

AIR QUALITY & CLIMATE IMPACT ASSESSMENT FOR FORMER BLAKES AND ESMONDE MOTORS SITE

Technical Report Prepared For

**John Spain & Associates,
39 Fitzwilliam Pl,
Dublin 2**

Technical Report Prepared By

Niamh Nolan BSocSci AMIAQM

Our Reference

NN/21/12054AR01_1

Date Of Issue

30 March 2022


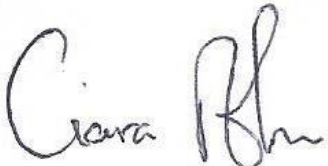
Dublin Office
The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.
T: + 353 1 847 4220
F: + 353 1 847 4257

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, T Hayes, D Kelly, E Porter

Document History

Document Reference		Original Issue Date	
21/12054AR01		08 October 2021	
Revision Level	Revision Date	Description	Sections Affected
_1	13/12/21	Updated traffic data & background information	4.2, 4.3 & 5.2

Record of Approval

Details	Written by	Checked by
Signature		
Name	Niamh Nolan	Ciara Nolan
Title	Air Quality Consultant	Air Quality Consultant
Date	30 March 2022	30 March 2022

EXECUTIVE SUMMARY

AWN Consulting Ltd. were commissioned to investigate the potential air quality and climate impacts associated with the proposed development at the former Blakes and Esmonde motor sites, Stillorgan, Dublin. The potential impacts and the outcome of the assessment are summarised below.

Impacts to air quality and climate can occur during both the construction and operational phases of the proposed development. With regard to the construction stage the greatest potential for air quality impacts is from fugitive dust emissions impacting nearby sensitive receptors. Construction plant and traffic can emit air pollutants which can also impact air quality and climate. In terms of the operational stage impacts to air quality and climate will be as a result of traffic emissions due to an increased number of vehicles and a change in traffic flows on nearby roads as a result of the proposed development.

Any potential dust impacts can be mitigated through the use of best practice and minimisation measures which are outlined in this report. Dust impacts will be short-term and imperceptible at all nearby sensitive receptors once the mitigation measures are implemented. Once works are completed dust levels will return to baseline conditions. A detailed air quality assessment of emissions from traffic has been conducted. The operational stage impact to air quality and climate is considered long-term, negative and imperceptible.

No significant impacts to air quality and climate are predicted during the construction or operational phases of the proposed development.

CONTENTS	Page
Executive Summary	3
1.0 Introduction	5
2.0 Assessment Criteria	5
3.0 Methodology	8
4.0 Baseline Environment	13
5.0 Impact Assessment	17
6.0 Mitigation Measures	20
7.0 Conclusions	22
References	23

1.0 INTRODUCTION

AWN Consulting Ltd. has been commissioned to carry out an assessment of the potential air quality and climate impacts as a result of the proposed mixed-use development (residential, restaurant, community sports hall, office hub, creche, residential support facilities) at the former Blakes and Esmonde motor sites, Stillorgan, Dublin.

The development will consist of the construction of a mixed use scheme of 377 no. "Built to Rent" BTR apartments, Community Sports Hall (933 sq. m), along with 5 no. restaurant/café (c. 841.2 sq.m), creche (c. 215 sq. m), office hub (195.3 sq. m) and ancillary residents' support facilities/services (1,016 sq. m) laid out in 6 no. blocks ranging in height from 3-9 storeys (over basement) comprising 21 no. studio apartments, 189 no. 1 bedroom apartments, 159 no. 2 bedroom apartments & 8 no. 3 bedroom apartments, and public realm upgrades on a site of c. 1.41 hectares.

2.0 ASSESSMENT CRITERIA

2.1 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.

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 European Commission Directive 2008/50/EC which has set limit values for a number of pollutants with the limit values for NO₂, PM₁₀ and PM_{2.5} being relevant to this assessment (see Table 1). Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC).

Pollutant	Regulation ^{Note 1}	Limit Type	Value
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust	350 mg/(m ² *day)
Nitrogen Dioxide	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
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 PM ₁₀
		Annual limit for protection of human health	40 µg/m ³ PM ₁₀
Particulate Matter (as PM _{2.5})	2008/50/EC	Annual limit for protection of human health	25 µg/m ³ PM _{2.5}

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

Table 1 Ambient Air Quality Standards

2.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in section 2.1 have set ambient air quality limit values for PM₁₀ and PM_{2.5}.

With regard 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.

However, guidelines for 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/(m²*day) averaged over a one year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled ‘Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/(m²*day) be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

2.3 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 adaptation 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, inter alia, a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019a). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a). The plan contains similar elements as the 2019 CAP and aims to set out how Ireland can reduce our greenhouse gas emissions by 51% by 2030 (compared to 2018 levels) which is in line with the EU ambitions, and a longer-term goal of achieving net-zero emissions no later than 2050. The 2021 CAP outlines that emissions from the Built Environment sector must be reduced to 4 -5 MtCO₂e by 2030 in order to meet our climate targets. This will require further measures in addition to those committed to in the 2019 CAP. This will include phasing out the use of fossil fuels for the space and water heating of buildings, improving the fabric and energy of our buildings, and promoting the use of lower carbon alternatives in construction.

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

The purpose of the 2021 Climate Act is to provide for the approval of plans 'for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050'. The 2021 Climate Act will

also 'provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'. The 2021 Climate Act defines the carbon budget as 'the total amount of greenhouse gas emissions that are permitted during the budget period'. The 2021 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

The Dun Laoghaire - Rathdown County Council Climate Change Action Plan 2019 – 2024 published in 2019 (Dun Laoghaire - Rathdown County Council and Codema, 2019) outlines a number of goals and plans to prepare for and adapt to climate change. There are five key action areas within the plan: Energy and Buildings, Transport, Flood Resilience, Nature-based Solutions and Resource Management. Some of the measures promoted within the Action Plan under the 5 key areas involve building retrofits, energy master-planning, better integration of transport and land use planning, increasing public bike facilities, developing public transport routes, development of flood resilient designs, promotion of the use of green infrastructure and waste prevention initiatives. The implementation of these measures will enable the Dun Laoghaire - Rathdown County Council area to adapt to climate change and will assist in bringing Ireland closer to achieving its climate related targets in future years. New developments need to be cognisant of the Action Plan and incorporate climate friendly designs and measures where possible.

3.0 METHODOLOGY

3.1 Construction Phase

3.1.1 Air Quality

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014) outlines an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site specific mitigation required. The use of UK guidance is considered best practice in the absence of applicable Irish guidance.

Construction phase traffic also has the potential to impact air quality and climate. The UK Highways Agency Design Manual for Roads and Bridges (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. The use of the UK guidance is recommended by the TII (2011) in the absence of specific Irish guidance, this approach is considered best practice and can be applied to any development that causes a change in traffic.

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

The construction stage traffic does not meet the above scoping criteria. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during construction as a result of traffic emissions.

3.1.2 Climate

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the proposed development.

3.2 Operational Phase

3.2.1 Air Quality

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 and can be applied to any development that causes a change in traffic.

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 but can be applied to any development that causes a change in traffic. 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 is 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 revised guidance *LA 105 Air Quality* states that modelling should be conducted for NO₂ for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. Modelling of PM₁₀ is only required for the base year to demonstrate that the air quality limit values in relation to PM₁₀ are not breached. Where the air quality modelling indicates exceedances of the PM₁₀ air quality limits in the base year then PM₁₀ 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 PM₁₀ can be used to show that the project does not impact on the PM_{2.5} limit value as if compliance with the PM₁₀ 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, 2021a).

The key pollutant reviewed in this assessment is NO₂. Modelling of operational NO₂ concentrations has been conducted for the do nothing and do something scenarios for the base year (2021) opening year (2024), design year (2039). 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 guidance *LA 150* (2019) scoping criteria outlined in Section 3.1 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. A total of 1 no. sensitive receptor within 200m of impacted road links were included within the modelling assessment (see Figure 1), this is a high sensitivity residential property.

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 document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011) details 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. 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 2 of the TII guidance document. The significance criteria are based on NO₂ and PM₁₀ as these pollutants are most likely to exceed the annual mean limit values (40 µg/m³).

Conversion of NO_x to NO₂

NO_x (NO + NO₂) 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 NO₂, rather than NO is increasing. With the

correct conditions (presence of sunlight and O₃) emissions in the form of NO, have the potential to be converted to NO₂.

Transport Infrastructure Ireland states the recommended method for the conversion of NO_x to NO₂ in *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011). The TII guidelines recommend the use of DEFRA's NO_x to NO₂ 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 O₃ and proportion of NO_x emitted as NO for each local authority across the UK. O₃ is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO₂ or PM₁₀.

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 NO₂ and NO_x for Ireland. The "All Non-Urban UK Traffic" traffic mix option was used.

Update to NO₂ Projections using DMRB

In 2011 the UK DEFRA published research (Highways England, 2013) on the long term trends in NO₂ and NO_x for roadside monitoring sites in the UK. This study marked a decrease in NO₂ concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this is that there now exists a gap between projected NO₂ concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO₂ concentrations for predicted future years. Subsequently, the UK Highways Agency published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years. This methodology has been used in the current assessment to predict future concentrations of NO₂ as a result of the proposed development.

Traffic Data Used in Modelling Assessment

Traffic flow information was obtained from Waterman Moylan for the purposes of this assessment. Data for the Do Nothing and Do Something scenarios for the base year 2021, opening year 2024 and design year 2039 were provided. The traffic data is worst case and in AADT which is detailed in Table 2 along with the % HGV. Only road links that met the DMRB scoping criteria outlined in Section 3.1 and that were within 200m of receptors were included in the modelling assessment. Background concentrations have been included as per Section 4.0 based on available EPA background monitoring data (EPA, 2021a).

This traffic data has also been used in the operational stage climate impact assessment.

Road Name	Base Year	Do-Nothing		Do-Something		Speed (kph)	HGV (%)
	2021	2024	2039	2024	2039		
Junction 2 – Arm B (The Hill)	5,192	5,447	5,606	6,577	6,737	50	1.16

Table 2 Traffic Data Used in Modelling Assessment



Figure 1 Location of Sensitive Receptors used in Air Quality Modelling Assessment

3.2.2 Climate

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 4.4). 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 (CO₂) 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 proposed project during the operational stage. If any of the road links impacted by the proposed development meet or exceed the below criteria, then further assessment is required.

- 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.

There is one road link that will experience an increase of 10% or more in the AADT. This road link has been included in the detailed climate assessment (see Table 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 carbon dioxide (CO₂). 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 project 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 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 Commercial and Residential Sustainability Energy Statement prepared in relation to this assessment has been reviewed and used to inform the operational phase climate assessment. This report outlines a number of measures in relation to energy usage from the proposed development primarily in relation to heat and electricity. A number of measures have been incorporated into the overall design of the development to reduce the impact to climate where possible.

4.0 BASELINE ENVIRONMENT

4.1 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 PM₁₀, 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} - PM₁₀) will actually increase at higher wind speeds. Thus, measured levels of PM₁₀ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport meteorological station, which is located approximately 15 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 2). For data collated during five representative years (2017 - 2021), the predominant wind direction is south-westerly (Met Eireann, 2022).

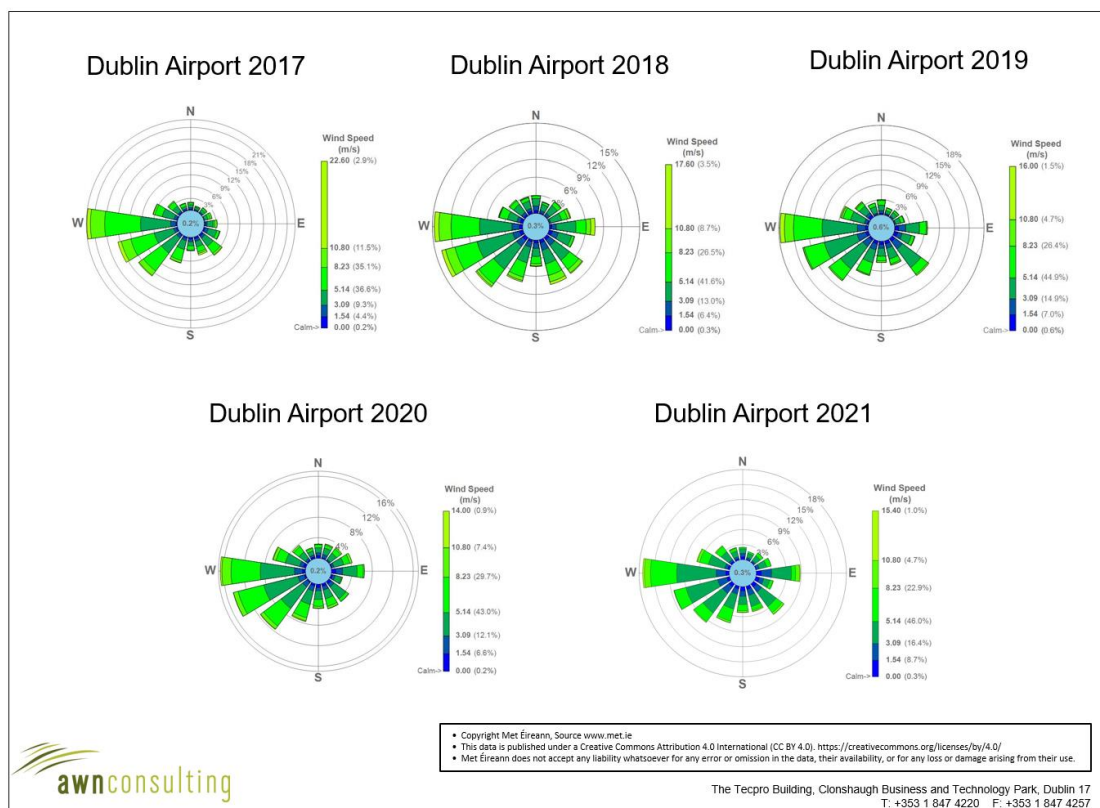


Figure 2 Dublin Airport Met Station Windrose 2017 – 2021 (Met Eireann, 2022)

4.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent EPA published annual report on air quality “*Air Quality In Ireland 2020*” (EPA 2021a) details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled ‘*Air Quality In Ireland 2020*’ (EPA 2021a). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the area of the proposed development is categorised as Zone A.

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

NO₂

With regard to NO₂, continuous monitoring data from the EPA (EPA, 2021a) at suburban Zone A locations in Ballyfermot, Dun Laoghaire, Swords and Rathmines show that current levels of NO₂ are below both the annual and 1-hour limit values, with annual average levels ranging from 15 – 22 µg/m³ in 2019 (see Table 3). Sufficient data is available for all stations to observe the long-term trend since 2015 (EPA, 2021a) (see Table 3), with results ranging from 13 – 22 µg/m³ and few exceedances of the one-hour limit value. The station in Dún Laoghaire is approximately 4 km east of the proposed development site and monitored background concentrations would be representative of the site location. Concentrations of NO₂ at the Dún Laoghaire site over the period 2015 – 2019 ranged from 15 - 19 µg/m³. Based on the above information, an estimate of the background NO₂ concentration in the region of the proposed development is 19 µg/m³.

Station	Averaging Period ^{Note 1,2}	Year				
		2015	2016	2017	2018	2019
Rathmines	Annual Mean NO ₂ (µg/m ³)	18	20	17	20	22
	Max 1-hr NO ₂ (µg/m ³)	106	102	116	138	183
Dún Laoghaire	Annual Mean NO ₂ (µg/m ³)	16	19	17	19	15
	Max 1-hr NO ₂ (µg/m ³)	103	142	153	135	104
Swords	Annual Mean NO ₂ (µg/m ³)	13	16	14	16	15
	Max 1-hr NO ₂ (µg/m ³)	170	206	107	112	108
Ballyfermot	Annual Mean NO ₂ (µg/m ³)	16	17	17	17	20
	Max 1-hr NO ₂ (µg/m ³)	142	127	148	217	124

^{Note 1} Annual average limit value of 40 µg/m³ and hourly limit value of 200 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

^{Note 2} 1-hour limit value - 200 µg/m³ as a 99.8th percentile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 3 Background NO₂ Concentrations In Zone A Locations (µg/m³)

PM₁₀

Continuous PM₁₀ monitoring carried out at the Zone A locations of Tallaght, Rathmines, Phoenix Park and Dún Laoghaire showed 2015 – 2019 annual mean concentrations ranging from 9 – 16 µg/m³ (Table 4), with at most 9 exceedances (in Rathmines) of the 24-hour limit value of 50 µg/m³ (35 exceedances are permitted per year). The most representative location is Dún Laoghaire which had an average annual mean concentration of 12.7 µg/m³ over the five year period. Based on the EPA data (Table 4) a conservative estimate of the current background PM₁₀ concentration in the region of the proposed development is 13 µg/m³.

Station	Averaging Period ^{Notes 1, 2}	Year				
		2015	2016	2017	2018	2019
Tallaght	Annual Mean PM ₁₀ (µg/m ³)	14	14	11.8	15	12
	24-hr Mean > 50 µg/m ³ (days)	4	0	2	1	3
Rathmines	Annual Mean PM ₁₀ (µg/m ³)	15	15	13	15	15
	24-hr Mean > 50 µg/m ³ (days)	5	3	5	2	9
Phoenix Park	Annual Mean PM ₁₀ (µg/m ³)	12	11	9	11	11
	24-hr Mean > 50 µg/m ³ (days)	2	0	1	0	2
Dún Laoghaire	Annual Mean PM ₁₀ (µg/m ³)	13	13	12	13	12
	24-hr Mean > 50 µg/m ³ (days)	3	0	2	0	2

^{Note 1} Annual average limit value of 40 µg/m³ and 24-hour limit value of 50 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

^{Note 2} 24-hour limit value - 50 µg/m³ as a 90.4thile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Table 4 Background PM₁₀ Concentrations In Zone A Locations (µg/m³)

PM_{2.5}

Continuous PM_{2.5} monitoring carried out at the Zone A location of Rathmines showed PM_{2.5}/PM₁₀ ratios ranging from 0.60 – 0.68 over the period 2015 – 2019. Based on this information, a conservative ratio of 0.7 was used to generate a background PM_{2.5} concentration in the region of the proposed development of 9.1 µg/m³.

Background concentrations for Opening Year 2024 and Design Year 2039 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).

4.3 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 2020 (EPA, 2021b). The data published in 2021 states that Ireland will exceed its 2020 annual limit set under the EU’s Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.73 Mt. For 2021, total national greenhouse gas emissions are estimated to be 57.70 million tonnes carbon dioxide equivalent (Mt CO₂eq) with 44.38 MtCO₂eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2021 at 37.1% of the total, with the transport sector accounting for 17.9% of emissions of CO₂.

GHG emissions for 2020 are estimated to be 3.6% lower than those recorded in 2019. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for five years in a row. Emissions from 2016 – 2020 exceeded the annual EU targets by 0.29 MtCO₂eq, 2.94 MtCO₂eq, 5.57 MtCO₂eq, 6.85 MtCO₂eq and 6.73 MtCO₂eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2020 – 2040 (EPA, 2021c) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018 and the Climate Action Plan published in 2019. Implementation of these are classed as a “*With Additional Measures scenario*” for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 to 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU’s Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 12.2MtCO₂eq under the “With Existing Measures” scenario and under the “With Additional Measures” scenario. The projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available (EPA, 2021c).

5.0 IMPACT ASSESSMENT

5.1 Construction Phase

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 PM₁₀/PM_{2.5} emissions. While construction dust tends to be deposited within 350m of a construction site, the majority of the deposition occurs within the first 50m. The proposed development can be considered moderate in scale and therefore, there is the potential for significant dust soiling impacts within 50m of the site (Table 5). The closest high sensitivity receptors (residential properties) to the site are approximately 5 – 10m to the south of the site. There are some commercial and industrial premises in close proximity to the site, however, these are regarded as having medium to low sensitivity in terms of dust impacts. In the absence of mitigation there is the potential for short-term, negative, slight impacts to nearby sensitive receptors as a result of construction dust emissions.

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

Table 5 Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place (TII, 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 in Section 3.1. It can therefore be determined that the construction stage traffic will have an imperceptible, negative, localised and short-term impact on air quality.

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 CO₂ and N₂O 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.

5.1.3 Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact human health through the release of PM₁₀ and PM_{2.5} emissions. As per Table 5 significant PM₁₀ emissions can occur within 15m of the site for a development of this scale. Therefore, in the absence of mitigation there is the potential for slight, negative, short-term impacts to human health as a result of the proposed development.

5.2 Operational Phase

5.2.1 Air Quality

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 NO₂ 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. The assessment was carried out at 1 no. high sensitivity residential receptor (R1) (see Figure 1).

Transport Infrastructure Ireland’s document *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 and this can be applied to any development that causes a change in traffic. 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 results of the assessment of the impact of the proposed development on NO₂ in the opening year 2024 are shown in Table 6 and for design year 2039 are shown in Table 7. The annual average concentration is in compliance with the limit value at the worst-case receptor in 2024 and 2039. Concentrations of NO₂ are at most 50% of the annual limit value in 2024 and at most 47% in 2039. There are some increases in traffic volumes between 2024 and 2039, therefore any reductions in concentrations are due to decreased background values. In addition, the hourly limit value for NO₂ is 200 µg/m³ 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 NO₂ concentration is not predicted to be exceeded in any modelled year (Table 8).

The impact of the proposed development on annual mean NO₂ concentrations can be assessed relative to “Do Nothing (DN)” levels. Relative to baseline levels, there are predicted to be some imperceptible increases in NO₂ concentrations at receptor R1. Concentrations will increase by at most 0.2% of the annual limit value in both 2024 and 2039. Using the assessment criteria outlined in TII (2011) guidance the impact of the proposed development in terms of NO₂ is considered negligible. Therefore, the overall

impact of NO₂ concentrations as a result of the proposed development is long-term, negative and imperceptible.

Concentrations of PM₁₀ were modelled for the baseline year of 2021. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m³ at all receptors assessed, therefore, further modelling for the opening and design years was not required as per the UK Highways Agency guidance (2019a). Concentrations reached at most 0.06 µg/m³ excluding background concentrations. When a background concentration of 13 µg/m³ is included the overall impact is 32.6% 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.

Receptor	Impact Opening Year 2024				
	DN	DS	DS-DN	Magnitude	Description
R1	19.9	19.9	0.07	Imperceptible	Negligible Increase

Note 1 Based on UK Highways Agency IAN technique for predicting future NO₂ concentrations
Table 6 Predicted Annual Mean NO₂ Concentrations – Opening Year 2024 (µg/m³)

Receptor	Impact Design Year 2039				
	DN	DS	DS-DN	Magnitude	Description
R1	19.0	19.1	0.09	Imperceptible	Negligible Increase

Note 1 Based on UK Highways Agency IAN technique for predicting future NO₂ concentrations
Table 7 Predicted Annual Mean NO₂ Concentrations – Design Year 2039 (µg/m³)

Receptor	Opening Year 2024		Design Year 2039	
	DN	DS	DN	DS
R1	69.5	69.8	66.4	66.7

Table 8 Predicted 99.8th percentile of Daily Maximum 1-hour NO₂ Concentrations (µg/m³)

5.2.2 Climate

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. A detailed flood risk assessment has been undertaken as part of this planning application and adequate attenuation and drainage have been provided for to account for increased rainfall in future years. Therefore, the impact will be imperceptible.

There is the potential for a number of greenhouse gas emissions to atmosphere during the operational phase of the development. The predicted concentrations of CO₂ for the future years of 2024 and 2039 are detailed in Table 9. These are significantly less than the 2024 and 2030 targets set out under EU legislation (targets post 2030 are not available). It is predicted that in 2024 the proposed development will increase CO₂ emissions by 0.00002% of the EU 2024 target. In 2039 CO₂ emissions will increase by

0.00002% of the 2030 target. Therefore, the climate impact of the proposed development is considered negative, long-term and imperceptible.

Year	Scenario	CO ₂
		(tonnes/annum)
2024	Do Nothing	29
	Do Something	35
2039	Do Nothing	30
	Do Something	36
Increment in 2024		6 Tonnes
Increment in 2039		6 Tonnes
Emission Ceiling (kilo Tonnes) 2024		40,113 ^{Note 1}
Emission Ceiling (kilo Tonnes) 2030		33,381 ^{Note 1}
Impact in 2024 (%)		0.00002 %
Impact in 2039 (%)		0.00002 %

^{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 525/2013

Table 9 Climate Impact Assessment

In addition, the proposed development has been designed to reduce the impact to climate where possible, the following measures have been incorporated into the design of the development: The use of photovoltaics as a means of providing a renewable source of energy for the building is being considered. The proposed development aims to be a “Near Zero – Energy Building” meaning it will have a very high energy performance. Further details of the measures to be incorporated into the design of the development are outlined within the Commercial and Residential Sustainability Energy Statement prepared in support of this planning application.

5.2.3 Human Health

Traffic related air emissions have the potential to impact air quality which can affect human health. However, air dispersion modelling of traffic emissions has shown that levels of all pollutants are below the ambient air quality standards set for the protection of human health. It can be determined that the impact to human health during the operational stage is long-term, negative and imperceptible.

6.0 MITIGATION MEASURES

6.1 Construction Phase

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. These measures will be incorporated into the overall construction environmental management plan (CEMP) for the site in order to prevent significant dust emissions from site. The main measures are summarized below:

- 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 will 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 will 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 and footpaths outside the site will be regularly inspected for cleanliness and cleaned as necessary. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- 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. Prior to demolition blocks should be soft striped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).

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.

Construction stage 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 CO₂ and N₂O emissions. However, due to short-term nature of these 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.

6.2 Operational Phase

6.2.1 Air Quality

The impact of the proposed development on air quality and climate is predicted to be imperceptible with respect to the operational phase in the long term. Therefore, no site specific mitigation measures are required.

7.0 CONCLUSION

No significant impacts to air quality or climate are predicted during the construction or operational phases of the proposed development. Once the best practice dust minimisation measures outlined in Section 6.1 are implemented, fugitive emissions of dust from the site during construction will be insignificant and pose no nuisance to nearby receptors. Following the assessment of traffic during the operational phase of the development the impact on ambient air quality in the operational stage is considered long-term, localised, negative and imperceptible.

The proposed development is not predicted to significantly impact climate during the operational stage. Increases in traffic derived levels of CO₂ have been assessed against Ireland's EU 2030 target. Changes in CO₂ emissions are significantly below the EU target and therefore the climatic impact in the operational stage is considered long-term, negative and imperceptible. In addition, the proposed development has been designed to minimise the impact to climate where possible during operation.

REFERENCES

- DEHLG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities
- Department of the Environment, Heritage and Local Government (2010) Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities
- Dun Laoghaire – Rathdown County Council & Codema (2019) Dun Laoghaire - Rathdown County Council Climate Change Action Plan 2019 -2024
- Environmental Protection Agency (2019) GHG Emissions Projections Report - Ireland's Greenhouse Gas Emissions Projections 2018 - 2040
- Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements – Draft
- Environmental Protection Agency (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports - Draft
- Environmental Protection Agency (2020a) Air Quality Monitoring Report 2019 (& previous annual reports)
- Environmental Protection Agency (2020b) Ireland's Provisional Greenhouse Gas Emissions 1990 – 2019
- Environmental Protection Agency (2021) EPA website Available at: <http://www.epa.ie/whatwedo/monitoring/air/>
- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment
- German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft
- Government of Ireland (2015) Climate Action and Low Carbon Development Act
- Government of Ireland (2019) Climate Action Plan 2019
- Government of Ireland (2020a) Draft General Scheme of the Climate Action (Amendment) Bill 2019
- Government of Ireland (2020b) Climate Action and Low Carbon Development (Amendment) Bill 2020
- Institute of Air Quality Management (IAQM) (2014) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1
- Met Éireann (2022) Met Eireann website: <https://www.met.ie/>
- Transport Infrastructure Ireland (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes (Rev. 2, Transport Infrastructure Ireland, 2009)
- Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes
- UK DEFRA (2016) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. PG(16)

UK DEFRA (2018) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM.TG(16)

UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)

UK Highways Agency (2019a) UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality

UK Highways Agency (2019b) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

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