8. AIR AND CLIMATE

8.1 Introduction

MKO prepared the Air and Climate section of this Environmental Impact Assessment Report (EIAR) for the proposed quarry restoration at the existing Lawler quarry located at Portersize, Ballitore, Co. Kildare.

This section examines the effect of the proposed development (i.e. proposed quarry restoration) on air and climate. Where required, appropriate mitigation measures to limit any identified significant impacts to air and climate are recommended.

8.1.1 Statement of Authority

This section of the EIAR has been prepared by Eoin O'Sullivan and reviewed by Michael Watson, both of MKO. Eoin is an experienced geo-environmental scientist and has over ten years' experience in the design, implementation and interpretation of all phases of geo-environmental and geotechnical site investigations. Eoin has also got extensive experience in the preparation of air and climate assessments and reports for EIAs, particularly relating to wind energy. Eoin is also proficient in undertaking detailed quantitative risk assessments for the protection of controlled waters and human health. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment.

Michael has over seventeen years' experience in the environmental sector and worked for the Geological Survey of Ireland (GSI) and then a prominent private environmental and hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) and a Chartered Environmentalist (CEnv).

8.2 Air

8.2.1 Background

The site is located in a rural area, approximately 1.5 km to the southeast of Ballitore, Co. Kildare. The primary land-use in the vicinity of the site comprises a mix of agricultural land and housing.

8.2.2 Methodology

This assessment has been undertaken with reference to the following sources of information:

- EPA (2011) Ambient Air Monitoring at Newbridge, Co. Kildare, 1st October 2009 to 24th May 2010.
- EPA (2006) Environmental Management in the Extractive Industry (Non-Scheduled Minerals)
- Department of the Environment, Climate and Communications (DECC) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities.
- EPA (2018) Ozone monitoring records from Bray monitoring station.

8.2.3 Air Quality Standards

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

- The first Daughter Directive (1999/30/EC) deals with sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, deals with polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air.

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

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 8-1 sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 8-1 European sites within likely zone of impact of the Proposed Development

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in	1st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
					a calendar year	
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
	of human health					
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	52	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	30	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold for the protection of human health	24 hours	20	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 8-2 presents the limit and target values for ozone.

Table 8-2 Target values for Ozone Defined in Directive 2008/50/EC

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

AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 mg/m^3 and is expressed as mg/m^3 hours.

8.2.3.1 Air Quality and Health

The Environmental Protection Agency (EPA) 2016 report '*Ireland's Environment – An Assessment*' noted that in Ireland, the premature deaths attributable to air pollution are estimated at 1,200 people. A more recent European Environmental Agency Report, '*Air Quality in Europe – 2018 Report*' highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 422,000 people in Europe in 2015, with regards to

deaths relating to $PM_{2.5}$. The estimated impacts on the population in Europe of exposure to NO_2 and O_3 concentrations in 2015 were around 79,000 and 17,700 premature deaths per year respectively, From this, 1,100 Irish deaths were attributable to fine particulate matter ($PM_{2.5}$), 30 Irish deaths were attributable to nitrogen oxides (NO_2) and 20 Irish deaths were attributable to Ozone (O_3) (Source: *Air Quality in Europe – 2018 Report',* EEA, 2018). These emissions, along with others including sulphur oxides (SOx) are produced during fossil fuel-based electricity generation and traffic in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from the proposed development, a number of mitigation measures will be implemented at this site to reduce the impact from dust and vehicle emissions, which are discussed in Sections 8.4 below.

8.2.4 Air Quality Zones

The EPA has designated four Air Quality Zones for Ireland:

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

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the proposed development lies within Zone D, which represents rural areas located away from large population centres.

8.2.5 Existing Air Quality

The air quality in the vicinity of the proposed development site is typical of that of rural areas in the east of Ireland, i.e. Zone D. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. Data is available for Newbridge, Co. Kildare, in the report, *'Ambient Air Monitoring At Newbridge, Co. Kildare 1st October 2009 to 24th May 2010'*, as detailed below. This monitoring location lies within Zone C however, which comprises urban areas with populations greater than 15,000. Lower measurement values for all air quality parameters would be expected for the proposed development site as it lies in a rural location, within Zone D.

More recent data is also available for Ozone at the Bray monitoring station which is located approximately 50km to the northeast of the site. Similar measurement values for ozone would be expected for the proposed development site as it also lies in a rural location, within Zone D.

8.2.5.1 Sulphur Dioxide (SO_2)

Sulphur dioxide data for the 2009 to 2010 monitoring period in Newbridge is presented in Table 8-3.

Table 8-3 Sulphur Dioxide Data Newbridge October 2009 to May 2010

Parameter	Measurement
No. of hours	5,635
No. of measured values	5,193
Percentage Coverage	92.2%
Maximum hourly value	31.9 µg/m^3
98th percentile for hourly values	8.8 µg/m^3

Parameter	Measurement
Mean hourly value	2.9 µg/m^3
Maximum 24-hour mean	7.7 µg/m^3
98th percentile for 24-hour mean	7.0 µg/m^3

During the period of operation there were no exceedances of the hourly and daily limit values for the protection of human health. As can observed from Table 8-3 the maximum hourly value recorded during the assessment period was 31.9 µg/m^3.

It would be expected that SO_2 values at the proposed development site (Zone D) would be significantly lower than those recorded at the Newbridge monitoring site (Zone C).

8.2.5.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. Particulate matter (PM_{10}) data for the 2009 to 2010 monitoring period in Newbridge is presented in Table 8-4.

Table 8-4 Particulate Matter (PM_{10}) Data Newbridge October 2009 to May 2010

Parameter	Measurement
No. of days	236
No. of measured values	197
Percentage Coverage	83.5%
Maximum daily value	74.3 µg/m^3
Mean daily value	17.3 µg/m^3

The 24-hour limit of 50 µg/m^3 for the protection of human health was exceeded twice during the monitoring period. The upper assessment threshold of 30 µg/m^3 for the protection of human health was exceeded on 10 days while the lower assessment threshold of 25 µg/m^3 was exceeded on 37 days during the monitoring period. It would be expected that PM_{10} values at the proposed development site (Zone D) would be significantly lower than those recorded at the Newbridge monitoring site (Zone C).

8.2.5.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide and oxides of nitrogen (NOx) data for the 2009 to 2010 monitoring period in Newbridge is presented in Table 8-5.

Table 8-5 Nitrogen Dioxide and Oxides of Nitrogen Data Newbridge October 2009 to May 2010

Parameter	Measurement
No. of hours	5,200
No. of measured values	5,177
Percentage Coverage	99.6%

Parameter	Measurement
Maximum hourly value (NO_2)	104.3 µg/m^3
99.7 percentile for hourly values (NO_2)	78.3 µg/m^3
Mean hourly value (NO_2)	15.4 µg/m^3
Mean hourly value (NO_x)	24.8 µg/m^3 NO_2

There was one exceedance of the lower threshold value (100 µg/m^3) for the protection of human health. The Directive stipulates that the lower assessment threshold should not be exceeded more than 18 times in a calendar year. The mean hourly NO_2 value (15.4 µg/m^3) recorded during the period of measurement was below the annual lower assessment threshold for the protection of human health (26 µg/m^3). The mean hourly value of NOx (24.8 µg/m^3 NO_2) recorded during the measurement period exceeded the lower assessment threshold concentration concerning protection of vegetation and natural ecosystem (19.5 µg/m^3 NOx). It would be expected that NO_2 and NO_x values at the proposed development site (Zone D) would be significantly lower than those recorded at the Newbridge monitoring site (Zone C).

8.2.5.4 Carbon Monoxide (CO)

Carbon Monoxide (CO) data for the 2009 to 2010 monitoring period in Newbridge is presented in Table 8-6. The average concentration of carbon monoxide was 0.4 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10 mg/m^3). On no occasions were values in excess of the 10 mg/m^3 limit value set out in Directives 2000/69/EC or 2008/69/EC.

Table 8-6 Carbon Monoxide Data for Newbridge October 2009 to May 2010

Parameter	Measurement
No. of hours	5,484
No. of measured values	5,315
Percentage Coverage	96.9%
Maximum hourly value	2.2 mg/m^3
98th percentile for hourly values	1.2 mg/m^3
Mean hourly value	0.4 mg/m^3
Maximum 8-hour mean	1.87 mg/m^3
98th percentile for 8-hour mean	10.9 mg/m^3

8.2.5.5 Ozone (O_3)

Ozone data for Bray for 2018 is presented in Table 8-7. As can be observed from Table 8-7 there was one exceedance of the maximum daily eight-hour mean limit of 120 µg/m^3. The legislation stipulates that this limit should not be exceeded on more than 25 days.

Table 8-7 Ozone Data for Bray in 2018

Parameter	Measurement
Annual Mean	57 µg/m^3

Parameter	Measurement
Median	60 µg/m^3
% Data Capture	93.8%
No. of days > 120	1 days
Maximum 8-hour value	126.3 µg/m^3

8.3 Dust Monitoring

8.3.1 Background

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e. soil, sand, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction, and/or periods of dry weather.

Emission limit values for dust have been set out in Condition 19 of the existing quarry site planning permission (An Bord Pleanála PL 09.226857, Kildare County Council Pl. Ref. No. 07/723). The emission limit values for dust is set at 350 mg/m^2/day averaged over 30 days when measured at the boundary of the site. These emission limit values are in accordance with EPA guidelines contained in *Environmental Management in the Extractive Industries* (2006) and the DECC guidelines, *Quarries and Ancillary Activities, Guidelines for Planning Authorities* (2004).

8.3.2 Receiving Environment

There are nineteen (19) houses located within 500 metres of the proposed development site. The closest occupied dwelling is located adjoining the southwest site boundary, on the west side of the existing site access road, off the R747.

The quarry site is accessed from an existing entrance on the R747 Regional Road, which travels in a south-southeast direction between Ballitore, Co. Kildare and Baltinglass, Co. Wicklow. The R747 is located approximately 270m southwest of the quarry void.

8.3.3 Dust Monitoring

Dust monitoring had been undertaken previously at the existing quarry site however records were not available for inclusion in this report. Due to the lack of available historic data, MKO conducted one round of dust monitoring to provide an updated baseline for the site and to be used for the purposes of this assessment.

Dust deposition was measured using Bergerhoff dust gauges, which were exposed over a 30-day period to collect bulk dust deposition. The dust gauges consist of a collecting jar positioned at 1.5 meters above ground level with a bird guard around the collecting jar.

Dust monitoring was carried out by MKO staff with 3 no. samples collected between the period 17th August, 2020 to 16th September, 2020.

Dust monitoring records and the laboratory results report are presented in Appendix 8-1. MKO has used this dust monitoring data for the period August to September 2020 for the purposes of this assessment.

Map Legend

- Dust monitoring location
- Site boundary

Ballitore
Béal Átha an Tuair
Ballitore Br.
PO
elhall
ss Rds
Burial Ground
Portersize
White
Timolin
Portersize Cross Rds
Ballycore
Kno
Burial Groun
Motte
R747
R747
DM01
DM02
DM03
100
110
120
130
140
150
160
169
141
120

Drawing Title: Dust Monitoring Locations

Project Title: Lawler Quarry Restoration

Drawn By	Checked By
Eoin Hurst	Eoin O'Sullivan
Project No.	Drawing No.
191115	Fig 8-1
Scale: 1:10000	Date: 07.10.20

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8.3.4 Monitoring Locations

Samples were collected at three fixed locations at the site (DM01, DM02 and DM03) as shown on Figure 8-1, over a 30 day sample period. DM01 is located on agricultural land at the southwestern boundary of the quarry void, approximately 220m northwest of an unnamed local road off the R747. DM02 is located adjacent to the site entrance road, southwest of the quarry void, approximately 120m north of the R747. DM03 is located at the eastern boundary of the quarry void, on agricultural land, approximately 320m northwest of the unnamed local road off the R747.

8.3.5 Results

Dust monitoring samples were submitted by MKO to City Analysts Ltd. in Ringsend, Dublin for laboratory analysis of inorganic, organic and total dust. The laboratory results for DM01, DM02 and DM03 are presented in Appendix 8-1.

The results show that total depositional dust levels measured at DM01, DM02 and DM03 were below the 350 mg/m^2/day limit value over the monitoring period. The maximum reported value for total dust was 28.39 mg/m^2/day at DM02. The reported inorganic particulate fraction (that fraction representative of site quarry activity) was 4.94 mg/m^2/day at DM02.

It is noted that the inorganic particulate faction from all three samples was reported significantly below the 350 mg/m^2/day limit value.

8.4 Likely and Significant Impacts and Associated Mitigation Measures

8.4.1 Characteristics of the Proposed Development

It is intended to infill and restore lands within the quarry void to give a landform which merges into the surrounding landscape. It is proposed to import approximately 1,299,791m^3 or 2,339,624 tonnes of inert soil and stone material for the infilling and restoration of an existing and future quarry void with inert soil and stone over an area of approximately 18.95 hectares. There will be a phased restoration of the quarry voids working from the base of the void vertically building up soil and stone. The soil and stone will be spread in layers, approximately 1.0-2.0m each, up to ground level. Following completion of the infilling works, topsoil will be placed over the fill material and the soils will be rolled and reseeded with grasses to bring the site into agricultural use.

The proposed development also includes the following restoration measures:

- Infill, grading and restoration of two settlement ponds, totalling 1.065 ha (two settlement pond areas in NW of site approx. 0.788 and 0.277 ha).
- Restoration of three smaller ponds, totalling 0.44 ha, in order to provide an area of aquatic habitat (three ponds are approx. 0.321, 0.0835 and 0.0358 ha).
- Planting of a raised soil bund with native tree species, along northern site boundary (planting area approx. 0.48 ha).
- Grading of a pre-existing soil mound at the site entrance (approx. 1.11 ha).
- Development and management of an artificial sand martin nesting site, to replace the existing nesting location identified in the soil mound at site entrance.

- Construction of a soil quarantine shed (approx. 180m^2 in area, 15m height), inspection area and re-fuelling area (hardstanding) located north of the existing site office (approx. 400m^2 hardstanding area).
- Associated minor works to include site access road improvements (resurfacing), upgrade of drainage infrastructure including new fuel/oil interceptor and surface drains on hardstanding, refurbishment/repair of existing site office and weighbridge.

The proposed development will use the existing quarry infrastructure including internal roads, site office, welfare facilities and other ancillaries to complete the works. A quarantine area will be provided as part of the proposed development.

8.4.2 "Do-Nothing" Scenario

If the proposed development were not to proceed, there would be no change to existing air quality conditions in the area. There would be no potential for minor emissions to occur as a result of the construction and operational phases of the proposed development.

8.4.3 Likely Impacts and Mitigation Measures – Construction Phase

8.4.3.1 General Air Quality

The construction of the concrete slab, road paving improvements and minor improvements to the drainage network will require the operation of construction vehicles and plant on site. Exhaust emissions associated with vehicles and plant will arise as a result of construction activities. This potential impact will not be significant and will be restricted to the duration of the construction phase which is anticipated to be less than one month. Therefore, this is considered a Temporary Slight Negative Impact.

Mitigation measures to reduce this effect are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while on-site, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed Construction and Environmental Management Plan (CEMP) will be prepared and submitted to Kildare County Council (KCC) for approval in advance of the works.

Residual Impact

Following implementation of mitigation measures as outlined above, residual impacts of the proposed development on general air quality will have a Temporary Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be no significant effects.

8.4.3.2 Dust Emissions

The construction of the concrete slab, road paving improvements and minor improvements to drainage network may give rise to dust emissions during the construction phase. This potential effect will not be significant and will be restricted to the duration of the construction phase. Therefore, this is a Temporary Slight Negative Impact. Dust suppression mitigation measures to reduce this effect are presented below.

Mitigation

- The hardstanding/roads adjacent the site will continue to be regularly inspected by the Site Manager for cleanliness and cleaned as necessary.
- If necessary, sporadic wetting of loose stone and soil surface will be carried out during the construction phase to minimise movement of dust particles to the air.
- Any hardstanding areas/site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- The transport of material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles.

Residual Impact

Temporary Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be no significant effects.

8.4.4 Likely Effects and Mitigation Measures – Operational Phase

8.4.4.1 General Air Quality

The soil and stone material will be delivered to the site by road going vehicles that have the potential to generate exhaust emissions. The restoration process will also require the use of machinery and plant that has the potential to generate exhaust emissions. This is likely to have a Long-term Slight Negative Impact, which will be reduced through the use of the best practice mitigation measures as presented below.

The following mitigation measures will be implemented at the site:

Mitigation

- All on-site plant and vehicles will be maintained in good operational order, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.

Residual Impact

Long-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant effects.

8.4.4.2 Dust Emissions

Dust can be generated from many on-site activities such as traffic movements and the restoration works. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather.

The proposed restoration will involve the unloading and levelling of soil and stone, which in terms of the potential for dust generation is not dissimilar to the previous extraction activity which created the existing void. The proposed project is located with the boundary of the existing quarry. Pre-mitigation, the potential dust emission effects could have a Long-term Moderate Negative Impact.

The following mitigation measures will be implemented at the site:

Mitigation

- The hardstanding/roads adjacent the site will continue to be regularly inspected by the Site Manager for cleanliness and cleaned as necessary.
- Any hardstanding areas/site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions. Water bowser movements will be carefully monitored as the application of too much water may lead to increased runoff.
- The transport of material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles.
- A wheel wash facility will be installed on site and all vehicles required to pass through the wheel wash on exiting the site.
- Following reinstatement, the area will be reseeded to facilitate immediate revegetation of the site and prevent dust generation.
- All plant and machinery will be maintained in good operational order while onsite.
- All plant and shall be stored in the dedicated compound area.

Residual Impact

Following implementation of mitigation measures as outlined above, residual impacts of dust generation from the restoration works will have a Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be no significant effects.

8.4.4.3 Dust Monitoring

It is proposed that dust deposition monitoring using the Bergerhoff Method, be carried out in line with the existing monitoring requirements for the quarry operation.

8.4.5 Health Effects

Whilst the operational phases of the proposed quarry are likely to lead to increases in dust and vehicle emissions, the implementation of the mitigation measures discussed above and good management practices can prevent or minimise potential effects off-site. Good management practice consists of good

site design and layout, adopting appropriate working methods, choosing the right equipment and ensuring that the workforce understands the company's responsibilities and is familiar with good working practice and dust suppression techniques. The potential for health effects are considered negligible as the potential for both exhaust and dust emissions will be limited and controlled through site layout design and mitigation measures.

8.4.6 Cumulative Effect

Potential cumulative effects on air quality between the proposed quarry development and other developments in the vicinity were also considered as part of this assessment. It is noted that the other land use activities in the area include agriculture related activities.

8.4.6.1 General Air Quality

The existing land use activities noted above and the proposed development will require plant items and vehicles which consume fossil fuels and therefore will lead to a minor level of air emissions cumulatively. However, given the facilities surrounding the site will be managed to control emissions to air and with the implementation of the mitigation measures discussed in Section 8.4.3.1 above, there is unlikely to be cumulative effects arising from the proposed restoration and other and other local existing developments, projects and plans.

8.4.6.2 Dust Emissions

As previously mentioned in Section 8.3, the proposed development site is located within an active quarry setting that has the potential to generate dust. However as noted above, given the quarry will be managed to control dust emissions and with the implementation of the identified mitigation measures in Section 8.4.3.2 above, the potential for dust emissions will be imperceptible. It is therefore considered that there is unlikely to be cumulative effects arising from the restoration works and other local existing developments, projects and plans.

8.5 Climate

8.5.1 Climate Change and Greenhouse Gases

Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

8.5.1.1 Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change (UNFCCC). The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. Ireland's contribution to the EU commitment for the period 2008 – 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

8.5.1.1.1 Doha Amendment to the Kyoto Protocol

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and,
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading can also be utilised).

8.5.1.1.2 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

8.5.1.1.3 COP25 Climate Change Conference

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the main outcome from the conference was the launch by the European Union (EU) of the '*The European Green New Deal'.* The deal sets out the EUs commitments to tackle climate and environmental related challenges and includes proposals to reduce emissions from the transport, agriculture and energy sectors. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. The Commission will present draft laws for the new deal to the EU in January 2020 and if accepted will likely be implemented in 2021. Decisions regarding the global carbon market were postponed until the next Climate Conference (COP26) which will be held in Glasgow in November 2020.

8.5.1.1.4 Emissions Projections

In 2016, the EPA published an update on Ireland's Greenhouse Gas Emission Projections to 2020. Ireland's target is to achieve a 20% reduction of non-Emissions Trading Scheme (non-ETS) sector

emissions, i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020.

Greenhouse gas emissions are projected to 2020 using two scenarios; 'With Measures' and 'With Additional Measures'. The 'With Measures' scenario assumes that no additional policies and measures, beyond those already in place by the end of 2014 are implemented. The 'With Additional Measures' scenario assumes implementation of the 'With Measures' scenario in addition to full achievement of Government renewable and energy efficiency targets for 2020, as set out in the National Renewable Energy Action Plan and the National Energy Efficiency Action Plan.

The EPA Emission Projections Update notes the following key trends:

- Ireland's non-Emissions Trading Scheme (ETS) emissions are projected to be 6% and 11% below 2005 levels in 2020 under the 'With Measures' and 'With Additional Measures' scenarios, respectively. The target for Ireland is a 20% reduction.
- Ireland is projected to exceed its annual binding limits in 2016 and 2017 under both scenarios, 'With Measures' and 'With Additional Measures'.
- Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 12 Mt CO_2 (metric tonnes of Carbon Dioxide) equivalent under the 'With Measures' scenario and 3 Mt CO_2 equivalent under the 'With Additional Measures' scenario.

The EPA report states that "Failure to meet 2020 renewable and energy efficiency targets will result in Ireland's emission levels moving even further from its emission reduction targets". The report also concludes:

- The latest projections estimate that by 2020 non-ETS emissions will be at best 11% below 2005 levels compared to the 20% reduction target. Emission trends from agriculture and transport are key determinants in meeting targets, however emissions from both sectors are projected to increase in the period to 2020.
- It is clear that Ireland faces significant challenges in meeting emission reduction targets for 2020 and beyond. ('Greenhouse Gas Emission Projections to 2020 – An Update', EPA, 2016).

8.5.1.1.5 *Progress to Date*

The 'Europe 2020 Strategy' is the EU's agenda for growth and jobs for the current decade. The Europe 2020 Strategy targets on climate change and energy include:

- Reducing greenhouse gas (GHG) emissions by at least 20% compared with 1990 levels;
- Increasing the share of renewable energy in final energy consumption to 20%; and
- Moving towards a 20% increase in energy efficiency.

Regarding progress on targets, the 'Europe 2020 indicators – climate change and energy' report provides a summary of recent statistics on climate change and energy in the EU.

In 2015, EU greenhouse gas emissions, including emissions from international aviation and indirect carbon dioxide (CO_2) emissions, were down by 22.1% when compared with 1990 levels. However, regarding the progress of individual Member States, and Ireland in particular, the Europe 2020 indicators include the following statements:

- 24 countries are on track to meet their GHG targets, except Austria, Belgium, **Ireland** and Luxembourg.
- Luxembourg emitted the most GHG per capita in the EU in 2014 ... followed by Estonia, **Ireland** and the Netherlands.

- In 2015, Malta was the farthest from reaching their national target, followed by Ireland, Belgium and Luxembourg.

8.5.2 Climate and Weather in the Existing Environment

County Kildare has a temperate oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Casement Aerodrome is the nearest weather and climate monitoring station to the proposed development site, located approximately 40km to the northeast of the site. Meteorological data recorded at Casement Aerodrome over the 30-year period from 1981-2010 is shown in Table 8-8 overleaf. The wettest months are October and December, and February is usually the driest. July and August are the warmest months with average temperatures of 15.7° Celsius.

8.5.2.1 Wind

The wind field characteristics of the area are important climatological elements in examining the potential for the generation of fugitive dust emissions from the site. Fugitive dust emissions from a surface occur if the winds are sufficiently strong and turbulent and the surface is dry and loose, together causing re-suspension of particulate matter from the ground. A wind speed at ground level in excess of about five metres per second is considered to be the threshold above which re-suspension of fine sized material from an exposed surface may occur. The surface needs to have a relatively low moisture content for this type of dust emission to take place and any wetting either by rainfall or sprayers, will greatly reduce the potential of fugitive dust emissions. The mean annual wind speed at Casement Aerodrome is 5.5 metres per second.

8.5.2.2 Rainfall

Long term rainfall data was also obtained from the monitoring station at Casement Aerodrome. The annual average rainfall for Casement Aerodrome is 754 millimetres per year (mm/yr).

Table 8-8 Data from Met Éireann Weather Station at Casement Aerodrome, 1981 to 2010 – Monthly an Annual Mean and Extreme Values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	8.0	8.2	10.2	12.4	15.2	17.9	19.8	19.5	17.1	13.6	10.2	8.3	13.4
Mean daily min	2.1	2.0	3.3	4.1	6.6	9.4	11.5	11.3	9.5	7.0	4.2	2.4	6.1
Mean temperature	5.1	5.1	6.8	8.2	10.9	13.6	15.7	15.4	13.3	10.3	7.2	5.4	9.7
Absolute max.	15.2	15.9	17.3	22.7	24.9	27.6	31.0	29.5	25.4	21.3	17.7	14.8	31.0
Absolute min.	-12.4	-8.0	-9.0	-5.5	-2.4	0.4	4.6	2.2	0.2	-4.1	-9.1	-15.7	-15.7
Mean num. of days with air frost	7.5	7.7	4.6	3.4	0.8	0.0	0.0	0.0	0.0	1.3	4.3	7.6	37.2
Mean num. of days with ground frost	14.0	14.0	11.0	11.0	4.0	0.0	0.0	0.0	1.0	4.0	9.0	14.0	82.0
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	87.2	86.7	84.5	80.1	77.4	77.7	79.7	82.2	84.5	86.3	88.9	88.4	83.6
Mean at 1500UTC	82.2	76.7	71.8	67.7	67.3	67.9	68.9	69.0	71.8	76.6	81.6	84.1	73.8
SUNSHINE (Hours)													
Mean daily duration	1.7	2.5	3.3	5.1	6.0	5.3	4.9	4.8	4.1	3.3	2.2	1.5	3.7
Greatest daily duration	8.1	9.2	10.9	13.2	15.4	16.0	15.5	14.4	12.3	10.1	8.5	6.9	16.0
Mean no. of days with no sun	8.9	5.8	4.4	2.5	1.8	2.1	1.6	1.1	2.4	4.5	7.0	9.9	52.0
RAINFALL (mm)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean monthly total	63.8	48.5	50.7	51.9	59.1	62.5	54.2	72.3	60.3	81.6	73.7	75.7	754.2
Greatest daily total	30.0	32.2	31.1	38.7	29.8	97.5	33.7	89.3	51.1	50.1	82.0	46.8	97.5
Mean num. of days with >= 0.2mm	17	14	16	14	15	14	15	16	14	16	16	16	183
Mean num. of days with >= 1.0mm	12	10	11	10	11	10	10	11	10	12	11	12	130
Mean num. of days with >= 5.0mm	4	3	3	3	3	3	3	4	4	4	4	5	43
WIND (knots)													
Mean monthly speed	13.6	12.9	12.4	9.8	9.1	8.6	8.8	9.0	9.6	11.1	11.6	12.3	10.7
Max. gust	80	78	71	59	63	51	58	55	59	65	66	82	82
Max. mean 10-minute speed	57	54	47	43	43	36	39	36	38	44	46	57	57
Mean num. of days with gales	4.5	3.2	2.1	0.6	0.4	0.1	0.1	0.2	0.3	1.2	1.9	3.5	18.1
WEATHER (Mean No. of Days With:)													
Snow or sleet	4.1	3.9	2.5	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.5	2.3	14.6
Snow lying at 0900UTC	1.8	1.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	4.1
Hail	1.0	1.5	2.7	2.4	1.5	0.2	0.2	0.1	0.2	0.2	0.7	0.6	11.3
Thunder	0.1	0.1	0.3	0.4	1.1	1.0	1.0	1.2	0.6	0.4	0.1	0.1	6.3
Fog	1.8	1.9	1.6	1.6	1.5	1.2	1.1	2.0	2.8	2.0	2.1	2.4	22.1

8.5.3 Potential Climate Impacts and Associated Mitigation Measures

8.5.3.1 'Do-Nothing' Effect

If the proposed development were not to proceed, there would be no change to existing climate conditions in the area.

8.5.3.2 Construction Phase

8.5.3.2.1 *Greenhouse Gas Emissions from Machinery*

The use of machinery during the construction of the proposed development will result in the emission of greenhouse gases. Operations such as the transport of equipment and materials are typical examples of machinery use. This effect is considered to be slight only, given the insignificant quantity of greenhouse gases that will be emitted. This is expected to have a Temporary Imperceptible Negative Impact.

8.5.3.3 Operational Phase

8.5.3.3.1 *Greenhouse Gas Emissions from Machinery*

The use of machinery during the operational phase will result in the emission of greenhouse gases. Operations such as the transport of soil and stone materials as well as restoration works are typical examples of machinery use. This effect is considered to be imperceptible only, given the insignificant quantity of greenhouse gases that will be emitted if any over the 'Do Nothing' scenario.

8.5.3.3.2 *Mitigation Measures*

As the proposed development will have no significant negative effects on climate, mitigation measures are not proposed other than all machinery and plant will be maintained in good operational order while on-site, minimising any emissions that are likely to arise. These measures will minimise any effect that the development might have on climate in the long-term.

8.5.3.4 Residual Impact (when filling of the quarry void is completed and following restoration)

There will be a Long-term Imperceptible Neutral Impact on climate associated with the proposed project.

8.5.3.5 Significance of Effects

Based on the assessment above there will be no significant effects.

8.5.3.6 Cumulative Effect

The proposed development and other agricultural operations in the area will require plant items which consume fossil fuels and therefore will lead to a minor emission of greenhouse gases cumulatively. However, given the agricultural facilities surrounding the site will be managed to control emissions to air and with the implementation of the mitigation measures discussed, the cumulative effects are likely to be negligible.

APPENDIX 8-1

DUST MONITORING RECORDS

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003
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Email:
reports@cityanalysts.ie

www.cityanalysts.ie

Customer

Eoin Hurst

McCarthy Keville O'Sullivan Ltd, T/A MKO
Tuam Road
Galway
Galway
Galway
H91 VW84

Certificate Of Analysis

Job Number: 20-84266
Issue Number: 1
Report Date: 6 October 2020

Site: 191115 / PO003066
PO Number: Not Supplied
Date Samples Received: 18/09/2020

Please find attached the results for the samples received at our laboratory on 18/09/2020.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Shane Reynolds
Laboratory Manager

Authorised Date: 6 October 2020

Notes are not INAB accredited

Results relate only to the items tested.
Information on methods of analysis and uncertainty of measurement is available on request.
Any opinions or interpretations indicated are outside the scope of our INAB accreditation.
This test report shall not be reproduced except in full or with written approval of City Analysts Limited.

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Certificate Of Analysis

Customer

Eoin Hurst

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Galway
H91 VW84

Report Reference: 20-84266

Report Version: 1

Site: 191115 / PO003066

Sample Description: DM01

Sample Type: Misc

Lab Reference Number: 533997

Date of Sampling: 17/09/2020

Date Sample Received: 18/09/2020

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	30/09/2020	Dusts Inorganic	< 0.01	mg/m2/day	-
D/D	30/09/2020	Dusts Organic	3.93	mg/m2/day	-
D/D	30/09/2020	Dusts Total	3.93	mg/m2/day	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

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Certificate Of Analysis

Customer

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H91 VW84

Report Reference: 20-84266

Report Version: 1

Site: 191115 / PO003066

Sample Description: DM02

Sample Type: Misc

Lab Reference Number: 533998

Date of Sampling: 17/09/2020

Date Sample Received: 18/09/2020

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	30/09/2020	Dusts Inorganic	4.94	mg/m2/day	-
D/D	06/10/2020	Dusts Organic	23.45	mg/m2/day	-
D/D	30/09/2020	Dusts Total	28.39	mg/m2/day	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

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Report Reference: 20-84266

Report Version: 1

Site: 191115 / PO003066

Sample Description: DM03

Sample Type: Misc

Lab Reference Number: 533999

Date of Sampling: 17/09/2020

Date Sample Received: 18/09/2020

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	30/09/2020	Dusts Inorganic	3.93	mg/m2/day	-
D/D	30/09/2020	Dusts Organic	17.78	mg/m2/day	-
D/D	30/09/2020	Dusts Total	21.71	mg/m2/day	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
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