9. AIR & CLIMATE

9.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the construction and operation of the Proposed Development. This section of the EIAR has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction. For the purposes of this EIAR, where the Proposed Development is referred to, this relates to all the project components described in detail in Chapter 4 of this EIAR. The full description of the Proposed Development is provided in Chapter 4 of this EIAR.

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

9.1.1 Statement of Authority

This section of the EIAR has been prepared by Niamh McHugh, David Naughton, Daire O'Shaughnessy reviewed by Eoin O'Sullivan, of MKO. Niamh is a Graduate Environmental Scientist and holds a BSc (Hons) in Environmental Science from the National University of Ireland, Galway. Since joining the company in 2021, Niamh has been involved in the preparation of chapters for a number of Environmental Impact Assessment Reports for large-scale developments. David is an Environmental Scientist with five years of consultancy experience with MKO and has been involved in a number of EIAR applications, predominantly in renewable energy, namely onshore wind. David has worked as project manager for a number of EIAR applications, providing a pivotal link liaising between the applicant and the EIAR project team to ensure all work is carried out to a high standard. David holds a BSc (Hons) in Environmental Science. Daire O'Shaughnessy is an Environmental Scientist who holds a B.Sc (Hons) in Environmental Science with three years of consultancy experience with MKO and has been involved in a range of EIAR applications. Eoin O'Sullivan is an experienced geo-environmental scientist and has over twelve years' experience in the assessment of a wide range of energy and infrastructure related projects and working in the fields of environmental and human health risk assessment, waste management, waste policy and permitting. Eoin has also got extensive experience in the preparation of air and climate assessments and reports for EIAs. Eoin has wide experience in the project management of large-scale infrastructural projects and brownfield developments and has routinely undertaken detailed quantitative risk assessment for the protection of controlled waters and ground gas risk assessments. 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.

9.2 Air

9.2.1 Background

The Proposed Development site is located within Co. Meath and Co. Kildare and located on the northern environs of Maynooth town, within zoned lands known as the 'Maynooth Environs lands' as set out in the Maynooth Environs Local Area Plan 2013-2019 (MLAP), which is incorporated into the Meath County Development Plan 2021-2027. The Proposed Development site is currently a greenfield site, with small scale agriculture as the primary land-use.

9.2.2 Air Quality Standards

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

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009).

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

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (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 PM_{10}) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 9-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) 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) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 9-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: https://www.epa.ie/air/quality/standards/)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (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 a calendar year	1st Jan 2005
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	35	-	Not to be exceeded more than 35 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	25	-	Not to be exceeded more than 35 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
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
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 9-2 presents the limit and target values for ozone.

Table 9-2 Target values for Ozone Defined in Directive 2008/50/EC .

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

* AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g. for forest and crops.

9.2.2.1 Air Quality and Health

The Environmental Protection Agency (EPA) report '*Air Quality in Ireland 2020'* noted that in Ireland, the premature deaths attributable to poor air quality are estimated at 1,300 people per annum. A more recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2020 Report'* highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 417,000 people in Europe in 2018, 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 2018 were around 55,000 and 20,600 premature deaths per year, respectively. From this, 1,300 Irish deaths were attributable to fine particulate matter ($PM_{2.5}$), 50 Irish deaths were attributable to nitrogen oxides (NO_2) and 60 Irish deaths were attributable to Ozone (O_3) (Source: *Air Quality in Europe – 2020 Report',* EEA, 2020).

Whilst there is the potential of such emissions and also dust emissions to be generated from the site operations, a number of mitigation measures will be implemented at this site to reduce the impact from dust and vehicle emissions, which are discussed in Section 9.2.4 below.

9.2.3 Air Quality Zones

The Environmental Protection Agency (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 Proposed Development site lies within Zone D, which represents rural areas located away from large population centres.

9.2.4 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. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2020'[1] was published by the EPA in 2021. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D.

9.2.4.1 Sulphur Dioxide (SO_2)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for hourly sulphur dioxide concentrations for four Zone D monitoring stations under Table A5 of the EPA report, namely, Cork Harbour, Kilkitt, Askeaton and Letterkenny. The average sulphur dioxide statistics across each of the four monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 9-3 below[2].

Table 9-3 Average Sulphur Dioxide Data for Zone D Sites in 2020

Parameter	Measurement (ug/m^3)
Annual Mean	4.15
Hourly values > 350	0.5
Hourly max	135.18
Daily values > 125	0
Daily max	25.55

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can observed from Table 9-3 the average maximum hourly value recorded during

[1] *EPA (2021). Air Quality in Ireland 2020 – Summary Data Tables* https://www.epa.ie/publications/monitoring–assessment/air/Summary-Data-Tables–2020.pdf

[2] *Letterkenny had the highest levels of Sulphur Dioxide emissions (Annual Mean, Median, Hourly Max and Daily Max) of any of the monitoring stations listed within the country for Table A5 of the 'Air Quality in Ireland 2020 – Summary Data Tables'. Lower values would be expected for the Proposed Development as it is located within a much more rural location.*

the assessment period was 135.18 µg/m^3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO_2 values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above.

9.2.4.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. The EPA Air Quality in Ireland 2020 summary tables provide annual mean PM_{10} concentration for twelve Zone D monitoring stations under Table A11 of the EPA report, namely, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh, Claremorris, Kilkitt, Cavan and Roscommon Town. The average Particulate matter (PM_{10}) statistics across each of the twelve monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 9-4.

Table 9-4 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2020

Parameter	Measurement (ug/m^3)
Annual Mean	11.17
% Data Capture	75
Values > 50 ug/m^3	Maximum Value of 5 exceedances at Macroom
Daily Max	46.5

Notes: [1-] PM_{10} daily limit for the protection of human health: No more than 35 days >50 µg/m^3

The daily limit of 50 µg/m^3 for the protection of human health was not exceeded more than 35 times during the monitoring period. It would be expected that PM_{10} values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above.

9.2.4.3 Nitrogen Dioxide (NO_2)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for hourly nitrogen dioxide concentrations for five Zone D monitoring stations under Table A2 of the EPA report, namely, Emo Court, Birr, Castlebar, Carrick-on-Shannon and Kilkitt. The average Nitrogen Dioxide (NO_2) statistics across each of the five monitoring stations listed in Zone D from the 2020 summary tables is presented in in 2020 is presented in Table 9-5 below.

Table 9-5 Average Nitrogen Dioxide Data for Zone D Sites in 2020

Parameter	Measurement (µg/m^3)
Annual Mean	7.6
NO_2 Values >200	0
Values > 140 (UAT)	0
Values >100 (LAT)	0
Hourly Max.	54

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. Furthermore, the lower and upper assessment thresholds of 100 and 140 µg/m^3 was not exceeded during the monitoring period. The average hourly max. NO_2 value of 54 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It would be expected

that NO_2 values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above.

9.2.4.4 Carbon Monoxide (CO)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for rolling 8-hour carbon monoxide concentrations for only one Zone D site, namely Birr air monitoring station, under Table A6 of the EPA report. Carbon Monoxide data from Birr Monitoring Station (Zone D) in 2020 is presented in Table 9-6 below.

Table 9-6 Carbon Monoxide Data for Birr - Zone D Site in 2020

Parameter	Measurement
Annual Mean	0.4 mg/m^3
Median	0.4 mg/m^3
% Data Capture	4.2%
Values > 10	0
Max	1.2 mg/m^3

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 10mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/69/EC. It would be expected that Carbon Monoxide values at the Proposed Development site would be similar or lower than those at Birr.

9.2.4.5 Ozone (O_3)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for rolling 8-hour ozone concentrations for seven Zone D monitoring stations under Table A7 of the EPA report, namely, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. The average Ozone (O_3) statistics across each of the seven monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 9-7 below.

Table 9-7 Average Ozone Data for Zone D Sites in 2020

Parameter	Measurement
Annual Mean	62 µg/m^3
Median	63 µg/m^3
% Data Capture	98%
No. of days > 1800	0 days

There were no exceedances of the maximum daily eight-hour mean limit of 120 µg/m^3. The legislation stipulates that this limit should not be exceeded on more than 25 days. It would be expected that ozone values at the Proposed Development site would be similar to those recorded for the Zone D sites above.

9.2.4.6 Dust

There are no statutory limits for dust deposition in Ireland. The German TA-Luft standard for dust deposition sets a maximum permissible emission level for dust deposition of 350 mg/m^2/day. Recommendations from the Department of the Environment, Health & Local Government[3] apply the Bergerhoff limit of 350 mg/m^2/day to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction activities associated with the Proposed Development.

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. Dust has the potential to be generated during the construction phase of the Proposed Development from on-site activities such as excavation and backfilling. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

The potential dust-related effects on local air quality and the relevant associated mitigation measures are presented in Sections 9.2.5.2.1 and 9.2.5.3.1 below.

[3] *DOEHLG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities*

9.2.5 Likely Significant Effects and Associated Mitigation Measures

9.2.5.1 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, there would be no change to the current land-use practice of agriculture. There would be no potential for minor emissions to occur as a result of the construction and operational phases of the Proposed Development.

9.2.5.2 Construction Phase

9.2.5.2.1 *Strategic Employment Zone (Site A)*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of buildings and site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust.

Pre-mitigation, these impacts have the potential to have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.
- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3a Appendix 4-3). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of Site A will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted to Meath County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of Site A.

9.2.5.2.2 *Healthcare Application (Site B)*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of buildings and site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust. Pre-mitigation, these impacts will have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.

- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.
- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3b Appendix 4-3). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of Site B will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted to Meath County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of Site B.

9.2.5.2.3 *Strategic Housing Development (Site C)*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of buildings and site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust. Pre-mitigation, these impacts will have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.
- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3c Appendix 4-3). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of Site C will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted Meath County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of Site C.

9.2.5.2.4 *Maynooth Outer Orbital Road (MOOR)*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust. Pre-mitigation, these impacts will have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.

- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3d: Appendix 4-2). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of the MOOR will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted to Meath County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of the MOOR.

9.2.5.2.5 *Kildare Bridge*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust. Pre-mitigation, these impacts will have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.
- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.
- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3e: Appendix 4-2). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of the Kildare Bridge works will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted to Kildare County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of the Kildare Bridge works.

9.2.5.2.6 *Moyglare Bridge*

Dust Emissions

Dust can be generated from many on-site activities such as excavation works, construction of site roads and delivery of aggregate materials to the site. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil 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. Traffic movements also have the potential to generate dust. Pre-mitigation, these impacts will have a Short-term Moderate Negative Impact.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Dampening down the dust at the source by the use of barriers such as debris netting on scaffolding around the buildings to block dust escaping where the building is within 10m of the site boundary where residential properties or public roads exist.
- Site roadways will be maintained in a stoned hard-core condition not allowing soil to accumulate which when dry can create dust.
- Wheel wash equipment will be set up at the site exit gates for all construction vehicles to pass through prior to leaving the site thus ensuring that no dirt etc. is transported outside the site onto the roadways.

- The 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.
- Dust levels will be monitored visually, on a daily basis by the project Environmental Officer. If dust levels become an issue, then all dust generating activities on site will cease until such time as weather conditions improve (e.g., wind levels drop or rain falls) or mitigation measures such as damping down of the ground are completed.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Volume 3f: Appendix 4-2). A CEMP is included with this application and includes further details of the above dust suppression measures and dust monitoring measures.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

Exhaust Emissions

The construction of the Moyglare Bridge will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a Short-term slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- All machinery will be switched off when not in use.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum.
- The methods of working will comply with all relevant legislation and best practice guidelines in reducing the environmental impacts of the works. A detailed CEMP will be prepared and submitted to Kildare County Council for approval in advance of the works.

Residual Impact

Following implementation of the mitigation measures outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to exhaust emissions during the construction of the Moyglare Bridge.

9.2.5.3 Operational Phase

9.2.5.3.1 *Strategic Employment Zone (Site A)*

Exhaust Emissions

Exhaust emissions associated with the operational phase of Site A will arise from machinery and vehicles such as cars and vans of employees and customers who work and require the services provided within the Strategic Employment Zone. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of Site A will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of Site A.

9.2.5.3.2 *Healthcare Application (Site B)*

Exhaust Emissions

Exhaust emissions associated with the operational phase of Site B will arise from machinery and vehicles such as cars and vans of employees and customers who work and require the services provided within the Community Healthcare Facilities. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of Site B will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of Site B.

9.2.5.3.3 *Strategic Housing Development (Site C)*

Exhaust Emissions

Exhaust emissions associated with the operational phase of Site C will arise from machinery and vehicles such as cars and vans of residents who live within the Strategic Housing Development. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of Site C will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of the Site C.

9.2.5.3.4 *Maynooth Outer Orbital Road (MOOR)*

Exhaust Emissions

Exhaust emissions associated with the operational phase of the MOOR will arise from machinery and vehicles such as cars and vans who require the services provided within the Maynooth Outer Orbital Road. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of the Proposed Development will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of the MOOR.

9.2.5.3.5 *Kildare Bridge*

Exhaust Emissions

Exhaust emissions associated with the operational phase of the Kildare Bridge application will arise from machinery and vehicles such as cars and vans who require the services provided within the Kildare Bridge application. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of the Proposed Development will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of the Kildare Bridge.

9.2.5.3.6 *Moyglare Bridge*

Exhaust Emissions

Exhaust emissions associated with the operational phase of The Moyglare Bridge will arise from machinery and vehicles such as cars and vans of employees and customers who work and require the services provided within the Moyglare Bridge application. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any machinery and/or maintenance vehicles brought onsite during the operational phase of the Proposed Development will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise.

Residual Impacts

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects on air quality due to the operation of the Moyglare Bridge.

9.2.5.4 Assessment of Potential for Impacts on Human Health

Whilst the Construction and Operational Phases of the Proposed Development are likely to lead to imperceptible increases in vehicle and dust emissions, the implementation of the mitigation measures as outlined above, and good management practices can prevent or minimise the potential effects off-site. Good management practice consists of good site design and layout, adopting appropriate working methods for any maintenance works to be carried out during operation, and choosing the right equipment for such maintenance works. The potential for health effects are considered to be imperceptible for both dust and exhaust emissions during the construction and operational phase of the Proposed Development and will be limited and controlled through site layout design and mitigation measures.

9.2.5.5 Cumulative Effects Resulting from Interactions Between Various Elements of the Proposed Development

The interaction of the various elements of the Proposed Development were considered and assessed in this EIAR with regards to air quality. The potential for each individual element of the Proposed Development on its own to result in significant effects on air quality was considered in the impact assessment. The entire project including the interactions between all its elements was also considered and assessed for its potential to result in significant effects on air quality in the impact assessment presented.

All interactions between the various elements of the project were considered and assessed both individually and cumulatively within this chapter. Where necessary, mitigation was employed to ensure that no cumulative effects will arise as a result of the interaction of the various elements of the development with one another.

9.2.5.6 Potential Cumulative In-Combination Effects

The potential cumulative effects of the Proposed Development in combination with the other projects described in Chapter 2 of this report have been considered in terms of impacts on population & human health.

There are a number of proposed or permitted housing developments within the vicinity of the Proposed Development. A description of the developments is provided in Chapter 2, and where appropriate the application documentation, EIAR and NIS for each development have been reviewed

Further information on the above is provided in Table 2-5 in Section 4.2.1 of Chapter 2..

9.2.5.6.1 *Cumulative In-Combination Effects on Air Quality*

Potential cumulative air quality impacts may arise during the construction phase due to possible overlap of the construction phases of the Proposed Development and offsite residential developments to the west and south. Agriculture, residential heating, transport vehicles and other local construction activities and the construction of the Proposed Development will require the consumption of fossil fuels and therefore will lead to a minor level of air emissions cumulatively. However, given the relatively small-scale machinery used, short-term duration of the construction phases, together with the implementation of the mitigation measures discussed above, there will be no significant cumulative impacts arising from the construction phase of the Proposed Development in combination with other local developments, projects and plans. The cumulative, in combination impact on air quality with other projects, will be negative, short term, and imperceptible.

While there will be an increase in local traffic and associated exhaust emissions with the Proposed Development, this impact will be imperceptible. Other future developments, including potential future

applications within the Moygaddy Masterplan area and nearby permitted residential developments, in the area once constructed will also contribute to increased traffic levels and associated exhaust emissions Any machinery and/or maintenance vehicles brought onsite during the operational phase of the Proposed Development will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thus minimising harmful emissions which may arise. Mitigation measures associated with other developments listed in Section 9.2.5.6 above will also be implemented. Therefore, these increases will also be imperceptible and the cumulative air quality impact of the operation of the Proposed Development when considered with other developments will be an imperceptible negative impact.

9.2.5.6.2 *Cumulative In-Combination Dust Emissions*

Dust emissions from the other land use activities in the area are likely to be imperceptible and localised to the immediate area of those projects. The potential for dust emissions from the construction phase of the Proposed Development exists but the residual effects will be imperceptible given the proposed mitigation measures in Section 9.2.5.2.1 above. Therefore, cumulative dust emission impacts resulting from the construction of the Proposed Development, in combination with other projects, will be negative, short term, and imperceptible.

9.3 Climate

9.3.1 Climate and Weather in the Existing Environment

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Casement, Co. Dublin, is the nearest weather and climate monitoring station to the Proposed Development site that has meteorological data recorded for the 30-year period from 1981 – 2010. The monitoring station is located approximately 19.3 km southeast of the Proposed Development site. Meteorological data recorded at casement over the 30-year period from 1981 – 2010 is shown in Table 8-7. The wettest months are October, November and January, with July being the driest month. July was also shown to be the hottest month with a mean temperature of 15.7 degrees Celsius.

9.3.1.1 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 the station, in Casement, is 10.7 metres per second.

9.3.1.2 Rainfall

Long term rainfall data was also obtained from the Met Éireann monitoring station at Casement. The 30-year annual average rainfall is 754.2 mm/yr. this is considered to be slightly above average when compared to the annual average rainfall for Dublin (Merrion Square) which recorded annual average rainfall of 730 mm/yr over the same period.

Table 8-7 Data from Met Éireann Weather Station at Casement, 1981 to 2010: Monthly and 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	4.2	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 No. 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 No. 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	79.1	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 num. 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	81.3	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
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

9.3.2 Likely Significant Effects and Associated Mitigation Measures

9.3.2.1 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, there would be no change to the current land-use practice of agriculture and the site would continue to be managed under the existing farming practices. If the Proposed Development were not to proceed, greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with construction vehicles and plant, and increased traffic volumes during the operational phase, would not arise. There would be no potential for minor emissions to occur as a result of the construction and operational phases of the Proposed Development.

9.3.2.2 Construction Phase

9.3.2.2.1 *Strategic Employment Zone (Site A)*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase. Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of Site A will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

9.3.2.2.2 *Healthcare Application (Site B)*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase.

Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site, will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of Site B will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

9.3.2.2.3 *Strategic Housing Development (Site C)*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase. Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site, will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of Site C will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

9.3.2.2.4 *Maynooth Outer Orbital Road (MOOR)*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase.

Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site, will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of the MOOR will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

9.3.2.2.5 *Kildare Bridge*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase. Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site, will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of Kildare Bridge will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

9.3.2.2.6 *Moyglare Bridge*

Greenhouse Gas Emissions During Construction Activities

The construction of foundations and buildings, site roads and associated infrastructure will require the operation of construction vehicles and plant on-site. Greenhouse gas emission, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase.

Therefore, this is a Short-term Slight Negative impact. Mitigation measures to reduce this impact are presented below.

Transport of Materials to Site

The transport of construction materials to the site, will also give rise to greenhouse gas emissions associated with transport vehicles. This constitutes a Short-term Slight Negative Impact in terms of air quality. Mitigation measures in relation to greenhouse gas emission are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Aggregate materials for the construction of Moyglare Bridge will be obtained from local quarries and batching facilities where needed. This will significantly reduce the distance that delivery vehicles will need to travel to access the site.

Residual Impact

Short-term Imperceptible Negative Impact on climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above, there will be no significant direct or indirect effects.

9.3.2.3 Operational Phase

9.3.2.3.1 *Strategic Employment Zone (Site A)*

Greenhouse Gas Emissions

The operational phase of Site A has the potential to release greenhouse gas emissions, primarily through the burning of fossil fuels, such as oil, for heating purposes and the increased local traffic volumes once the Site A is operational. This has the potential to lead to a Long-term Moderate Negative Impact on Climate as a result of greenhouse gas emissions.

Mitigation

Site A is designed to comply with Building Regulations Part L 2017 nZEB (near zero energy building). Full details of the thermal performance and energy saving measures proposed for the development are given in the Building Services Planning Report, which forms Volume 3a: Appendix 9-1 of this EIAR. Solar PV panels will be located on the roof of each office building to offset any dependency and overuse of fossil fuel. Site A also includes for the upgrade and provision of additional cycling and pedestrian infrastructure and bicycle parking facilities will be provided at Site A. The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Site A, Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.3.2 *Healthcare Application (Site B)*

Greenhouse Gas Emissions

The operational phase of Site B has the potential to release greenhouse gas emissions, primarily through the burning of fossil fuels, such as oil, for heating purposes and the increased local traffic volumes once the Site B is operational. This has the potential to lead to a Long-term Moderate Negative Impact on Climate as a result of greenhouse gas emissions.

Mitigation

Site B is designed to comply with Building Regulations Part L 2017 nZEB (near zero energy building). Full details of the thermal performance and energy saving measures proposed for the development are given in the Building Services Planning Report, which forms Volume 3b: Appendix 9-1 of this EIAR. Solar PV panels will be located on the roof of each office building to offset any dependency and overuse of fossil fuel. Site B also includes for the upgrade and provision of additional cycling and pedestrian infrastructure and bicycle parking facilities will be provided at Site B. The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Site B, Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.3.3 *Strategic Housing Development (Site C)*

Greenhouse Gas Emissions

The operational phase of Site C has the potential to release greenhouse gas emissions, primarily through the burning of fossil fuels, such as oil, for heating purposes and the increased local traffic volumes once the Site C is operational. This has the potential to lead to a Long-term Moderate Negative Impact on Climate as a result of greenhouse gas emissions.

Mitigation

Site C is designed to comply with Building Regulations Part L 2017 nZEB (near zero energy building). Full details of the thermal performance and energy saving measures proposed for the development are given in the Building Services Planning Report, which forms Volume 3c: Appendix 9-1 of this EIAR. Solar PV panels will be located on the roof of each office building to offset any dependency and overuse of fossil fuel. Site C also includes for the upgrade and provision of additional cycling and pedestrian infrastructure and bicycle parking facilities will be provided at Site C. The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Site C, Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.3.4 *Maynooth Outer Orbital Road (MOOR)*

Greenhouse Gas Emissions

The operational phase of the MOOR has the potential to release greenhouse gas emissions, primarily through the burning of fossil fuels, such as petrol and diesel for transport purposes and increased traffic volumes. This has the potential to lead to a Long-term Moderate Negative Impact on Climate as a result of greenhouse gas emissions.

Mitigation

The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.3.5 *Kildare Bridge*

Greenhouse Gas Emissions

The operational phase of the Kildare Bridge will provide a cycle and pedestrian bridge and therefore no emissions are expected to occur from the operational phase of the Kildare Bridge.

Mitigation

The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight positive Impact on Climate due to providing additional pedestrian and cycle access to Maynooth Town.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.3.6 *Moyglare Bridge*

Greenhouse Gas Emissions

The operational phase of the Moyglare Bridge has the potential to release greenhouse gas emissions, primarily through the burning of fossil fuels, such as petrol and diesel for transport purposes and increased traffic volumes. This has the potential to lead to a Long-term Moderate Negative Impact on Climate as a result of greenhouse gas emissions.

Mitigation

The improved pedestrian and cycling infrastructure will provide alternative modes of transport for those living and working locally to Maynooth town and surrounding areas, which will reduce the dependency on vehicular transport and associated greenhouse gas emissions.

Residual Impact

Long-term Slight Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects

9.3.2.4 Cumulative Effects Resulting from Interactions Between Various Elements of the Proposed Development

The interaction of the various elements of the Proposed Development were considered and assessed in this EIAR with regards to climate. The potential for each individual element of the Proposed Development on its own to result in significant effects on climate was considered in the impact assessment. The entire project including the interactions between all its elements was also considered and assessed for its potential to result in significant effects on climate in the impact assessment presented.

All interactions between the various elements of the project were considered and assessed both individually and cumulatively within this chapter. Where necessary, mitigation was employed to ensure that no cumulative effects will arise as a result of the interaction of the various elements of the Proposed Development with one another.

9.3.2.5 Potential Cumulative In-Combination Effects

The potential cumulative effects of the Proposed Development in combination with the other projects described in Chapter 2 of this report have been considered in terms of impacts on population & human health.

There are a number of proposed or permitted housing developments within the vicinity of the Proposed Development. A description of the developments is provided in Chapter 2, and where appropriate the application documentation, EIAR and NIS for each development have been reviewed

Further information on the above is provided in Table 2-5 in Section 4.2.1 of Chapter 2.

9.3.2.5.1 Cumulative In-Combination Climate Impacts

Potential cumulative air quality impacts may arise during the construction phase due to possible overlap of the construction phases of the Proposed Development and other offsite developments and land uses. Agricultural activities in the area, light commercial activity, other local construction activities and the construction of the Proposed Development will require the consumption of fossil fuels and therefore will lead to a minor emissions of greenhouse gasses cumulatively. However, given the relatively small-scale machinery used, short-term duration of the construction phases, together with the implementation of the mitigation measures discussed above, there is unlikely to be significant cumulative impacts arising from the construction phases of the Proposed Development and other local developments, projects and plans.

The Proposed Development once operational will not lead to significant levels of greenhouse gas emissions, with emissions from the use of the buildings and increased traffic volumes mitigated to a Long-term Slight Negative Impact. Other future developments, including potential future applications within the Moygaddy Masterplan area and nearby permitted residential developments, in the area once constructed will also contribute to increased traffic levels and associated exhaust emissions. However, these developments will also employ their own mitigation measures and therefore the cumulative impact on climate from the release of greenhouse gasses during the operation of the Proposed Development when considered with other developments will be Long-term Slight Negative Impact.