9.0 AIR AND CLIMATE

9.1 Introduction

This chapter assesses the likely air quality and climate impacts associated with a proposed quarry extension in Bellewstown, Co. Meath. A full description of the development can be found in Chapter 3.

The subject site is Bellewstown Quarry and proximate agricultural land in Co. Meath located in the townlands of Bellewstown, Hilltown Little, Gafney Little and Hilltown Great. The site comprises the existing rock quarry and a portion of land extending to the northeast on which it is proposed to deliver a new dedicated private quarry access road. The quarry area extends to approximately c. 39.4 hectares. The overall site size (development boundary) is 47.3 hectares, which includes an area of 7.9 hectares to accommodate the new access road to serve the quarry.

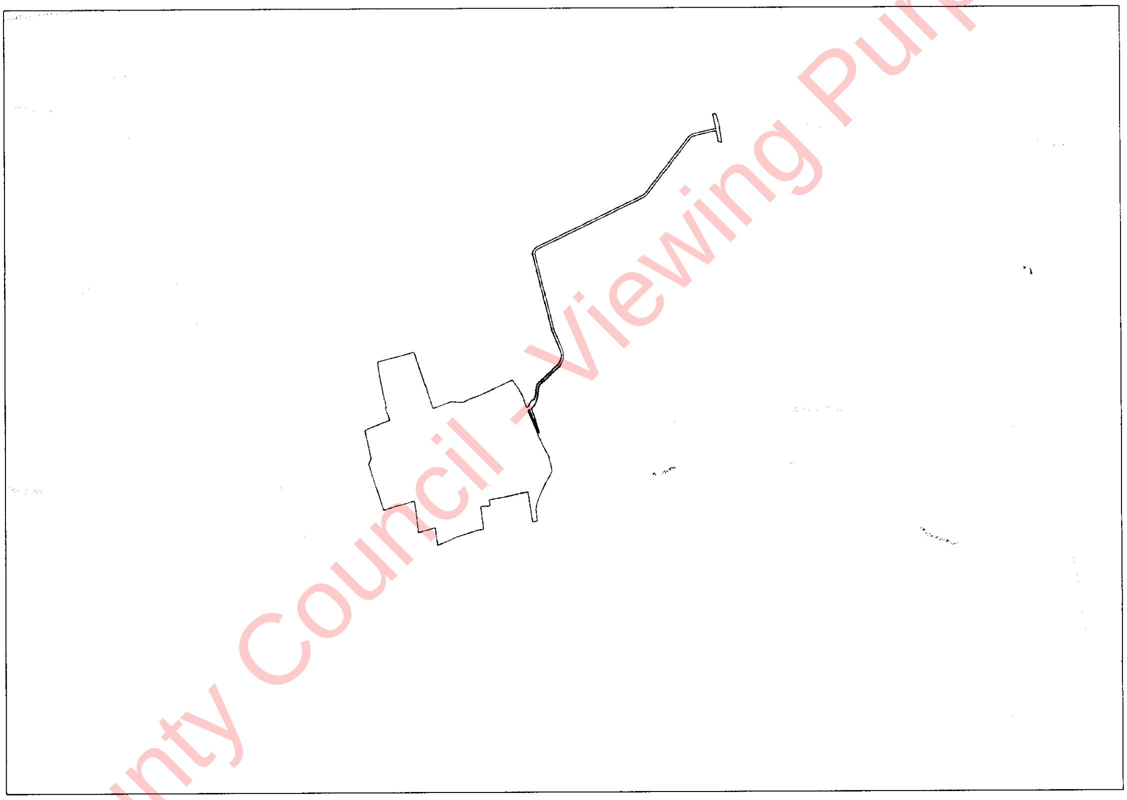

Figure 9.1: Location of Subject Site outlined in red. (Source: www.openstreetmaps.com, 2022.)

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9.2 Methodology

9.2.1 Criterial for Rating of Impacts

The rating of potential environmental effects of the development on air quality and climate is based on the criteria presented in Table 3.3 of the EPA (2022) document titled *Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports*. These criteria consider the quality, significance, duration and types of effect characteristics identified.

Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. The applicable standards in Ireland include the *Air Quality Standards Regulations 2011*, which incorporate EU Directive 2008/50/EC (see Table 9.1). The ambient air quality standards applicable for PM_{10} and $PM_{2.5}$ are outlined in this Directive. These standards have been used in the current assessment to determine the potential impact of PM_{10} and $PM_{2.5}$ emissions from the development on air quality.

There are no statutory limits on dust deposition and the focus is on the prevention of nuisance and minimising air borne dust emissions where practicable. Although coarse dust is not regarded as a threat to health, it can create a nuisance by depositing on surfaces. No statutory or official air quality criterion for dust annoyance has been set in Ireland, UK, Europe or at World Health Organisation level.

The most commonly applied guideline is the *German TA Luft* (German VDI, 2002) guideline of 350 mg/(m^2*day) as measured using Bergerhoff type dust deposit gauges as per the German Standard Method for determination of dust deposition rate (VDI 2119). This is commonly applied to ensure that no nuisance effects will result from specified industrial activities. Below these thresholds dust problems are considered less likely. Dust deposition is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (30 days +/- 2 days).

Recommendations outlined by the Department of the Environment, Heritage & Local Government (2004), apply the Bergerhoff limit of 350 mg/(m^2*day) to the land ownership boundary of quarries. This standard can be applied to the development in regard to dust deposition.

Pollutant	Regulation [Note 1]	Limit Type	Value
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/m³
		Annual limit for protection of human health	40 µg/m³
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m³
Dust deposition (non-hazardous dust)	TA Luft (German VDI 2002)	Average daily dust deposition at the boundary of the site	350 mg/(m²*day) Total Dust

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

Table 9.1: Air Quality Standards 2011 & TA Luft.

Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global Greenhouse Gas (GHG) emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

Following on from the recently published European Climate Law (EU, 2021), and as part of the EU's *"Fit for 55"* legislative package where the EU has recently committed to a domestic reduction of net greenhouse gas emissions by at least 55% compared to 1990 levels by 2020, the Effort Sharing Regulation is proposed to be strengthened with increased ambition by the year 2030. The proposal for Ireland is to increase the GHG emission reduction target from 30% to 42% relative to 2005 levels whilst the ETS market will also have more stringent reductions from the currently proposed reduction of 43% by 2030 compared to 2005 to a 61% reduction by 2030 based on annual reductions of 4.2% compared to the previous annual reduction level of 2.2% per year (EU, 2021).

In 2015, the *Climate Action and Low Carbon Development Act 2015* (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland *'to pursue, and achieve, the transition to a low carbon, climate resilient and* *environmentally sustainable economy by the end of the year 2050'* (3.(1) of No. 46 of 2015). This is referred to in the Act as the *'national transition objective'*. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first *Climate Action Plan* (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019a). The *Climate Action Plan 2019* outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second *Climate Action Plan* in November 2021 (Government of Ireland, 2021a). The plan contains similar elements as the 2019 CAP and aims to set out how Ireland can reduce our greenhouse gas emissions by 51% by 2030 (compared to 2018 levels) which is in line with the EU ambitions, and a longer-term goal of to achieving net-zero emissions no later than 2050. The 2021 CAP outlines that emissions from the Built Environment sector must be reduced to 4 -5 $MtCO_2e$ by 2030 in order to meet our climate targets. This will require further measures in addition to those committed to in the 2019 CAP. This will include phasing out the use of fossil fuels for the space and water heating of buildings, improving the fabric and energy of our buildings, and promoting the use of lower carbon alternatives in construction.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2019) followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (S.I No. 32 of 2021) (hereafter referred to as the 2021 Climate Act) (Government of Ireland, 2021). The 2021 Climate Act was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act is to provide for the approval of plans *'for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050'*. The 2021 Climate Act will also *'provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'*. The 2021 Climate Act defines the carbon budget as *'the total amount of greenhouse gas emissions that are permitted during the budget period'*.

The 2021 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

9.2.2 Dispersion Modelling Methodology

The methodology used as part of this assessment involved undertaking a desk-based study to examine all relevant information relating to air quality conditions in the vicinity of the application site.

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA, 2015, 2020, 2022) and using the methodology outlined in the guidance documents published by the USEPA (USEPA, 2004, 2017, 2021). The air dispersion modelling input data consisted of information on the physical environment, design details from all emission sources on-site and five full years of meteorological data. Using this input data the model predicted ambient ground level concentrations and deposition rates beyond the land ownership boundary for each hour of the modelled meteorological years. The model post-processed the data to identify the location and maximum of the worst-case ground level concentration. This worst-case concentration and deposition rate was then added to the background concentration and deposition rate to give the worst-case predicted environmental concentration (PEC) and deposition flux. The PEC was then compared with the relevant ambient air quality standard to assess the significance of the releases from the site.

In order to assess the dust deposition flux at the land ownership boundary, and the PM_{10} and $PM_{2.5}$ concentrations associated with the quarrying activities at sensitive locations beyond the land ownership boundary, air dispersion modelling was undertaken. Modelling using the United States Environmental Protection Agency (USEPA) new generation dispersion model AERMOD (USEPA, 2021) (version 21112) was used as recommended by the USEPA (2017) and Irish EPA (2020). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model has been designated the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA, 2017). The AERMET meteorological pre-processor (USEPA, 2018) was used to generate hourly boundary layer parameters for use by AERMOD. Dust generation rates were calculated from factors derived from empirical assessment and detailed in the USEPA database entitled "*Compilation of Air Pollution Emission Factors*", Volume 2, AP-42 (1986, updated periodically) (USEPA, 1986). The emission factors have been presented in Appendix 9.2.

<u>Process Emissions</u>

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

The potential for dust to be emitted will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed, wind direction and dust prevention measures in place. This chapter identifies and quantifies the dust sources from the quarry.

The total extraction area will comprise 17.3 ha and is part of an overall larger landholding in the ownership of the applicant. The site is currently accessed via the Mullagh Road from Bellewstown. As part of the proposed development, it is proposed to construct a new site road which will redirect traffic away from Bellewstown village and link the quarry to the L1615.

The site is an existing rock quarry. It is proposed to extract up to a maximum of 450,000 tonnes of material per annum as is currently permitted. This extraction rate has been used in order to estimate the impact of the quarry in the surrounding environment.

For the purposes of this assessment an estimate of 6.75 truck movements in and out of the site per hour has been assumed, based on an average of 81 loads per day total. The permitted hours of operation at the quarry are Monday to Friday 07:00 to 18:00 and Saturday 07:00 to 14:00. These hours have been used for the purpose of the assessment.

The following operations are the main dust generating sources or activities at the quarry:

- Topsoil removal of proposed extension area
- Movement of empty trucks along paved public roads
- Movement of empty trucks along unpaved haul roads
- Extraction of material
- Crushing of material
- Screening of material
- Transfer of material along conveyors
- Stockpiling of material
- Loading of material
- Movement of full trucks along unpaved haul roads
- Movement of full trucks along paved public roads
- Wind erosion at dump areas, stockpiles and exposed quarry surface.

The formulae and emission rates for the onsite activities are outlined in Appendix 9.2.

Dust Generation Rates

Dust generation rates depend on the site activity, particle size, the moisture content of the material and weather conditions. 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 0.2mm has fallen.

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as they can remain airborne for greater distances and give rise to the potential dust nuisance at the sensitive receptors. This size range would broadly be described as silt. Emission rates are normally predicted on a site-specific particle size distribution for each dust emission source. In the absence of such information, the particle size distribution outlined in AP-42 Appendix B.2.2 for Category 3 (mechanically generated aggregate) (USEPA,

1986) has been used and is outlined in Table 9.2. The moisture content of the extracted rock has been estimated at 2.1%.

Cumulative % ≤ Stated Size	Particle Size, µm	Minimum Value	Maximum Value	Standard Deviation
4	1.0	-	-	-
11	2.0	-	-	-
15	2.5	3	35	7
18	3.0	-	-	-
25	4.0	-	-	-
30	5.0	-	-	-
34	6.0	15	65	13
51	10.0	23	81	14

Source: AP-42 (USEPA, 1986)

Table 9.2: Category 3 Mechanically Generated Aggregates

Dust deposition typically occurs in close proximity to the dust-generating source. There are a small number of sensitive locations in proximity to the site which can be affected by dust deposition. The quarry is located in an area with a relatively low population density, the majority of residential dwellings are in ribbon development along the local surrounding roads. The nearest dwellings are located within 80m to the direct south of the site. Generally, the potential for severe dust impacts is greatest within 100m of dust generating activities, though residual impacts can occur for distances beyond 100m.

A receptor grid was created at which concentrations would be modelled. The receptor grid was based on a Cartesian grid with the site at the centre. The inner grid measured 3km x 3km with the site at the centre and concentrations calculated at 50 m intervals. The outer grid measured 8km x 8km with the site at the centre and with concentrations calculated at 400 m intervals. Boundary receptor locations were also placed along the land ownership boundary of the site, at 25 m intervals. Nearby sensitive residential properties were also added to the model as discrete receptors giving a total of 4,858 calculation points for the model. The modelling has investigated the deposition and concentrations of dust, PM_{10} and $PM_{2.5}$ for the activities outlined above.

9.2.3 Road Traffic

There is the potential for emissions from road vehicles accessing the site to impact air quality and climate. Pollutants such as NO_2, PM_{10}, $PM_{2.5}$ and CO_2 are emitted from road vehicles.

The UK Highways Agency guidance *LA 105 Air Quality* (2019a) states the following scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project):

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

The following scoping criteria from the UK DMRB climate guidance document *LA 114 Climate* (UK Highways Agency 2019b) are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage:

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy-duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

If any of the road links impacts by a proposed development meet any of the above criteria, then a detailed assessment is required.

The above scoping criteria for both air quality and climate have been used in the current assessment to determine whether the impacted road links require modelling. It was found that the traffic changes associated with the proposed development were significantly below the air quality assessment criteria outlined above and therefore a detailed modelling assessment was not required as impacts to air quality as a result of traffic emissions are predicted to be imperceptible.

However, a number of local road links will experience a change of 10% or more in the AADT and the HDV, therefore a detailed dispersion modelling assessment of traffic related CO_2 emissions is required to determine the impact to climate. The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (2011) and the methodology provided in Annex D in the *UK Design Manual for Roads and Bridges* (UK Highways Agency, 2007). The assessment focused on determining the resulting change in emissions of carbon dioxide (CO_2) for the Do Something scenario (with the proposed development) versus the Do Nothing scenario (without the proposed development). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any development that causes a change in traffic. The inputs to the dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds (see Table 9.3).

Road Name	Speed (kmph)	Do Nothing	Do Something	Do Nothing	Do Something
		Opening Year 2022		Future Year 2037	
		AADT (%HGV)	AADT (%HGV)	AADT (%HGV)	AADT (%HGV)
L56172 (North)	50	65 (12%)	65 (12%)	61 (20%)	77 (16%)
L56172 (South)	50	112 (59%)	54 (15%)	55 (18%)	65 (18%)
L5618 (West)	50	581 (11%)	549 (6%)	677 (7%)	681 (7%)
L5618 (Central)	50	679 (10%)	652 (6%)	804 (7%)	808 (7%)
L5618 (East)	50	822 (9%)	810 (8%)	1,010 (9%)	1,010 (9%)
Stamullen Road	50	914 (8%)	903 (7%)	1,122 (8%)	1,124 (8%)
L1615 (South)	50	1,178 (5%)	1,174 (5%)	1,450 (6%)	1,452 (6%)
L1615 (North)	50	1,250 (4%)	1,408 (15%)	1,538 (5%)	1,702 (14%)
R150 (West)	100	4,676 (9%)	4,834 (12%)	5,851 (11%)	6,015 (14%)

Table 9.3: Traffic Data used in Operational Phase Climate Assessment.

9.3 Description of the Existing Environment

The subject site is Bellewstown Quarry and proximate agricultural land in Co. Meath located in the townlands of Bellewstown, Hilltown Little, Gafney Little and Hilltown Great. The site comprises the existing rock quarry and a portion of land extending to the northeast on which it is proposed to deliver a new dedicated quarry access road. The quarry area extends to approximately c. 39.4 hectares. The overall site size (development boundary) is 47.3 hectares, which includes an area of 7.9 hectares to accommodate the new access road to serve the quarry.

9.3.1 Meteorological Conditions

Meteorological conditions significantly affect the level of dust emissions and subsequent deposition downwind of the source. The most significant meteorological elements affecting dust deposition are rainfall and wind-speed. High levels of moisture either retained in soil or as a result of rainfall help suppress the generation of dust due to the cohesive nature of water between dust particles. Rain also assists in removing dust from the atmosphere through washout. Wind can lift particles up into the air and transport the dust downwind as well as drying out the surface. The worst dust deposition conditions typically occur, therefore, during dry conditions with strong winds.

The closest representative Met Éireann synoptic station to the quarry is at Dublin Airport, which is approximately 24 km south of the site.

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 Dublin Airport Meteorological Station (Met Eireann, 2022) identified that typically 191 days per annum are "wet". Thus, approximately 50% of the time no significant dust generation will be likely due to meteorological conditions.

Wind frequency is also 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 south-westerly to westerly, thereby predominantly dispersing any potential dust emissions to the north-east and east of the site (see Figure 9.2). Wind speeds averaged 5.3 m/s over the period 1981 - 2010. Calm conditions account for only a small fraction of the time in any one year peaking at 53 hours in 2019 (0.6% of the time).

All meteorological data referenced within this report is provided by Met Éireann (source www.met.ie) (Met Eireann, 2022). The air dispersion modelling assessment has been conducted for five meteorological years (2016 – 2020) using meteorological data from Dublin Airport meteorological station as per the EPA guidance (2020a).

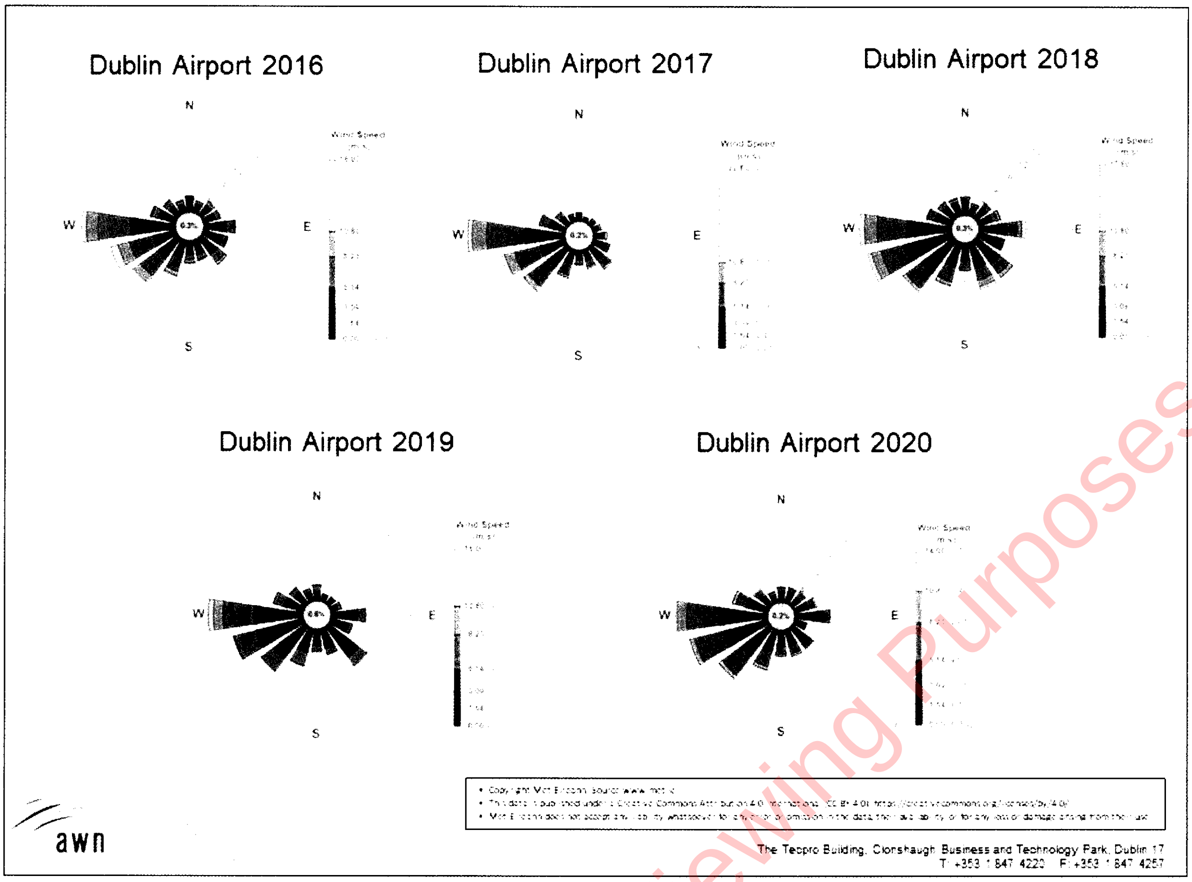

Figure 9.2: Dublin Airport Windroses 2016 - 2020.

9.3.2 Background Sources of Dust

The sources of dust arising from the site contribute to background levels of dust. Dust is present naturally in the air from a number of sources including weathering of minerals, and pick-up across open land and dust generated from fires. Dust monitoring has been conducted at four locations on site (D1 – D4) in recent years (see Figure 9.3). Historical dust monitoring data from 2012 – 2020 has been reviewed in order to inform background concentrations of dust deposition in the vicinity of the site. Long-term average results for location D1 – D4 were 55.9 mg/(m^2*day), 53.2 mg/(m^2*day), 58.0 mg/(m^2*day) and 51.9 mg/(m^2*day) respectively.

There has been one exceedance of the TA Luft limit value of 350 mg/(m^2*day) at location D1 in May 2016 and one exceedance at location D2 in March/April 2020. However, average results for all locations are well below this limit. A value of 60 mg/(m^2*day) has been chosen as a background dust deposition level in the region of the facility for the purposes of this assessment.

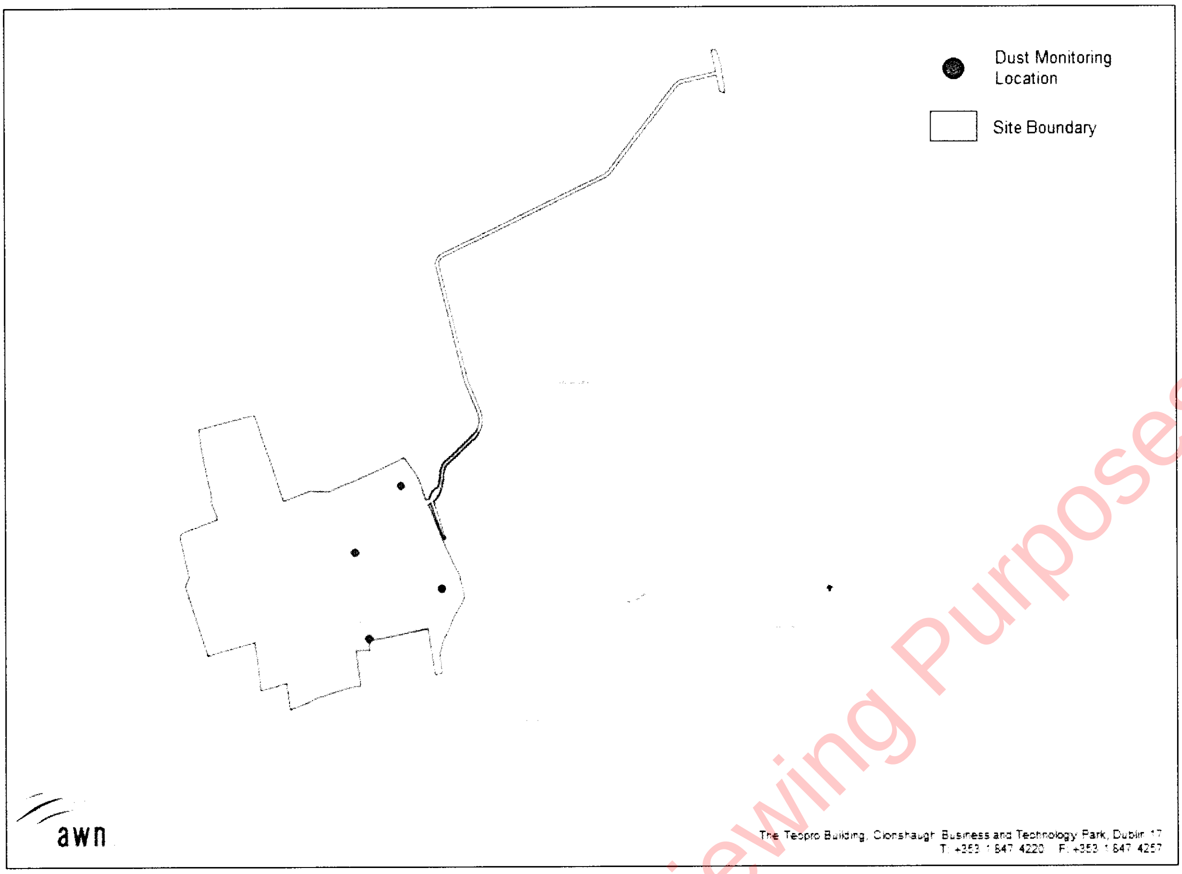

Figure 9.3: Dust Monitoring Locations, Bellewstown Quarry, Co. Meath.

9.3.3 Background Sources of PM_{10} and $PM_{2.5}$

Monitoring for PM_{10} and $PM_{2.5}$ is carried out by the EPA and Local Authorities at a range of locations throughout Ireland. The details of the monitoring are published in annual reports. The most recent annual monitoring report is *'Air Quality in Ireland 2020'* (EPA, 2021a). Four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021a). 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 and assessment, the proposed development is within Zone D.

In 2020 the EPA reported (EPA, 2021a) that Ireland was compliant with EU legal air quality limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA *Air Quality in Ireland 2020* report details the effect that the Covid-19 restrictions had on air monitoring stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. The report also notes that CSO figures show that while traffic volumes are still slightly below 2019 levels, they have significantly increased since 2020 levels. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason, they have not been included in the baseline section and previous long-term data has been used to determine baseline levels of pollutants in the vicinity of the proposed development.

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar and Claremorris in 2019. The average annual mean concentrations measured at the two sites were 16 μg/m³ and 11 μg/m³ respectively (Table 9.4). Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2019 gave an average level of 7 μg/m³ (EPA, 2021a). The 90.4th percentile of 24-hour results was also below the limit value of 50 μg/m³ at all locations. Based on the above information a conservative annual mean background concentration of 9 μg/m³ has been used in this assessment.

In relation to the annual averages, the ambient background concentration is added directly to the process concentration. However, in relation to the short-term peak concentration, concentrations due to emissions from elevated sources cannot be combined in the same way. Guidance from the UK DEFRA (UK DEFRA, 2016) and the EPA (EPA, 2020a) advises that for PM_{10} an estimate of the maximum combined pollutant concentration can be obtained as shown below:

PM_{10} - The 90.4th%ile of total 24-hour mean PM_{10} is equal to the maximum of either A or B below:

a) 90.4th%ile of 24-hour mean background PM_{10} + annual mean process contribution PM_{10}
b) 90.4th%ile 24-hour mean process contribution PM_{10} + annual mean background PM_{10}.

In relation to the maximum 24-hour averaging period (as a 90.4th%ile), a value of 15 μg/m³ was employed using the methodology outlined in Appendix E of AG4 (EPA, 2020a) based on average data from the rural Zone D monitoring site in Kilkitt over the period 2015 – 2019.

Station	Averaging Period	Year				
		2015	2016	2017	2018	2019
Castlebar	Annual Mean PM_{10} (μg/m³)	13	12	11	11	16
	90th %ile 24-hr PM_{10} (μg/m³)	22	20	19	20	24
Killkitt	Annual Mean PM_{10} (μg/m³)	9	8	8	9	7
	90th %ile 24-hr PM_{10} (μg/m³)	18	15	14	15	13
Claremorris	Annual Mean PM_{10} (μg/m³)	10	10	11	12	11
	90th %ile 24-hr PM_{10} (μg/m³)	17	17	17	20	20
Enniscorthy	Annual Mean PM_{10} (μg/m³)	18	17	-	-	18
	90th %ile 24-hr PM_{10} (μg/m³)	34	32	-	-	-

Table 9.4: Trends in Zone D Air Quality – PM_{10} (μg/m³).

The results of $PM_{2.5}$ monitoring at the Zone D location of Claremorris over the period 2015 – 2019 (EPA, 2021a) indicated an average $PM_{2.5}/PM_{10}$ ratio ranging from 0.4 –0.6. Based on this information, a conservative ratio of 0.65 was used to generate a background $PM_{2.5}$ concentration of 5.85 μg/m³. This estimated background concentration was added directly to the annual mean process contribution to determine the predicted environmental concentration in terms of $PM_{2.5}$.

9.3.4 Dust Sensitive Receptors

There are varying degrees of dust sensitivity depending on the receptor type. Those of highest sensitivity have the greatest risk of being adversely impacted by increases in ambient dust levels. However, this principle does not always apply and variation from the standard can occur depending on local factors such as rainfall and wind direction and receptor distance from the source. Table 9.5 categorises dust sensitive receptors depending on their level of sensitivity, high, medium or low.

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and clinics	Schools	Farms
Retirement homes	Residential areas	Light and heavy industry
Hi-tech industries	Food retailers	Outdoor storage
Painting and furnishing	Greenhouses and nurseries	
Food processing	Horticultural land	
	Biodiversity	

Table 9.5: Levels of Sensitivity per Receptor Type.

The receptor types in the study area consist of medium and low sensitivity receptors consisting mainly of residential areas and farms. There are a limited number of human receptors in the vicinity of the application site in the form of occupied dwellings. The nearest dwellings are located to the south of the site along the main road with a smaller number of properties located in ribbon development along the main road to the east of the site. The closest receptor to the site is within approximately 80 m of the main works area. Vegetation, berms and the natural topography can act as breaks between the sources and the receptor. Tree lines can also act as an efficient dust filter and can be a useful dust control safeguard.

9.3.5 Climatic Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2020 (EPA, 2021b). The data published in 2021 states that Ireland will exceed its 2020 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.73 Mt. For 2021, total national greenhouse gas emissions are estimated to be 57.70 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 44.38 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2021 at 37.1% of the total, with the transport sector accounting for 17.9% of emissions of CO_2.

GHG emissions for 2020 are estimated to be 3.6% lower than those recorded in 2019. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for five years in a row. Emissions from 2016 – 2020 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq, 6.85 MtCO_2eq and 6.73 MtCO_2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2020 – 2040 (EPA, 2021c) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018 and the Climate Action Plan published in 2019. Implementation of these are classed as a *"With Additional Measures scenario"* for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 to 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 12.2MtCO_2eq under the "With Existing Measures" scenario and under the "With Additional Measures" scenario (EPA, 2021c). The projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available.

9.4 Impact Assessment

9.4.1 Do Nothing Scenario

Under the Do Nothing Scenario the operations at the existing permitted area of site would continue plus activities will be undertaken in the area of the extension for 10 years based on 32 loads per day.

The results of the operational phase dispersion modelling assessment (Section 9.4.3) show that dust deposition levels and concentrations of PM_{10} and $PM_{2.5}$ from the quarrying operations are significantly below the relevant limit values. Modelling of dust deposition, PM_{10} and $PM_{2.5}$ has been conducted for the Do Nothing scenario with the results detailed below based on 32 truck loads per day. The results indicate that the impact of the Do Nothing scenario is localised, long-term, negative and imperceptible.

<u>Dust Deposition</u>

Emissions from the site under existing operations lead to a dust deposition level averaged over the full year of at most 12.0 mg/(m^2*day) at the land ownership boundary to the quarry (see Table 9.6). Based on a worst case background dust deposition of 60 mg/(m^2*day) in the region of the site, the combined dust deposition level peaks at 72.0 mg/(m^2*day) which is 21% of the TA Luft Limit Value of 350 mg/(m^2*day). However, operational activities from the quarry contribute a maximum of 3.4% of the TA-Luft Limit Value.

Pollutant / Year	Worst Case Background Level (mg/(m^2*day))	Process Contribution (mg/(m^2*day))	Predicted Deposition (mg/(m^2*day))	Limit Value (mg/(m^2*day)) Note 1
Dust Deposition / 2016	60	9.7	69.7	350
Dust Deposition / 2017	60	10.3	70.3	350
Dust Deposition / 2018	60	12.0	72.0	350
Dust Deposition / 2019	60	10.5	70.5	350
Dust Deposition / 2020	60	11.0	71.0	350

Note 1 TA-Luft as interpreted by DEHLG (2004)

Table 9.6: Dispersion Modelling Results for Dust Deposition at Boundary – Do Nothing Scenario.

PM_{10}

Predicted PM_{10} concentrations are significantly lower than the ambient air quality standards at the worst-case residential receptor due to background concentrations and existing operations (see Table 9.7). For emissions from the existing operations the predicted 24-hour and annual mean concentrations (excluding background) at the worst-case receptor peak at 1.13 μg/m^3 and 0.45 μg/m^3 respectively. Based on an annual mean background PM_{10} concentration of 9 μg/m^3 in the region of the proposed development, the combined annual PM_{10} concentration including the site peaks at 9.45 μg/m^3 (Table 9.7). This predicted level equates to at most 24% of the annual limit value of 40 μg/m^3. The predicted 24-hour PM_{10} concentration (including background) peaks at 15.45 μg/m^3 which is 31% of the 24-hour limit value of 50 μg/m^3 (measured as a 90.4th%ile). Operational activities from the quarry contribute a maximum of 1.1% of the PM_{10} annual mean limit value.

Pollutant / Year	Background (μg/m^3)	Averaging Period	Process Contribution (μg/m^3)	Predicted Environmental Concentration (μg/m^3) Note 2	Limit Value (μg/m^3) Note 1
PM_{10} / 2016	15.00	90.4th%ile of 24-hr means	1.08	15.45	50
	9.00	Annual Mean	0.45	9.45	40
PM_{10} / 2017	15.00	90.4th%ile of 24-hr means	0.92	15.42	50
	9.00	Annual Mean	0.42	9.42	40
PM_{10} / 2018	15.00	90.4th%ile of 24-hr means	0.86	15.29	50
	9.00	Annual Mean	0.29	9.29	40
PM_{10} / 2019	15.00	90.4th%ile of 24-hr means	1.13	15.43	50
	9.00	Annual Mean	0.43	9.43	40
PM_{10} / 2020	15.00	90.4th%ile of 24-hr means	0.92	15.36	50
	9.00	Annual Mean	0.36	9.36	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance based on the maximum background 24-hr mean (as a 90th%ile) of 15 μg/m^3 from rural Zone D monitoring stations

Table 9.7: Dispersion Model Results for PM_{10} – Do Nothing Scenario.

$PM_{2.5}$

Predicted $PM_{2.5}$ concentrations at the worst-case receptor are significantly lower than the limit value of 25 μg/m^3 (see Table 9.8) for the existing operations. The predicted annual concentration (excluding background) at the worst-case receptor peaks at 0.10 μg/m^3. Based on a background $PM_{2.5}$ concentration of 5.85 μg/m^3 in the region of the site, the annual $PM_{2.5}$ concentration including the operations peaks at 5.95 μg/m^3. This peak level equates to 23.8% of the annual limit value for $PM_{2.5}$. Operational activities from the quarry contribute a maximum of 0.4% of the $PM_{2.5}$ annual mean limit value.

Pollutant / Year	Background (μg/m³)	Averaging Period	Process Contribution (μg/m³)	Predicted Environmental Concentration (μg/m³)	Limit Value (μg/m³) Note 1
$PM_{2.5}$ / 2016	5.85	Annual Mean	0.10	5.95	0.10
$PM_{2.5}$ / 2017	5.85	Annual Mean	0.09	5.94	0.09
$PM_{2.5}$ / 2018	5.85	Annual Mean	0.08	5.93	0.08
$PM_{2.5}$ / 2019	5.85	Annual Mean	0.10	5.95	0.10
$PM_{2.5}$ / 2020	5.85	Annual Mean	0.81	6.66	0.81

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 9.8 Dispersion Model Results for $PM_{2.5}$ – Do Nothing Scenario

9.4.2 Construction Phase

Air Quality

The proposed development will include a new site access road, new road entrances with the existing quarry entrance moving south and the wheel wash also moving. Further details are provided in Section 3.4 of Chapter 3. There will be minor dust emissions associated with the construction of the new site access road and these will be temporary in nature. Construction dust emissions are not predicted to have a significant impact on local air quality. Overburden for the proposed extension area will be stripped in phases and will be undertaken during the normal day to day operations at the site and has been considered within the operational phase assessment detailed in Section 9.4.3.

Climate

Construction works associated with the proposed development will not lead to a significant impact on climate.

9.4.3 Operational Phase

Air Quality

The main potential sources of emissions to air will be associated with plant and machinery undertaking day to day activities such as extraction, onsite processing and transportation of material and dust blow generated during dry, windy conditions. Potential impacts associated with day-to-day activities have been separated into dust deposition and vehicle and plant emissions. The assessment is based on the proposed increased traffic volume of 81 truck loads per day.

Dust Deposition

Emissions from the proposed development site lead to a dust deposition level averaged over the full year of at most 12.0 mg/(m^2*day) at the land ownership boundary to the quarry (see Table 9.9). Based on a worst case background dust deposition of 60 mg/(m^2*day) in the region of the site, the combined dust deposition level peaks at 72.0 mg/(m^2*day) which is 21% of the TA Luft Limit Value of 350 mg/(m^2*day). However, operational activities from the quarry contribute a maximum of 3.4% of the TA-Luft Limit Value. Figure 9.4 shows the geographical variation in annual dust deposition levels in the region of the development.

The dust deposition level decreases with increasing distance from the site. The worst-case dust deposition at the closest sensitive receptor to the site peaks at 17.4% of the TA Luft limit value, including background concentrations.

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

Pollutant / Year	**Worst Case Background Level (mg/(m^2*day))**	**Process Contribution (mg/(m^2*day))**	**Predicted Deposition (mg/(m^2*day))**	**Limit Value (mg/(m^2*day))** Note 1
Dust Deposition / 2016	60	9.7	69.7	350
Dust Deposition / 2017	60	10.3	70.3	350
Dust Deposition / 2018	60	12.0	72.0	350
Dust Deposition / 2019	60	10.5	70.5	350
Dust Deposition / 2020	60	11.0	71.0	350

Note 1 TA-Luft as interpreted by DEHLG (2004)

Table 9.9: Dispersion Modelling Results for Dust Deposition at Boundary.

PM_{10}

Predicted PM_{10} concentrations are significantly lower than the ambient air quality standards at the worst-case residential receptor due to background concentrations and emissions from the proposed development (see Table 9.10). For emissions from the proposed development the predicted 24-hour and annual mean concentrations (excluding background) at the worst-case receptor peak at 1.13 µg/m^3 and 0.45 µg/m^3 respectively. Based on an annual mean background PM_{10} concentration of 9 µg/m^3 in the region of the proposed development, the combined annual PM_{10} concentration including the site peaks at 9.45 µg/m^3 (Table 9.10). This predicted level equates to at most 24% of the annual limit value of 40 µg/m^3. The predicted 24-hour PM_{10} concentration (including background) peaks at 15.45 µg/m^3 which is 31% of the 24-hour limit value of 50 µg/m^3 (measured as a 90.4^{th}%ile). Operational activities from the quarry contribute a maximum of 1% of the PM_{10} annual mean limit value. The impact of PM_{10} is considered imperceptible, negative, localised and long-term.

The geographical variation in the 24-hour mean (90.4^{th}%ile) PM_{10} ground level concentrations are illustrated as concentration contours in Figure 9.5. The locations of the maximum concentrations for PM_{10} are close to the boundary of the site with concentrations decreasing with distance from the facility.

Pollutant / Year	Background (μg/m³)	Averaging Period	Process Contribution (μg/m³)	Predicted Environmental Concentration (μg/m³) Note 2	Limit Value (μg/m³) Note 1
PM_{10} / 2016	15.00	90.4th%ile of 24-hr means	1.08	15.45	50
	9.00	Annual Mean	0.45	9.45	40
PM_{10} / 2017	15.00	90.4th%ile of 24-hr means	0.92	15.42	50
	9.00	Annual Mean	0.43	9.42	40
PM_{10} / 2018	15.00	90.4th%ile of 24-hr means	0.86	15.29	50
	9.00	Annual Mean	0.29	9.29	40
PM_{10} / 2019	15.00	90.4th%ile of 24-hr means	1.13	15.43	50
	9.00	Annual Mean	0.43	9.43	40
PM_{10} / 2020	15.00	90.4th%ile of 24-hr means	0.92	15.36	50
	9.00	Annual Mean	0.36	9.36	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance based on the maximum background 24-hr mean (as a 90th%ile) of 15 μg/m³ from rural Zone D monitoring stations

Table 9.10: Dispersion Model Results for PM_{10}.

$PM_{2.5}$

Predicted $PM_{2.5}$ concentrations at the worst-case receptor are significantly lower than the limit value of 25 μg/m³ (see Table 9.11) for the proposed development.

The predicted annual concentration (excluding background) at the worst-case receptor peaks at 0.10 μg/m³. Based on a background $PM_{2.5}$ concentration of 5.85 μg/m³ in the region of the site, the annual $PM_{2.5}$ concentration including the operations peaks at 5.95 μg/m³. This peak level equates to 24% of the annual limit value for $PM_{2.5}$. Operational activities from the quarry contribute a maximum of 0.4% of the $PM_{2.5}$ annual mean limit value. The impact of $PM_{2.5}$ is considered imperceptible, negative, localised and long-term.

Pollutant / Year	Background (μg/m³)	Averaging Period	Process Contribution (μg/m³)	Predicted Environmental Concentration (μg/m³)	Limit Value (μg/m³) Note 1
$PM_{2.5}$ / 2016	5.85	Annual Mean	0.10	5.95	25
$PM_{2.5}$ / 2017	5.85	Annual Mean	0.09	5.94	25
$PM_{2.5}$ / 2018	5.85	Annual Mean	0.08	5.93	25
$PM_{2.5}$ / 2019	5.85	Annual Mean	0.10	5.95	25
$PM_{2.5}$ / 2020	5.85	Annual Mean	0.08	5.93	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 9.11: Dispersion Model Results for $PM_{2.5}$.

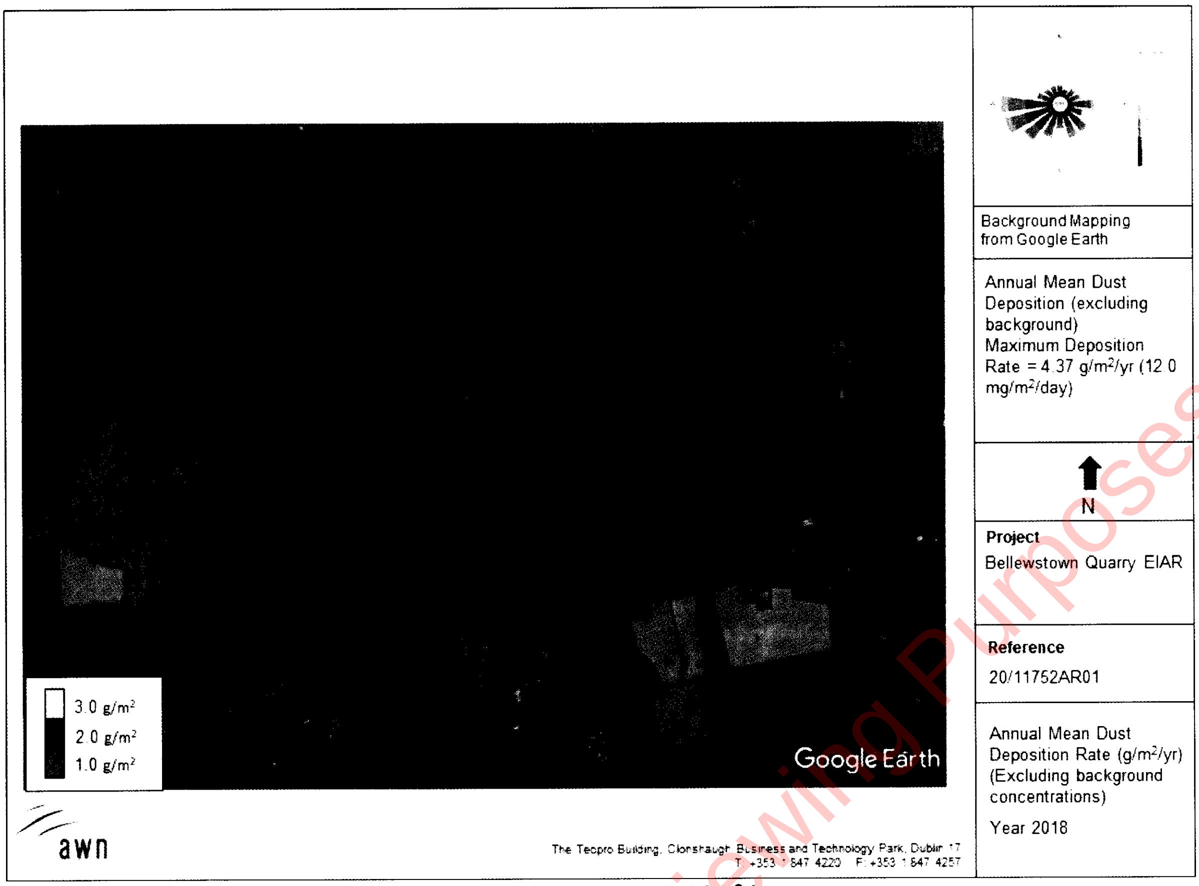

Figure 9.4: Annual Mean Dust Deposition Rate (g/m²/yr).

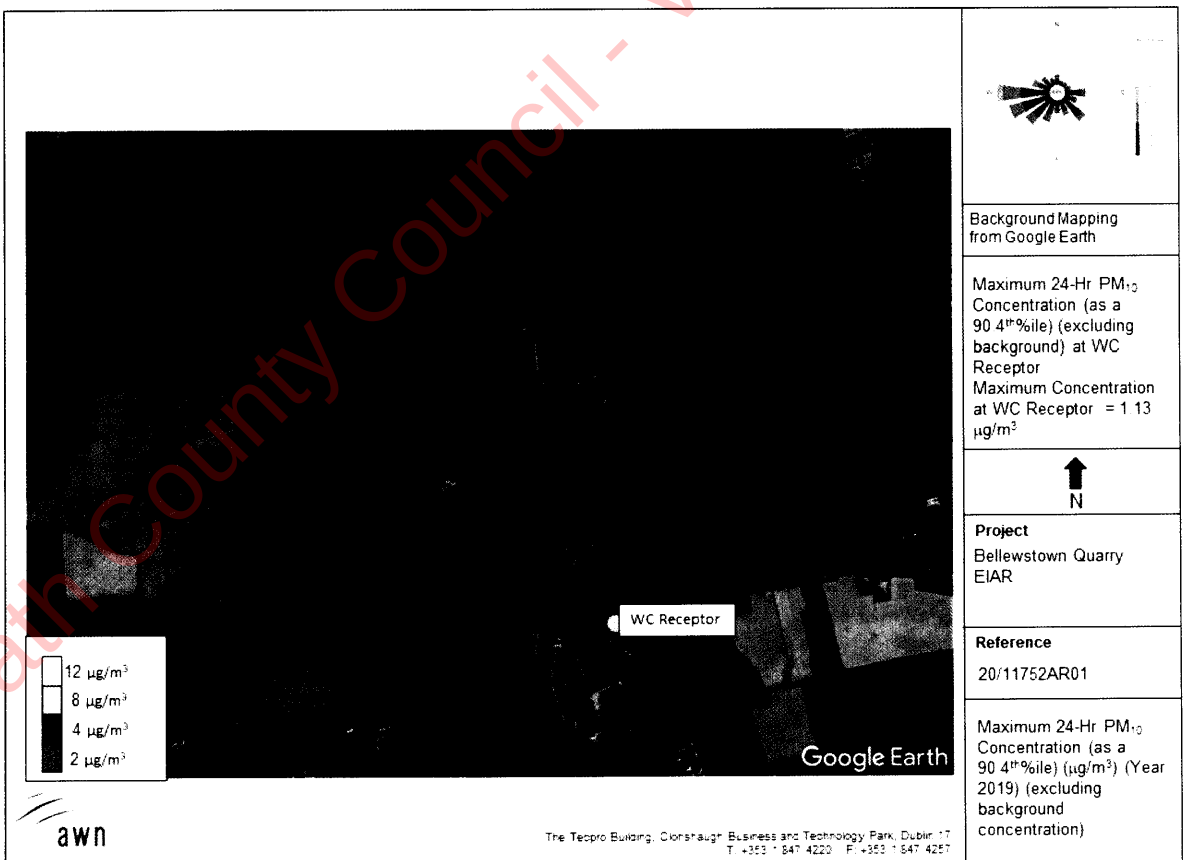

Figure 9.5: Maximum 24-Hr PM_{10} Concentration (as a 90.4th%ile) (μg/m³).

Road Traffic Emissions

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, PM_{10} and $PM_{2.5}$.

The traffic generated as part of the proposed development was reviewed against the DMRB screening criteria as outlined in Section 9.2.3. It was determined that none of the roads impacted by the development met the screening criteria and therefore impacts from road traffic emissions on local air quality are considered long-term, neutral and imperceptible.

Climate

There is the potential for CO_2 emissions associated with vehicles accessing the site to impact climate. The predicted concentrations of CO_2 for the future years of 2022 and 2037 are detailed in Table 9.12. These are significantly less than the 2022 and 2030 targets set out under EU legislation (targets beyond 2030 are not available). It is predicted that in 2022 the proposed development will increase CO_2 emissions by 0.00013% of the EU 2022 target. Similarly low increases in CO_2 emissions are predicted to occur in 2037 with emissions increasing by 0.00026% of the EU 2030 target. Therefore, the potential climate impact of the proposed development is considered negative, long-term and imperceptible.

Year	**Scenario**	**CO_2 (tonnes/annum)**
2022	Do Nothing	613
	Do Something	668
2037	Do Nothing	762
	Do Something	849
Increment in 2022		54.7 Tonnes
Increment in 2037		87.7 Tonnes
Emission Ceiling (kilo Tonnes) 2022		**42,357** Note 1
Emission Ceiling (kilo Tonnes) 2030		**33,381** Note 1
Impact in 2022 (%)		0.00013 %
Impact in 2037 (%)		0.00026 %

Note 1 Target under Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council

Table 9.12: Climate Assessment of Traffic Emissions.

There is the potential for future climate change to alter meteorological conditions, increasing wind speeds, longer dry periods and increased rainfall. While increased rainfall is likely to reduce the risk of dust nuisance, increased windspeeds and dry periods have the potential to cause adverse impacts at the site boundary. However, any increase in boundary dust deposition concentrations can be reported through dust monitoring and additional dust minimisation efforts can be put in place in order to suppress and minimise dust nuisance.

Human Health

Air dispersion modelling of operational activities at the site was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions of PM_{10} and $PM_{2.5}$ as a result of the development are compliant with all National and EU ambient air quality limit values (see Table 9.1) and, therefore, will not result in a significant impact on human health.

Cumulative Impacts

Cumulative effects have been assessed for the proposed development. Background concentrations have been included in the modelling study for dust deposition and EPA data for PM_{10} and $PM_{2.5}$. These background concentrations account for non-localised sources of the pollutants of concern.

The public roadworks on the L1615 to be completed on grant of this planning application have been considered cumulatively with the proposed development. The works primarily involve improving the carriageway and strengthening and repair works on Beaumont Bridge. There is the potential for dust emissions to occur during the works, however, due to the minor scale of the works involved these dust emissions are not predicted to be significant. Emissions from vehicles travelling along this route have been assessed in the previous sections of this Chapter in the context of both air quality and climate, with impacts predicted to be imperceptible.

There are no other significant sources of dust, PM_{10} or $PM_{2.5}$ within the area of impact from the quarry and therefore no further prediction of cumulative impact is required.

9.5 Remedial Measures

There are a number of mitigation measures in place on site to prevent significant dust emissions from on-site activities. These measures include:

- A wheel wash is in place on site which trucks must pass through prior to exiting onto the public road.
- A water bowser is used during dry periods to dampen all internal site roads and the proposed private road.
- Sweeping and cleaning of site roads and adjoining public roads on a regular basis.
- All fine materials are covered when leaving the site to prevent dust escaping.
- Dust suppression in the form of water misters and sprays are in place on the screening and crushing plant.
- Speeds restrictions are in place on site and to be imposed on the proposed private road

These measures have been incorporated into the modelling assessment to determine the impact of the site on levels of dust deposition and ambient levels of particulate matter (PM_{10} / $PM_{2.5}$). The modelling assessment found that there was an imperceptible impact on the ambient air quality environment as a result of the development and therefore further mitigation is not required. These mitigation measures will continue to be enforced to prevent significant dust emissions from the site.

9.6 Monitoring

Monitoring for dust deposition is currently conducted at 4 locations on site using the Bergerhoff Method as per German Standard VDI 2119. It is recommended that monitoring continue on site to ensure that no significant dust nuisance is occurring. It is further recommended that an additional monitoring point towards the north eastern end of the new private access road is installed to capture dust emissions associated with site vehicles entering and exiting the site and the impact to nearby receptors in this area.

9.7 Residual Impacts

It is not anticipated that there will be an adverse impact on air quality in the vicinity of the proposed development.

Modelled emissions from the proposed development lead to ambient concentrations which are within the relevant ambient air quality standards for dust, PM_{10} and $PM_{2.5}$. Thus, the impact on air quality and climate of the proposed development is not significant and no residual impact is anticipated.

9.8 References

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USEPA (2021) *AERMOD Description of Model Formulation and Evaluation*

APPENDIX 9.1: AMBIENT AIR QUALITY STANDARDS

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC) (see Table 10.1). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time. In response to the problem of acid rain, sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. Council Directive 1999/30/EC, as relating to limit values for sulphur dioxide, nitrogen dioxide, lead and particulate matter. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002. It started to reduce from 1 January 2003, continuing every 12 months thereafter by equal annual percentages to reach 0% by the respective attainment date for each pollutant. A second daughter directive, EU Council Directive 2000/69/EC, limit values for both carbon monoxide and benzene in ambient air is also included in the Air Quality Standards Regulations 2002. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. This has also been passed into Irish Law under the Air Quality Standards Regulations 2011 (S.I. 180 of 2011) (see Table 10.1). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margin of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ is to establish a target value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2010) and a limit value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2012), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 $\mu g/m^3$ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 $\mu g/m^3$. Where the AEI is currently greater than 22 $\mu g/m^3$ all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008-2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 has been set which was to be complied with by 2012 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other factors, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

APPENDIX 9.2: EMISSION FACTORS

Emission Factors Used In Dust Emission Calculations (USEPA, 1986 & subsequent updates):

Road Haulage (Unpaved)

E =[281.9*k*(s/12)^a(W/3)^b((365-P)/365) g/veh km

Where:

s = surface silt content (8.3%)

k = 4.9 (Total Dust), 1.8 (PM_{10}), 0.15 ($PM_{2.5}$)

W = mean vehicle weight (32 tonnes)

a = 0.9 ($PM_{10}/PM_{2.5}$), 0.7 (Total Dust)

b = 0.45

P = 191 wet days

Road Haulage (Paved)

E =[k*(sL)$^{0.91}$*(W)$^{1.02}$](1-(P)/4N) g/veh km

Where:

sL = surface silt loading (0.6 g/m^2)

k = 24 (Total Dust), 4.6 (PM_{10}), 0.66 ($PM_{2.5}$)

W = mean vehicle weight (32 tonnes)

P = 191 wet days

N = 365 days

Material Loading

E =k(0.0016)*(U/2.2)$^{1.3}$/(M/2)$^{1.4}$((365-P)/365) kg/Mg

Where:

k = 0.74 (Total Dust), 0.35 (PM_{10}), 0.053 ($PM_{2.5}$)

M = moisture content (2.1%)

U = mean wind speed (5.3 m/s)

P = 191 wet days

Screening

E = ((T*K)/(H*3600*A))*((365-P)/365) g/s/m^2

Where:

T = Annual Tonnage of Material (450,000 T)

K = 12.5 (Total Dust), 4.3 (PM_{10}) , 0.28 ($PM_{2.5}$)

H = Annual Hours of Operation (3475 hours)

A = Area of Excavation

P = 191 Wet Days

Conveyor

E = ((T*K)/(H*3600*A))*((365-P)/365) g/s/m^2

Where:

T = Annual Tonnage of Material (450,000 T)

K = 1.5 (Total Dust), 0.55 (PM_{10}) , 0.14 ($PM_{2.5}$)

H = Annual Hours of Operation (3475 hours)

A = Area of Excavation

P = 191 Wet Days

Topsoil Removal

E = ((T*K)/(H*3600*A))*((365-P)/365) g/s/m^2

Where:
T = Annual Tonnage of Material (450,000 T)
K = 29 (Total Dust), 13.7 (PM_{10}) , 2.07 ($PM_{2.5}$)
H = Annual Hours of Operation (3475 hours)
A = Area of Excavation
P = 191 Wet Days

Wind Erosion of Stockpiles

The formulae for calculating wind erosion can be found in section 13.2.5 of AP42 titled "Industrial Wind Erosion". Information on monthly peak wind speeds and the number of gales per month is required in order to calculate the emission rates.

Operation	Total Dust Emission Rate	PM_{10} Emission Rate	$PM_{2.5}$ Emission Rate
Topsoil removal (g/s/m^2)	3.73E-05	1.76E-05	2.66E-06
Screening (g/s/m^2)	1.20E-04	4.13E-05	2.69E-06
Primary, Secondary & Tertiary Crushing (g/s/m^2)	6.64E-05	2.95E-05	5.41E-06
Conveyor Transfers (g/s/m^2)	1.41E-04	5.15E-05	1.31E-05
Blasting & Drilling (g/s/m^2)	1.10E-05	5.45E-06	4.90E-07
Material Loading (g/s/m^2)	3.69E-03	1.74E-03	2.64E-04
Paved Roads (g/s) per source every 5 m	3.25E-04	1.08E-05	1.55E-06
Unpaved Roads (g/s) per source every 5 m	4.48E-05	1.53E-05	1.27E-06