8. AIR QUALITY AND CLIMATE

8.1 Introduction

This chapter assesses the likely air quality and climate impacts, if any, associated with the proposed residential development at Clonminch, Tullamore, Co. Offaly. The site is located south of Tullamore town and adjacent to the N52. A full description of the development can be found in Chapter 3.

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This chapter has been prepared with regard to the following guidelines:

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018)
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017);

8.2. Study Methodology

8.2.1. Criteria for Rating of Impacts

8.2.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 8.1 and Appendix 8.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC, which has set limit values for NO_2, PM_{10} and $PM_{2.5}$ which are applicable in relation to this project (see Table 8.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see Appendix 8.1).

Table 8.1: Ambient Air Quality Standards

Pollutant	Regulation [Note 1]	Limit Type	Value
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
		Critical level for protection of vegetation	30 µg/m3 NO + NO_2
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3
Dust Deposition (Non – Hazardous Dust)	TA-Luft as interpreted by DEHLG (2004)	Average daily dust deposition at the boundary of the site	350 mg/(m^2*day)

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

8.2.1.2 **Dust Deposition Guidelines**

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$) and the EU ambient air quality standards outlined in Table 8.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Health & Local Government (DEHLG, 2004) 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 of the proposed development.

8.2.1.3 **Climate Agreements**

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

Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

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

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

The *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2019). The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

In October 2020, the Climate Action and Low Carbon Development (Amendment) Bill 2020 (Government of Ireland, 2020) was published in draft format (draft 2020 Climate Act) which amends and enhances the 2015 Climate Act. Once approved, the purpose of the 2020 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050*'. The 2020 Climate Act will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy*'. The 2020 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action

Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

8.2.1.4 **Construction Phase**

The current assessment focuses on identifying the existing baseline levels of PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the proposed development.

Increased traffic emissions associated with site vehicles and HGVs can also impact air quality during construction. The traffic data for the construction phase of the development has been reviewed in line with the DMRB assessment criteria outlined below. The UK DMRB guidance (UK Highways Agency, 2019a) states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

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

None of the road links impacted by the proposed development during construction meet the above criteria and therefore can be scoped out of a detailed air quality assessment.

8.2.1.5 **Operational Phase**

8.2.1.5.1 Air Quality Assessment

The air quality assessment has been carried out following procedures described in the publications by the EPA (2015; 2017) and using the methodology outlined in the guidance documents published by the UK Highways Agency (2019a) and UK Department of Environment Food and Rural Affairs (DEFRA) (2016; 2018). Transport Infrastructure Ireland (TII) reference the use of the UK Highways Agency and DEFRA guidance and methodology in their document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011). This approach is considered best practice in the absence of Irish guidance.

In 2019 the UK Highways Agency DMRB air quality guidance was revised with *LA 105 Air Quality* replacing a number of key pieces of guidance (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). This revised document outlines a number of changes for air quality assessments in relation to road schemes and residential/mixed-use developments. Previously the DMRB air quality spreadsheet was used for the majority of assessments in Ireland with detailed modelling only required if this screening tool indicated compliance issues with the EU air quality standards. Guidance from Transport Infrastructure Ireland (TII, 2011) recommends the use of the UK Highways Agency DMRB spreadsheet tool for assessing the air quality impacts from road schemes. However, the DMRB spreadsheet tool was last revised in 2007 and accounts for modelled years up to 2025. Vehicle emission standards up to Euro V are included but since 2017, Euro 6d standards are applicable for the new fleet. In addition, the model does not account for electric or hybrid vehicle use. Therefore, this a somewhat

outdated assessment tool. The LA 105 guidance document states that the DMRB spreadsheet tool may still be used for simple air quality assessments where there is unlikely to be a breach of the air quality standards. Due to its use of a "dirtier" fleet, vehicle emissions would be considered to be higher than more modern models and therefore any results will be conservative in nature and will provide a worst-case assessment.

The 2019 UK Highways Agency DMRB air quality guidance was revised with *LA 105 Air Quality* stating that modelling should be conducted for NO_2 for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the do minimum and do something scenarios. Modelling of $PM_{2.5}$ is not required as there are currently no issues with compliance with regard to this pollutant. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Historically modelling of carbon monoxide (CO) and benzene (Bz) was required however, this is no longer needed as concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres (EPA, 2020a). The key pollutant reviewed in this assessment is NO_2. Concentrations of PM_{10} have been reviewed for the baseline year to show there are no issues with compliance. Modelling of operational NO_2 concentrations has been conducted for the base year (2019) as well as the do nothing and do something scenarios for the opening year (2028) and design year (2038).

The TII guidance (2011) states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK Highways Agency scoping criteria guidance outlined in Section 8.2.1.4 was used to determine the road links required for inclusion in the modelling assessment. Sensitive receptors within 200m of impacted road links are included within the modelling assessment. Pollutant concentrations are calculated at these sensitive receptor locations to determine the impact of the proposed development in terms of air quality. The guidance states a proportionate number of representative receptors which are located in areas which will experience the highest concentrations or greatest improvements as a result of the proposed development are to be included in the modelling (UK Highways Agency, 2019a). The TII guidance (2011) defines sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. Three sensitive receptors (residential properties R1, R2 and R3) were included in the modelling assessment and are detailed in Figure 8.1.

The following model inputs are required to complete the assessment using the DMRB spreadsheet tool: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles (%HGV), annual average traffic speeds and background concentrations. Using this input data, the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using

generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards.

The TII *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011) detail a methodology for determining air quality impact significance criteria for road schemes, which can be applied to any project that causes a change in traffic flows. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Appendix 8.1, Table A8.1.1 to Table A8.1.3. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3).

Conversion of NO_x to NO_2

NO_X (NO + NO_2) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV's the proportion of NO_X emitted as NO_2, rather than NO is increasing. With the correct conditions (presence of sunlight and O_3) emissions in the form of NO, have the potential to be converted to NO_2.

Transport Infrastructure Ireland states the recommended method for calculating the conversion of NO_x to NO_2 in "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*" (TII, 2011). The TII guidelines recommend the use of DEFRAs NO_x to NO_2 calculator (2020) which was originally published in 2009 and is currently on version 8.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O_3 and proportion of NO_x emitted as NO for each local authority across the UK. O_3 is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO_2 or PM_{10}.

The calculator includes Local Authorities in Northern Ireland and the TII guidance recommends the use of 'Armagh, Banbridge and Craigavon' as the choice for local authority when using the calculator. The choice of Craigavon provides the most suitable relationship between NO_2 and NO_x for Ireland. The "non-urban UK traffic" traffic mix option was used.

Traffic Data Used in Modelling Assessment

Traffic flow information was obtained from DBFL Consulting Engineers for the purposes of this assessment. Data for the Do Nothing and Do Something scenarios for the base year 2019, opening year 2028 and design year 2038 were provided. The traffic data is detailed in Table 8.2 with the %HGV shown in parenthesis below the AADT. Only road links that met the DMRB scoping criteria outlined in Section 8.2.1.4 and that were within 200m of receptors were included in the modelling assessment. The majority of road links within the Traffic Impact Assessment have been scoped out of the air quality modelling assessment as they do not meet the assessment

criteria and impacts from traffic changes on these links can be considered imperceptible. Background concentrations have been included as per Section 8.3.3 of this chapter based on available EPA background monitoring data (EPA, 2020a). This traffic data has also been used in the operational stage climate impact assessment.

Table 8.2: Traffic Data used in the Air Quality & Climate Modelling Assessment

Road Name	Speed (kph)	Base Year 2019	Opening Year 2028		Design Year 2038	
			Do Nothing	Do Something	Do Nothing	Do Something
Clonminch Link B*	60	13,042 (6.3%)	14,514 (7.1%)	15,624 (6.6%)	15,248 (8.2%)	16,359 (7.7%)
Clonminch Link D*	50	8,521 (3.4%)	9,503 (3.8%)	11,378 (3.2%)	9,983 (4.4%)	11,858 (3.7%)
Clonminch Link E*	68	8,399 (2.1%)	9,334 (2.3%)	11,209 (1.9%)	9,808 (2.7%)	11,682 (2.3%)
Clonminch Link F	68	8,399 (2.1%)	9,334 (2.3%)	10,321 (2.1%)	9,808 (2.7%)	10,794 (2.4%)

Note 1 Links marked with an asterix (*) were included within the local air quality assessment. All links were included within the climate assessment.

Figure 8.1 Approximate Location of Sensitive Receptors used in Air Quality Modelling Assessment

8.2.1.5.2 Climate Assessment

Ireland has annual GHG targets which are set at an EU level and need to be complied with in order to reduce the impact of climate change. Impacts to climate as a result of GHG emissions are assessed against the targets set out by the EU under *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by*

Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013. Which has set a target of a 30% reduction in non-ETS sector emissions by 2030 relative to 2005 levels.

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established by reference to EPA data on annual GHG emissions (see Section 8.3.3). Thereafter the impact of the proposed development on climate is determined. Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate.

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019b). The following scoping criteria are used to determine whether a detailed climate assessment is required for a the operational stage of a proposed project. During operation, will roads meet or exceed any of the following criteria:

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

If any of the road links meets one or more of the above criteria, then further assessment is required. There are a number of road links that will experience an increase of 10% or more in the AADT. These road links have been included in the detailed climate assessment (see Table 8.2). The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (2011) and the methodology provided in Annex D in the UK Design Manual for Roads and Bridges (UK Highways Agency, 2007). The assessment focused on determining the resulting change in emissions of and carbon dioxide (CO_2). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any development that causes a change in traffic. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds (see Table 8.2).

The EU guidance (2013) also states indirect GHG emissions as a result of a development must be considered, this includes emissions associated with energy usage. The Building lifecycle Report and Architectural Design Statement prepared in relation to the proposed development have been reviewed and used to inform the operational phase climate assessment. These reports outline a number of measures that have been incorporated into the overall design of the development to reduce the impact to climate where possible.

8.2.1.5.3 Air Quality Impact on Sensitive Ecological Sites

For routes that pass within 2 km of a designated area of conservation (either Irish or European designation) the TII requires consultation with an Ecologist (2011). However, in practice the potential for impact to an ecological site is highest within 200m of a road and when significant changes in AADT (>5%) occur. Only sites that are sensitive to nitrogen deposition should be included in the assessment.

TII's *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (2009) and *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (DEHLG, 2010) provide details regarding the legal protection of designated conservation areas.

If both of the following assessment criteria are met, an assessment of the potential for impact due to nitrogen deposition shall be conducted:

- A designated area of conservation is located within 200 m of the proposed development; and
- A significant change in AADT flows (>5%) will occur.

There are no designated sites within 200m of any of the road links impacted by the proposed development and therefore this assessment is not required.

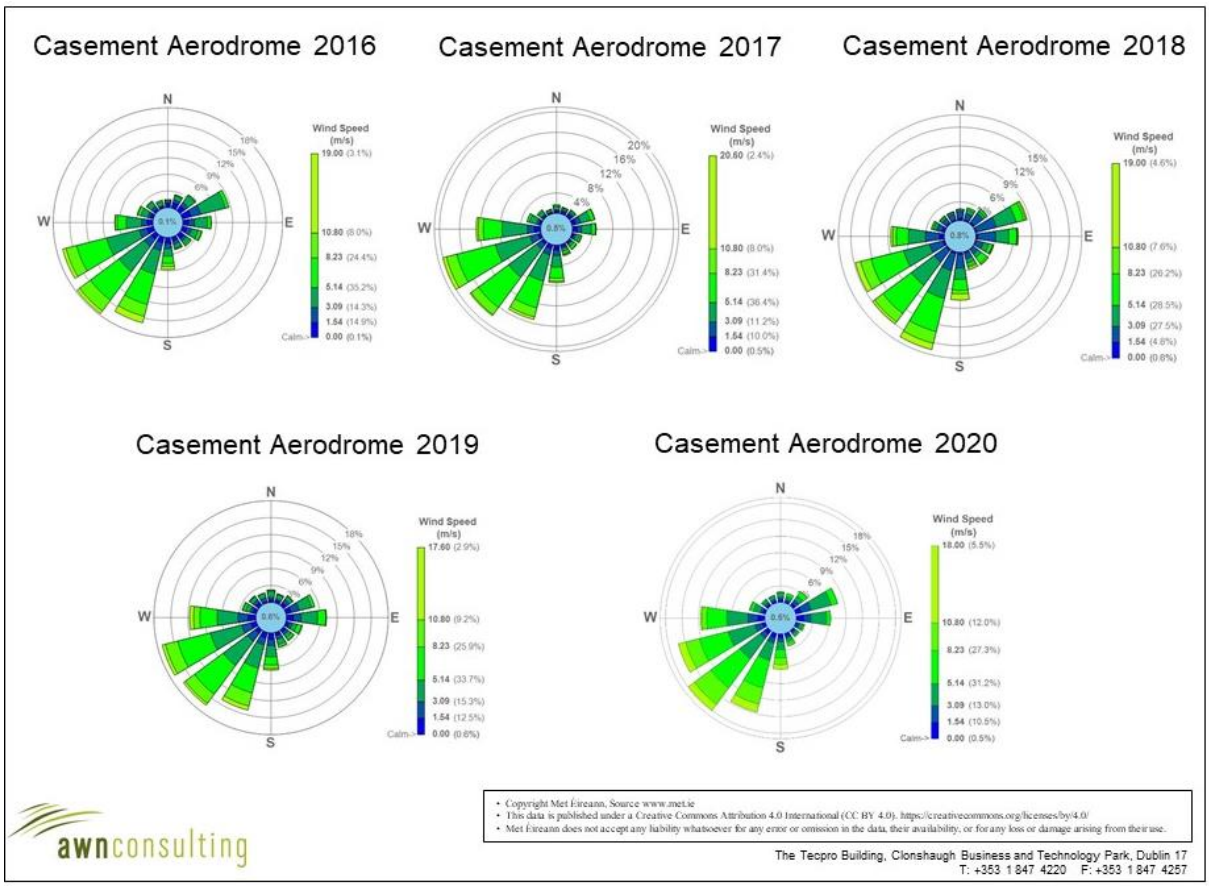
8.3. Receiving Environment

8.3.1. Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Casement Aerodrome, which is located approximately 70 km east of the site. Casement Aerodrome meteorological data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 8.2). For data collated during five representative years (2015 – 2019), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.5 m/s over the period 2005 – 2019 (Met Eireann, 2020).

Figure 8.2 Casement Aerodrome Windrose 2016 - 2020



8.3.2. Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA. The most recent annual report on air quality in Ireland is "*Air Quality in Ireland 2019*" (EPA, 2020a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2021).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development site is within Zone D (EPA, 2021). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2020a), at suburban (non-roadside) Zone D locations show that current levels of NO_2 are well below both the annual and 1-hour limit values, with annual average levels ranging from 4 - 8 µg/m^3 in 2019 (see Table 8.3). Sufficient data is available for the stations in Castlebar, Kilkitt and Emo to observe the long-term trend since 2015 (EPA, 2020a) (see Table 8.3), with results

ranging from 2 - 9 µg/m^3 and few exceedances of the one-hour limit value. Based on the information below and keeping regard for the distance from the town centre of Tullamore, a conservative estimate of the current background NO_2 concentration for the region of the proposed development is 8 µg/m^3.

Table 8.3 Trends in Zone D Air Quality – Nitrogen Dioxide (NO_2)

Year	Castlebar	Kilkitt	Emo
2015	8	2	3
2016	9	3	4
2017	7	2	3
2018	8	3	3
2019	8	5	4
Average	**8**	**3**	**4**

Note 1 *Annual average limit value - 40 µg/m3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).*

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar and Claremorris in 2019. The average annual mean concentrations measured at the sites was at most 16 µg/m^3 over the 5-year period (Table 8.4). Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2019 gave an average level of 7 µg/m^3 (EPA, 2020a). The average results over the last five years at a range of Zone D locations suggests an upper average of no more than 13 µg/m^3 as a background concentration. Based on the above information a conservative estimate of the current background PM_{10} concentration for the region of the development in 2021 is 13 µg/m^3.

Table 8.4 Trends in Zone D Air Quality -PM_{10}

Year	Castlebar	Kilkitt	Claremorris
2015	13	9	10
2016	12	8	10
2017	11	8	11
2018	11	9	12
2019	16	7	11
Average	**13**	**8**	**11**

Note 1 *Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).*

The results of $PM_{2.5}$ monitoring at Claremorris in 2019 indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.4, with ratios of up to 0.6 in the past five years. Based on this information, a conservative ratio of 0.7 was used to generate a current background $PM_{2.5}$ concentration of 9.1 µg/m^3.

Background concentrations for Opening Year 2028 and Design Year 2038 have been calculated. These have used current estimated background concentrations and the year on year reduction factors provided by Transport Infrastructure Ireland in the *Guidelines for the Treatment of Air Quality During the Planning and Construction of*

National Road Schemes (2011) and the UK Department for Environment, Food and Rural Affairs LAQM.TG(16) (2018).

8.3.3. Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2019 (EPA, 2020b). The data published in 2020 states that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.98 Mt. For 2019, total national greenhouse gas emissions are estimated to be 59.90 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 45.71 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2019 at 35.3% of the total, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are estimated to be 4.5% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq and 6.98 MtCO_2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA 2019) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 – 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO_2eq under the "With Existing Measures2 scenario and 9 Mt CO_2eq under the "With Additional Measures" scenario (EPA, 2019).

8.3.4. Sensitivity of the Receiving Environment

In line with the IAQM guidance document (2014) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are multiple residential developments located along the west boundary of the site and private residential properties located on the south boundary of the site. As such there are between 10 – 100 high sensitivity receptors within 20m of the proposed works. Based on the IAQM criteria outlined in Table 8.5, the worst case sensitivity of the area to dust soiling is considered to be **high.**

Table 8.5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from source (m)			
		<20	**<50**	**<100**	**<350**
High	>100	High	High	Medium	Low
	10-100	**High**	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is estimated to be 13 µg/m^3 and there are between 10 – 100 high sensitivity receptors located within 20m of the proposed works. Based on the IAQM criteria outlined in Table 8.6, the worst case sensitivity of the area to human health impacts is considered **low**.

Table 8.6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from source (m)			
			<20	**<50**	**<100**	**<200**
High	< 24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	**Low**	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low

8.4. Characteristics of the Proposed Development

The site is located south of Tullamore town and adjacent to the N52. The proposed development will provide a mix of dwellings including apartments, semi-detached and terraced houses. Public open space, a childcare facility and a neighbourhood centre will also be provided along with associated infrastructure. A full description of the development can be found in Chapter 3.

When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

A. construction phase, and;

B. operational phase.

During the construction stage the main source of air quality impacts will be as a result of fugitive dust emissions from site activities. Emissions from construction vehicles and machinery have the potential to impact climate. The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows on local road links which are affected by the development. The following describes the primary sources of potential air quality and climate impacts which have been assessed as part of this EIAR.

8.5. Potential Impacts of the Proposed Development

8.5.1. Construction Phase

8.5.1.1 Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust and PM_{10}/$PM_{2.5}$ emissions. While there are between 10 – 100 sensitive receptors within 20 meters from the proposed development, the sensitivity of the area to dust related human health impacts is low (Table 8.6). The proposed development can be considered large in scale and therefore there is the potential for significant dust soiling 100m from the source (TII 2011) (Table 8.7). While construction dust tends to be deposited within 350m of a construction site, the majority of the deposition occurs within the first 50m. There are multiple residential developments bordering the site to the west along with private residential developments bordering the south of the site. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. Provided the dust minimisation measures outlined in the plan (see Appendix 8.3) are adhered to, the air quality impacts during the construction phase will be short-term and not significant.

Table 8.7 Assessment Criteria for the Impact of Dust from Construction with Standard Mitigation in Place

Source		**Potential Distance for Significant Effects (Distance From Source)**		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

Source TII 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (2011)

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the DMRB assessment criteria as per Section 8.2.1.4. It can therefore be determined that the construction stage traffic will have a neutral, imperceptible and short-term impact on air quality.

8.5.1.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management Document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible, neutral and short term.

8.5.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the air quality impact of construction of the proposed development will be short-term, negative and imperceptible with respect to human health.

8.5.2. Operational Phase

8.5.2.1 Local Air Quality Assessment

TII Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII, 2011) detail a methodology for determining air quality impact significance criteria for road schemes and has been adopted for this assessment, as is best practice. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

The impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The impact of NO_2 emissions for the opening and design years was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (2016, 2018). Firstly, background concentrations have been included in the modelling study. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern. Appropriate background levels were selected based on the available monitoring data provided by the EPA (EPA, 2020a) (see Section 8.3.3). The modelling scenarios include for the cumulative impact of other developments in the vicinity of the proposed development, where such information is available.

The results of the assessment of the impact of the proposed development on NO_2 in the opening and design years are shown Table 8.8 for opening year 2028 and Table 8.9 for the design year 2038. The annual average concentration is within the limit value at all worst-case receptors. Levels of NO_2 are 35% of the annual limit value in 2028 and 36% in 2038. The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th percentile (i.e.

it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in 2028 or 2038 (Table 8.10).

The impact of the proposed development on annual mean NO_2 levels can be assessed relative to "Do Nothing (DN)" levels in 2028 and 2038. Relative to baseline levels, some imperceptible to small increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, the greatest impact on NO_2 concentrations will be an increase of 1.3% of the annual limit value at receptor R1. Thus, using the assessment criteria outlined in Appendix 8.1 Tables A8.1.1 – A8.1.2, the impact of the proposed development in terms of NO_2 is negligible. Therefore, the overall impact of NO_2 concentrations as a result of the proposed development is long-term and imperceptible at all of the receptors assessed.

Concentrations of PM_{10} were modelled for the baseline year of 2019. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m^3 at all receptors assessed, therefore, further modelling for the opening and design years was not required. Concentrations reached at most 0.81 µg/m^3. When a background concentration of 13 µg/m^3 is included the overall impact is 35% of the annual limit value at the worst case receptor.

The impact of the proposed development on ambient air quality in the operational stage is considered long-term, localised, negative and imperceptible.

Table 8.8 Predicted Annual Mean NO_2 Concentrations – Opening Year 2028 (µg/m^3)

Receptor	DN	DS	DS-DN	Magnitude	Description
R1	10.6	11.1	0.49	Small	Negligible Increase
R2	10.9	11.4	0.47	Small	Negligible Increase
R3	13.8	13.9	0.12	Imperceptible	Negligible Increase

Table 8.9 Predicted Annual Mean NO_2 Concentrations – Design Year 2038 (µg/m^3)

Receptor	DN	DS	DS-DN	Magnitude	Description
R1	10.7	11.2	0.51	Small	Negligible Increase
R2	11.1	11.6	0.47	Small	Negligible Increase
R3	14.4	14.4	-0.01	Imperceptible	Negligible Decrease

Table 8.10 Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3)

Receptor	Opening Year (2028)		Design Year (2038)	
	DN	DS	DN	DS
R1	37.1	38.8	37.5	39.3
R2	38.2	39.9	38.9	40.6
R3	48.4	48.8	50.3	50.3

8.5.2.2 Climate Assessment

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. However, adequate attenuation and drainage have been provided for to account for increased rainfall in future years as part of the design of this development. Therefore, the impact will be long-term, localised, neutral and imperceptible.

There is also the potential for increased traffic volumes to impact climate. The impact of the proposed development on emissions of CO_2 were assessed using the Design Manual for Roads and Bridges screening model (see Table 8.11). The results show that the impact of the proposed development in 2028 will be to increase CO_2 emissions by 0.00029% of Ireland's EU 2030 Target. In the design year of 2038, the proposed development will also increase CO_2 emissions by 0.00029% of the EU 2030 Target. Thus, the impact of the proposed development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2030 Targets.

Therefore, the likely overall magnitude of the changes on climate in the operational stage is long-term and negative and imperceptible.

Table 8.11 Climate Assessment

Year	Scenario	CO_2 (tonnes/annum)
2028	Do Nothing	1,083
	Do Something	1,178
2038	Do Nothing	1,175
	Do Something	1,271
Increment in 2028		95.0 Tonnes
Increment in 2038		96.3 Tonnes
Emission Ceiling (kilo Tonnes) 2030 Note 1		**32,860**
Impact in 2028 (%)		0.00029 %
Impact in 2038 (%)		0.00029 %

Note 1 Target under Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2

In addition, the proposed development has been designed to reduce the impact to climate where possible during operation by incorporating a number of measures into the design of the development. The proposed development will ensure compliance with current Part L of the Building Regulations and also the residential policy (Chapter 8) of the Offaly County Council Development Plan (2014-2020) & Renewable Energy Directive 2009/28/EC and the National Renewable Energy Action Plan (NREAP).

The proposed development will be built to NZEB (Near Zero Energy Building) standard. Robust materials with good longevity will be chosen to reduce maintenance costs and embodied carbon of materials due to replacement requirements. It is proposed to include possible heat pumps or exhaust air heat pumps throughout the development as these systems operate with very high efficiency which provides significant carbon reductions in comparison to a traditional boiler system. The use of photovoltaic panels may also be implemented throughout the development to heat hot water and aid the electricity supply. The use of Compact Fluorescent Lamps (CFLs) or LED lamps will also be incorporated into the design of this development using 80% less electricity and last up to 10 times longer than an ordinary light bulb.

As part of the proposed development, it is proposed to provide segregated cycle-tracks along Clonminch Road. This will provide the option for people to use more sustainable modes of transport and reduce the use of

personal passenger cars. Sustainable modes of transport have been prioritised where possible within the proposed development. Electric vehicle charging infrastructure has also been provided along with a significant number of bicycle parking spaces. All of these measures will help to reduce the carbon footprint of the proposed development and the operational impact on climate.

8.5.2.3 Human Health

Air dispersion modelling of operational traffic emissions was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions as a result of the proposed development are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. The receptors modelled represent the worst-case locations impacted by additional traffic generated by the proposed development, all other locations will have a lesser impact than the receptors modelled in this assessment. The impact to human health is predicted to be long-term, negative and imperceptible.

8.5.3. 'Do Nothing' Scenario

The Do Nothing scenario includes retention of the current site without the proposed residential development. In this scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc).

The Do Nothing scenario for the operational phase is assessed within Section 8.5.2.

8.6. Mitigation Measures

In order to sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed development.

8.6.1. Construction Phase

8.6.1.1 Air Quality

The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the dust management plan. The key aspects of controlling dust are listed below. Full details of the dust management plan can be found in Appendix 8.3. In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.

- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

8.6.1.2 Climate

Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to the scale and nature of the works the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

8.6.2. Operational Phase

The operational phase air quality impact is considered imperceptible and therefore no site specific mitigation measures are required.

8.7. Predicted Impact of the Proposed Development

8.7.1. Construction Phase

8.7.1.1 Air Quality

When the dust minimisation measures detailed in the mitigation section and Appendix 8.3 of this Chapter are implemented, fugitive emissions of dust from the site will be short-term, negative, localized and imperceptible and will pose no nuisance at nearby receptors.

8.7.1.2 Climate

Due to the scale and nature of the construction activities CO_2 and N_2O emissions during construction will have an imperceptible, neutral and short-term impact on climate.

8.7.2. Operational Phase

The results of the air dispersion modelling study indicate that the residual impacts of the proposed development on air quality and climate is predicted to be long-term, negative and imperceptible with respect to the operational phase.

8.8. Cumulative Impacts

8.8.1. Construction Phase

As with the proposed development, the primary source of air quality impacts during the construction phase of nearby committed developments will be the potential for nuisance dust impacts. According to the IAQM guidance (2014), there is the potential for cumulative construction dust impacts if the construction phase of a proposed development coincides with the construction of another development within 350m. The dust minimisation measures outlined for the proposed development should be implemented throughout the construction phase of the proposed development to avoid any cumulative nuisance dust impacts occurring. Once these minimisation measures are in place the impact to air quality is considered short-term and imperceptible.

Construction machinery and vehicles have the potential to impact climate through the release of GHG emissions. However, based on the nature and scale of the proposed works CO_2 and N_2O emissions during the two to four year construction phase, there will be an imperceptible impact on climate.

The mitigation measures should be implemented throughout the construction phase of the proposed development to ensure that the impact of the developments complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the cumulative impact of construction of the proposed development is likely to be short-term and imperceptible with respect to human health.

8.8.2. Operational Phase

The local air quality impact assessment and climate impact assessment described earlier in Sections 8.5.2.1 and 8.5.2.2 have been based on cumulative traffic data incorporating projected traffic from existing and committed developments in the vicinity of the project site. As the outcomes of those assessments concluded that impacts will be long-term and imperceptible with respect to air quality and climate, no further cumulative impact assessment is required for the proposed development.

8.9. Monitoring

8.9.1. Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors (residential dwellings) during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel

located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28-32 days.

8.9.2. Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

8.10. Difficulties Encountered

There were no difficulties encountered while carrying out this Air Quality and Climate assessment.

8.11. References

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

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

8.12. Appendices

APPENDIX 8.1: AMBIENT AIR QUALITY STANDARDS

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

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

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

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regard to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 µg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m^3, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for

$PM_{2.5}$ concentrations of less than 8.5 µg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m^3). Where the AEI is currently greater than 22 µg/m^3 all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 was set to be complied with by 2015 again based on the AEI.

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

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

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

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

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects

of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

APPENDIX 8.2: TRANSPORT INFRASTRUCTURE IRELAND SIGNIFICANCE CRITERIA

Table A8.2.1: *Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations*

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m³	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m³	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m³
Medium	Increase / decrease 2 - <4 µg/m³	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m³
Small	Increase / decrease 0.4 - <2 µg/m³	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m³
Imperceptible	Increase / decrease <0.4 µg/m³	Increase / decrease <1 day	Increase / decrease <0.25 µg/m³

Table A8.2.2: *Air Quality Impact Significance Criteria For Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor*

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration [Note 1]		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

[Note 1] *Well Below Standard = <75% of limit value.*

Table A8.2.3: *Air Quality Impact Significance Criteria for Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor*

Absolute Concentration in Relation to Objective / Limit Value	**Change in Concentration** Note 1		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value with Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value with Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value with Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value with Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

APPENDIX 8.3: DUST MANAGEMENT PLAN

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997).

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 8.2 for the windrose Casement Aerodrome). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (IAQM, 2014; UK ODPM, 2002). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;

- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK ODPM, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site shall be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK ODPM, 2002).
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.