude of Dust Effect |
|---|---|---|---|---|---|---|---|
| SR15 | 52.724882, -7.018281 | 120m West | Medium | Ineffective | Negligible | High | Negligible |
| SR16 | 52.725006, -7.013222 | 400m East | Medium | Ineffective | Negligible | High | Negligible |

The Disamenity Dust Assessment has concluded that there will be an overall Negligible impact on sensitive receptors as a result of the Proposed Development. It is likely that the local terrain and natural features between the source and the receptors will variously act as barriers, reduce airborne concentrations due to impaction, lengthen pathways, affect air flow, and increase or inhibit dispersion and dilution. Nevertheless, appropriate mitigation measures will be incorporated as this will substantially reduce any likelihood of fugitive emissions causing an impact on sensitive receptors in the vicinity of the Proposed Development.

##### **8.5.1.2.2** Dust Containing Silica

Exposure to fine respirable dust which contains silica is considered to be a major health risk encountered by quarry industry employees. Silica is a natural mineral found in the majority of rocks, sands and clays, therefore workers in the quarrying industry are particularly susceptible. Silica dust exposure to quarry workers may arise from the quarrying, crushing, screening and processing of stone into various sizes, and dust resuspension and circulation within cabs of vehicles. Workers are at risk from fine airborne particles, which are often not visible to the naked eye, and therefore pose no obvious hazard to workers, entering the respiratory tract. Exposure to silica dust over a number of years can result in the development of a condition known as silicosis; a lung disease which interferes with oxygen uptake in the bloodstream. New evidence also suggests that long-term exposure to silica can increase the risk of lung cancer (Health and Safety Authority, 2020). Silica dust exposure can be managed in line with the appropriate mitigation measures set out for all dust impacts.

#### ***8.5.1.3 Traffic-Related Air Emissions***

Construction vehicles and machinery during this phase will temporarily and intermittently generate exhaust fumes and consequently potential emissions of volatile organic compounds, nitrogen oxides, sulphur oxides, and particulate matter (dust). Dust emissions associated with vehicular movements are largely due to the resuspension of particulate materials from ground disturbance. According to the IAQM (2014), experience from the assessment of exhaust emissions from on-site machinery and site traffic suggests that they are unlikely to cause a significant effect on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. Air pollutants may increase marginally due to construction-related traffic and machinery from the Proposed Development. However, any such increase is not considered significant and will be well within relevant ambient air quality standards. According to TII (2011), the significance of impacts due to vehicle emissions during the Construction Phase will be dependent on the number of additional vehicle movements, the proportion of

HGVs and the proximity of sensitive receptors to site access routes. If construction traffic would lead to a significant change (> 10%) in Annual Average Daily Traffic (AADT) flows near to sensitive receptors, then concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ should be predicted in line with the methodology as outlined within TII guidance. Construction traffic is not expected to result in a significant change (> 10%) in AADT flows near to sensitive receptors. According to Chapter 12 Traffic, based on figures provided by the design team, it is estimated that on average 5 no. construction workers will be based on site each day. This would likely equate to a daily average of 2 no. contractor staff vehicle trips (assuming a vehicle occupancy of 3 no. contractors per vehicle) or a peak of 5 no. contractor staff vehicle trips. In regard to construction related deliveries, it is estimated a daily average of 5 no. HV trips (e.g. excavated materials off-site, import materials, delivery HGVs, etc.) and 2 no. LV trips (delivery vans) will occur during construction. Given the temporary nature of the construction related traffic, the impact of the estimated construction traffic is expected to be minimal. Therefore, a detailed air quality assessment is not required.

Operational traffic will use local roads Operational traffic will use regional and local roads to access the facility with potential increases of traffic flow on some roads and subsequent associated emissions of VOCs, nitrogen oxides, sulphur dioxides and increased particulate matter concentrations.

In terms of associated impacts on air quality, Table 8-17 outlines the criteria that are prerequisite for an air quality assessment. According to IAQM guidance (2017), if none of the criteria are met, then there should be no requirement to carry out an air quality assessment for the impact of the development on the local area, and the impacts can be considered as having an insignificant effect.

*Table 8-17: Indicative Criteria for Requiring an Air Quality Assessment (Source: IAQM, 2017)*

| Potential Change resulting from Proposed Development | Indicative Criteria to Proceed to an Air Quality Assessment |
|---|---|
| Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors | A change of LDV flows of more than 1000 Annual Average Daily Traffic (AADT) |
| Cause a significant change in Heavy Duty Vehicle (HGV) flows on local roads with relevant receptors | A change of HGV flows of more than 100 Annual Average Daily Traffic (AADT) |
| Realign roads, i.e. changing the proximity of receptors to traffic lanes | Where the change is 5m or more |
| Cause a change in Daily Average Speed (DAS) | Where the DAS will change by 10 km/h or more |
| Cause a change in peak hour speed | Where the peak hour speed will change by 20km/h or more. |

As per Chapter 12 Traffic, the criteria presented in Table 8-10 have not been met by the Proposed Development; it is therefore considered unlikely for significant air quality impacts to occur as a result of increased traffic flow and a quantitative assessment is not required in this case.

### 8.5.2 Potential Impacts on Climate

#### *8.5.2.1 Construction Phase*

There is the potential for combustion emissions from onsite machinery and traffic derived pollutants of $CO_2$ and $N_2O$ (Nitrous Oxide) to be emitted during the construction phase of the development. However, due to the size and duration of the construction phase, and the mitigation measures proposed, the effect on national greenhouse gas (GHG) emissions will be insignificant in terms of Ireland's obligations under the Kyoto Protocol and therefore will have no considerable impact on climate.

#### *8.5.2.2 Operational Phase*

Combustion emissions from onsite machinery and traffic derived pollutants of $CO_2$ and $N_2O$ will be emitted during facility operations. However, as concluded in Chapter 12 *Traffic,* the Proposed Development will not result in any significant change to current traffic movements. Therefore, no significant increases in associated greenhouse gas emissions are expected.

It is also noted that the quantity and scale of machinery to be used in the Proposed Development is limited to a loading shovel, excavator, screener, articulated lorry with a flatbed trailer, a handheld circular saw and a crusher, and associated GHG contributions are likely to be marginal in terms of overall national GHG emission estimates, and therefore unlikely to have an adverse effect on climate.

It is therefore concluded that macro and micro-climatic impacts as a result of the Proposed Development are negligible.

### 8.5.3 Potential Cumulative Impacts

Cumulative Impacts can be defined as "*impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*". Effects which are caused by the interaction of effects, or by associated or off-site projects, are classed as indirect effects. Cumulative effects are often indirect, arising from the accumulation of different effects that are individually minor. Such effects are not caused or controlled by the project developer.

The cumulative effects on the air quality and climate of the Proposed Development and other existing developments have been considered, in particular through the generation of air pollutants and greenhouse gas emissions. All planning applications which have been granted permission and are already developed have been incorporated into the baseline assessment of this application. There is an operational quarry located to the north of the Proposed Development site. The most significant potential for adverse cumulative impacts in combination with this offsite facility, in the context of Air Quality and Climate, is the potential for nuisance dust. The Disamenity Dust Assessment carried out in Section 8.5.1.2.1.1. has concluded that there will be an overall Negligible impact on sensitive receptors as a result of the Proposed Development. However, the adherence and full implementation of the appropriate control and mitigation measures will ensure there is no potential for cumulative impacts to arise.

*Table 8-18: Potential Cumulative Impacts*

| Application Reg. Ref. | Address | Development Proposal | Decision |
|---|---|---|---|
| **22238**<br>**Kilkenny Limestone Quarries Ltd** | Oldleighlin Quarry, Bannagagole, Co. Carlow | The installation of a Roof Mounted Solar PV Panel Array consisting of up to 2200m2 of solar panels with a peak capacity of up to 427.5Kwp mounted to the roofs of two industrial buildings via steel frames, including routing cable, trenching and backfilling of cables and all associated works. | Grant Permission<br>Decision date: 29/11/2022 |

In terms of dust, no significant impacts are predicted; good construction practice, which incorporates the implementation of the identified mitigation measures, will be employed at the Proposed Development site. Due to the implementation of good construction practices at the site of the Proposed Development and these offsite permitted developments, it is not anticipated that significant cumulative impacts will occur.

Assessment of operational stage impacts on air quality involved traffic data which is inclusive of traffic associated with other existing and permitted developments on the road networks surrounding the site both in current and future years. Therefore, cumulative impacts have been assessed in this regard and the impact on ambient air quality has been determined as insignificant.

### 8.5.4 "Do Nothing" Impact

A do-nothing scenario would result in the site remaining undeveloped. If the Proposed Development were not to proceed there would be no dust or transport related impacts on the air quality in the area or the macro and microclimate.

## 8.6 Avoidance, Remedial, and Mitigation Measures

### 8.6.1 Air Quality

#### *8.6.1.1 Construction Phase*

Due to the nature and duration of the proposed demolition works, it is not expected that adverse air quality impacts are likely to occur. However, appropriate mitigation measures will be employed to further prevent such impacts occurring.

- Rotary atomisers and water bowsers will be employed during dry weather;
- A wheel wash will be employed for dust suppression to ensure dust is not transferred to external roads;

- Daily visual observations will be made on fugitive dust levels; in the event of high dust levels, operations giving rise to such emissions will be ceased or curtailed;
- Engines and exhaust systems should be maintained so that exhaust emissions do not breach stationary emission limits set for the vehicle / equipment type and mode of operation;
- Exhaust emissions from vehicles and machinery will be minimised by avoidance of engines running unnecessarily as idle engines will not be permitted for excessive periods;
- The transport of dusty materials and aggregates will be carried out using covered / sheeted lorries;

#### *8.6.1.2 Operational Phase*

To minimise the potential risks of air quality impacts occurring during operations, a series of mitigation measures have been prepared:

- Rotary atomisers and water bowsers will be employed during dry weather and during any site preparation activities including overburden removal, excavation of works area, internal roads;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind and shorten the length of time for which material will be stockpiled;
- Regular spraying of material stockpiles and haul roads during dry and/or windy weather;
- Covering of loose loads of fine sized materials during transit;
- Regular use of a road sweeper unit on the site entrance road and at the site exit onto the local road network;
- A wheel wash will be employed for dust suppression to ensure dust is not transferred to external roads;
- Daily visual observations will be made on fugitive dust levels; in the event of high dust levels, operations giving rise to such emissions will be ceased or curtailed;
- Exhaust emissions from vehicles and machinery will be minimised by avoidance of engines running unnecessarily as idle engines will not be permitted for excessive periods;

- The transport of dusty materials and aggregates will be carried out using covered / sheeted lorries.

#### 8.6.2 Climate

As negative climatic impacts associated with the Construction and Operational Phases of the development are negligible, no mitigation measures are proposed. Best practice measures will be implemented to minimise exhaust emissions from construction and operational vehicles and machinery by avoidance of engines running unnecessarily, as idle engines will not be permitted for excessive periods.

#### 8.6.3 Worst Case Scenario

Worst case scenario would involve failures of mitigation measures for the Proposed Development. In the event of this, it is considered that localised dust will not cause any significant dust nuisance to nearby receptors.

### 8.7 Residual Impacts

Residual Impacts are defined *as 'effects that are predicted to remain after all assessments and mitigation measures'*. They are the remaining 'environmental costs' of a project and are the final or intended effects of a development after mitigation measures have been applied to avoid or reduce adverse impacts. Potential residual impacts from the Proposed Development were considered as part of this environmental assessment.

No negative residual impacts in the context of air quality and climate are anticipated regarding this Proposed Development.

### 8.8 Monitoring

Routine monitoring of dust deposition levels will be carried out at site boundaries to assess compliance with site planning conditions and to ensure that the residential amenity of local residential properties is not significantly impacted by site operations.

### 8.9 Interactions

Interactions between Air Quality and Climate and other aspects of this EIAR have been considered and are detailed below.

#### 8.9.1 Population and Human Health

Interactions between Air Quality and Population and Human Health have been considered as the Proposed Development has the potential to cause health issues as a result of impacts on air quality from dust nuisances, including silica dust, and potential traffic derived pollutants. However, the mitigation measures employed at the Proposed Development will ensure that all impacts are compliant with ambient air quality standards and human health will not be affected.

### 8.9.2 Biodiversity

It is not considered that the interaction between Air Quality and Climate and Biodiversity will be significant due to the implementation of the proposed mitigation measures.

### 8.9.3 Traffic

Traffic derived pollutants which may affect Air Quality and Climate are deemed insignificant due to the marginal change in traffic volume and movement associated with the Proposed Development as outlined in Chapter 12 Traffic

## 8.10 Difficulties Encountered When Compiling

No difficulties were encountered when compiling this chapter.

## 8.11 References

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