DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

EIAR FOR THE DEVELOPMENT OF A HEALTHCARE WASTE MANAGEMENT FACILITY AT BLARNEY BUSINESS PARK

Volume 2- Main Body of the EIAR
Chapter 11 – Air Quality

Prepared for:

SRCL Ireland Ltd (T/A Stericycle)

We protect what matters.

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11. AIR QUALITY

11.1 Introduction

This chapter assesses the likely air quality impacts associated with the proposed development. The assessment of impacts has been undertaken in the context of current relevant standards and guidance and identifies any requirements or possibilities for mitigation. The proposed development is defined in Chapter 1 Introduction and a detailed description of the proposed development is set out in Chapter 4 Description of the Existing and Proposed Development.

11.2 Characteristics of the Proposed Development

The purpose of this section is to provide an overview of the key relevant details of the proposed development. The information presented in this section is informed by the project design, but it is not a complete description of the proposed development. Therefore, it should be read in conjunction with the full development package. For a more comprehensive understanding of the Proposed Development, please refer to Chapter 4 – Description of Existing and Proposed Development, of Volume 2 of the EIAR. This chapter provides a detailed description of the construction, operational and decommissioning phases of the proposed development. It also references the planning drawings and other relevant documentation for the proposed development.

11.2.1 Construction Phase

The proposed works will comprise the installation of a Healthcare Waste Treatment and Transfer Facility at an existing vacant light-industrial/warehouse unit at the proposed development site.

The key construction works which will have a likely impact on air quality during construction are summarised below:

- The construction works associated with the proposed development will primarily involve internal installation work for the treatment plant, associated ancillary equipment and office fit out. External modifications will be limited to installation of additional security fencing and gated security access, installation of an air emission stack, and modifications to increase the size of roller shutter doors.
- Temporary storage of construction materials.
- Construction traffic accessing the site will emit air pollutants, primarily nitrogen oxides (NOx) and particulate matter (as PM_{10} and $PM_{2.5}$) during transport.

11.2.2 Operational Phase

The key activities which will have a likely impact on air quality during operation of the proposed development are summarised below:

- The operation of a volatile organic compound (VOC) abatement system and a boiler will release air pollutant emissions (primarily NOx, carbon monoxide (CO) and VOC emissions).
- Road traffic accessing the site will emit air pollutants, primarily NO_X and particulate matter (as PM_{10} and $PM_{2.5}$).

11.3 Statement of Authority

This chapter was prepared by Dr. Jovanna Arndt, a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. She holds a BSc. in Environmental Science and a Ph.D. in Atmospheric Chemistry from University College Cork. She is an Associate Member of both the Institute of Air Quality Management and the Institute of Environmental Sciences. She has been specialising in the area of air quality and climate over 8 years and has prepared air quality and climate assessments for inclusion within EIARs for residential developments such as Twenties Lane (Planning Application Ref: 22713), Cherrywood T13 (Planning Application Ref: DZ23A/0028), Corballis Donabate LRD (Planning Application Ref: LRD0017/S3), commercial and industrial developments by Dublin Airport Authority, Zoetis, Ipsen, Merck Millipore, Greener Ideas Limited and Abbvie, as well as renewable energy developments such as Codling Wind Park and the Cúil Na Móna Anaerobic Digestion Facility. She also specialises in assessing air quality impacts using air dispersion modelling of transportation schemes such as BusConnects Dublin, major Highways England Road schemes and major rail infrastructure in the form of High Speed 2 (HS2 in the UK). She has prepared air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of Environmental Protection Agency (EPA) Industrial Emissions Licences for Microsoft, Greener Ideas Limited, Merck Millipore, Lilly Limerick, Chemifloc, Takeda, Kingspan and Kilshane Energy. She has also provided Air Quality Action Plan (AQAP) and Air Quality Management Area (AQMA) support to several UK councils and assessed the air quality impacts of potential Clean Air Zones in the UK.

11.4 Relevant Legislation & Guidance

- Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe (recast);
- Air Quality Standards Regulations 2022 (S.I. 739 of 2022); and
- Volatile Organic Compounds from Organic Solvent Regulations (2002) (S.I. No. 543 of 2002).

The principal guidance and best practice documents used to inform the assessment of potential impacts on air quality are summarised below.

- 2024 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001-2021) & the Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic Substances) Regulations (2024) (HSA, 2024);
- AGTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air (UK Environment Agency (UKEA), 2014);
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM, 2020);
- Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (EPA, 2020);
- Air emissions risk assessment for your environmental permit (UKEA, 2025);
- Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (Dublin City Council (DCC), 2018);
- Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance (UK Office of Deputy Prime Minister (ODPM), 2002);
- Controlling Particles, Vapours & Noise Pollution from Construction Sites (BRE, 2003);
- Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006);

- Guidance on the Assessment of Dust from Demolition and Construction v2.2 (Institute of Air Quality Management (IAQM), 2024);
- IPPC H1 - IPPC Environmental Assessment for BAT (UK Environment Agency (UKEA), 2003);
- Licence Application Instruction Note 2 (IN2) (DRAFT) Assessing the Impact of Ammonia Emissions to Air and Nitrogen Deposition from EPA licensable activities on European Sites) (EPA, 2024c);
- Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(22) (UK Department for Environment, Food & Rural Affairs (DEFRA), 2022);
- PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects (Transport Infrastructure Ireland (TII), 2022);
- Planning Advice Note PAN50 Annex B: Controlling the Environmental Effects of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings (The Scottish Office, 1996).

In addition to specific air quality guidance documents, the following guidelines were considered and consulted in the preparation of this chapter:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the Environmental Protection Agency (EPA) Guidelines) (EPA, 2022);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018); and
- Environmental Impact Assessment (EIA) Directive Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission, 2017).

11.5 Assessment Criteria

11.5.1 Human Health

11.5.1.1 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.

11.5.1.1.1 CAFE Directive

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland are set out in Directive (EU) 2024/2881 *of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe (recast)*. This directive supersedes EU Directive 2008/50/EC *of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe* (CAFE Directive). It sets out new air quality standards for pollutants to be reached by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

The ambient air quality limit values for pollutants are set out in Annex I of Directive (EU) 2024/2881. Table 1 of Annex I in Directive (EU) 2024/2881 sets out the updated air quality limit values for pollutants to be achieved by 1 January 2030, which are more closely aligned with the WHO air quality guidelines. Table 2 of Annex I in Directive (EU) 2024/2881 sets out the limit values for air pollutants which are to be achieved by 11 December 2026 and are also applicable up to 2030. The limit values in Table 2 of Annex I are the same as the limits set under Directive 2008/50/EC and the Air Quality Standards Regulations 2022.

The Ambient Air Quality Standards Regulations 2022 (S.I. 739 of 2022) (the Air Quality Standards Regulations 2022) further transposed the CAFE Directive and revoked the Air Quality Standards Regulations 2011, as amended. With the adoption of Directive (EU) 2024/2881, Ireland must transpose this directive into national law, i.e. update the Air Quality Standards Regulations, before December 2026.

Ambient air quality legislation designed to protect human health, and the environment is generally based on assessing ambient air quality at locations where the exposure of the population is significant relevant to the averaging time of the pollutant. However, in the current assessment, ambient air quality legislation has been applied to all locations within 10 km of the facility regardless of whether any sensitive receptors (such as residential locations) are present. This represents a worst-case approach and an examination of the corresponding concentrations at the nearest sensitive receptors relative to the actual quoted maximum concentration indicates that these receptors generally experience ambient concentrations significantly lower than that reported for the worst-case location.

The ambient air quality standards applicable for the current assessment to determine the potential impact of NO_2, CO, PM_{10} and $PM_{2.5}$ on ambient air quality for protection of human health, and for the protection of vegetation and natural ecosystems in general are outlined are outlined in Table 11-1.

Table 11-1: CAFE Directive Ambient Air Quality Limit Values

Pollutant	Directive (EU) 2024/2881			
	Limit Type	Limit Value (to be attained by 2026 and applicable until 2030)	Limit Type	Limit Value (to be attained by 2030)
Nitrogen Dioxide (NO_2)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m3	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m3
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m3
	Annual limit for protection of human health	40 µg/m^3	Annual limit for protection of human health	20 µg/m^3

Pollutant	Directive (EU) 2024/2881			
	Limit Type	Limit Value (to be attained by 2026 and applicable until 2030)	Limit Type	Limit Value (to be attained by 2030)
Nitrogen Oxides (NO_X)	Critical level for protection of vegetation (Annual)	30 µg/m³	Critical level for protection of vegetation (Annual)	30 µg/m³
Carbon Monoxide (CO)	8-hour limit (on a rolling basis) for protection of human health	10 mg/m³	8-hour limit (on a rolling basis) for protection of human health	10 mg/m³
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	4 mg/m³
Particulate Matter (as PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m³	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 µg/m³
	Annual limit for protection of human health	40 µg/m³	Annual limit for protection of human health	20 µg/m³
Particulate Matter (as $PM_{2.5}$)	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	25 µg/m³
	Annual limit for protection of human health	25 µg/m³	Annual limit for protection of human health	10 µg/m³

Note: µg/m³ (micrograms per cubic metre).

11.5.1.1.2 WHO Air Quality Guidelines & Clean Air Strategy

In April 2023, the Government of Ireland published the *Clean Air Strategy for Ireland* (Government of Ireland, 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026 (Table 13-2), the IT4 targets by 2030 and the final targets by 2040 (Table 13-2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m^3. The strategy also acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both* $PM_{2.5}$ *and* NO_2".

Annex II of Directive (EU) 2024/2881 gives assessment thresholds which align with the clean air strategy final 2040 WHO targets. Directive (EU) 2024/2881 states that *"Member States shall endeavour to achieve and preserve the best ambient air quality and a high level of protection of human health and the environment, with the aim of achieving a zero-pollution objective as referred to in Article 1(1), in line with WHO recommendations, and below the assessment thresholds laid down in Annex II."*

These assessment thresholds relate to monitoring of ambient air quality by Member States, where "exceedances of the assessment thresholds specified in Annex II shall be determined on the basis of concentrations during the previous 5 years where sufficient data are available. An assessment threshold shall be deemed to have been exceeded if it has been exceeded during at least 3 separate years out of those previous 5 years."

Table 11-2: WHO Air Quality Guidelines 2021

Pollutant	Limit Type	IT3 (2026)	IT4 (2030)	Final Target (2040)
NO_2	24-hour limit for protection of human health	-	-	25 µg/m^3
	Annual limit for protection of human health	20 µg/m^3	-	10 µg/m^3
PM (as PM_{10})	24-hour limit for protection of human health	75 µg/m^3	50 µg/m^3	45 µg/m^3
	Annual limit for protection of human health	30 µg/m^3	20 µg/m^3	15 µg/m^3
PM (as $PM_{2.5}$)	24-hour limit for protection of human health	37.5 µg/m^3	25 µg/m^3	15 µg/m^3
	Annual limit for protection of human health	15 µg/m^3	10 µg/m^3	5 µg/m^3

The applicable air quality limit values for the purposes of this assessment are those set out in Table 11-1. The limit values stipulated under Table 2 of Annex I in Directive (EU) 2024/2881 and the Air Quality Standards Regulations 2022 are applicable for the Proposed Development as it will be constructed and operational prior to 2030.

11.5.1.1.3 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust that are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$). The EU ambient air quality standards outlined in Table 11-1 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 criteria have been stipulated for nuisance dust for this specific type of proposed 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. 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 TA-Luft limit of 350 mg/m^2/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.

11.5.1.1.4 Volatile Organic Compounds

Emissions of Volatile Organic Compounds from Organic Solvent Regulations (2002) (SI No. 543 of 2002) and subsequently the Industrial Emission Directive (2010/75/EU) outlines appropriate mass emission limits of volatile organic compounds from a range of industries. However, no statutory air quality standards for the individual organic compounds exist in Irish legislation. In the absence of statutory standards, it is common practice to reference other suitable authorities such as the World Health Organisation (WHO) or derive an ambient air quality guideline from occupational exposure limits (OEL).

In line with the approach outlined in AG4 (EPA, 2020), where no EU air quality standard exists, relevant statutory standards from other EU countries such as the UK, Germany or Denmark should be used. The most stringent European guideline / limit value from the sources outlined below should be referenced when determining compliance in the absence of an applicable EU ambient air quality standard. The relevant statutory guidance can be obtained from the following sources:

- Environmental Assessment Level (EAL) based on the Health & Safety Authority (HSA) publication 2024 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001-2021) & the Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic Substances) Regulations (2024) (HSA, 2024). The EAL should be derived using the approach outlined in Appendix D of UK Environment Agency "IPPC H1 - IPPC Environmental Assessment for BAT" (UKEA, 2003).
- The guidance outlines the approach for deriving both short-term and long-term EALs. In relation to the long-term (annual) EAL, this can be derived by applying a factor of 100 to the 8-hour Occupational Exposure Level (OEL). The factor of 100 allows for both the greater period of exposure and the greater sensitivity of the general population. For short-term (1-hour) exposure, the EAL is derived by applying a factor of 10 to the short term exposure limit (STEL). In this case, only the sensitivity of the general population need be taken into account as there is no need for additional safety factors in terms of the period of exposure. Where STELs are not listed then a value of 3 times the 8-hour time weighted average occupational exposure limit may be used (UKEA, 2003).
- EALs outlined at the UK DEFRA website https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit(UKEA,2025).

Table 11-3 identifies the appropriate short-term and long-term EALs, derived from the most stringent sources above, for the specific compounds which are likely to be used on-site.

Table 11-3: VOC Guideline Values Derived from OEL For Compounds Used Onsite

Pollutant	Regulation	Limit Type	Annual Mean Value	1-Hour Mean Value
2-Propanol	IPPC H1 EAL	Guideline Value	9,900	125,000
Acetone	IPPC H1 EAL	Guideline Value	18,100	362,000
Butane	IPPC H1 EAL	Guideline Value	14,500	181,000
Ethyl alcohol	IPPC H1 EAL	Guideline Value	19,200	576,000
Ethyl chloride	IPPC H1 EAL	Guideline Value	27,000	338,000

11.5.2 Ecology

11.5.2.1 Critical Levels

The Air Quality Standards Regulations 2022 outline an annual critical level of 30 µg/m^3 for NO_X (Table 11-1) for the protection of vegetation and natural ecosystems in general. The CAFE Directive (2008/50/EC) defines 'Critical Levels' as "*a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans*".

11.5.2.2 Critical Loads

A 'Critical Load' is defined by the United Nations Economic Commission for Europe (UNECE) as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE, 2003).

Critical loads are presented as a range, within which there is the potential for effects on sensitive ecological receptors. Critical load ranges for N deposition and acid deposition were derived from the Air Pollution Information System (APIS) website (APIS, 2025) and are reproduced as shown in Table 11-4 and Table 11-5. Also shown in these tables are the site feature code and name (i.e. the qualifying feature the site is designated for), the corresponding critical load class and EUNIS codes (European Nature Information System (EUNIS) by the European Environment Agency). The methodology for identifying the relevant sensitive ecological receptors shown in Table 11-4 and Table 11-5 is discussed in Section 11.7.3.2.2.

Critical loads are only available for internationally designated habitats (Special Protection Area (SPA) and Special Area of Conservation (SAC)), and for nationally designated Natural Heritage Areas (NHA).

Critical loads for proposed Natural Heritage Areas (pNHAs) are not defined on the APIS website. In the absence of defined critical loads, and in order to carry out an assessment for pNHAs, the site synopsis for each pNHA (NPWS, 2025) relevant to this assessment was reviewed for its range of habitats. Where possible, pNHA habitats identified from the site synopsis was assigned an equivalent nitrogen deposition or critical load class. These can be derived by searching APIS for the habitat type, rather than a specific site, or by reviewing SACs and SPAs with similar features. Where no equivalent critical load class could be assigned or a site synopsis was not available this has been denoted by "n/a".

As pNHAs are not fully designated Natural Heritage Areas and therefore have not undergone the same process of qualifying feature identification (which can then be processed by APIS), the critical load classes assigned to pNHA habitats are an interpretation as part of this assessment and may vary from those identified in future should the pNHA become fully designated.

In order to determine the appropriate nitrogen deposition critical load, and in addition to APIS, the EPA publication *Research 390: Nitrogen-Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats* (EPA, 2021) was consulted. In Table 3.2 of the publication empirical critical loads of nutrient nitrogen are outlined with a worst-case range of 5-10 kg/ha/yr for most habitat types. In addition, for most habitat types, the EPA publication recommends the midpoint is used to define the critical load (e.g. 7.5 kg/ha/yr). Thus, the mid-range critical load for the worst-case habitat type within the relevant sites have been used to compare with modelled process contributions.

Acid deposition critical loads are further categorised by nitrogen (N) or sulphur (S) components. Modelled acid deposition process contributions are therefore calculated in terms of both nitrogen (N) and sulphur (S) (see Section 11.6.2.2.5).

Deposition of sulphur (as sulphate (SO_4^{2-})) and nitrogen (as nitrate (NO_3^-), ammonium (NH_4^+) and nitric acid (HNO_3^-)), can cause acidification and both sulphur and nitrogen compounds must be taken into account when assessing acidification of soils. For the purposes of determining links between critical loads and atmospheric emissions of sulphur and nitrogen, critical loads are further derived to produce a maximum critical load for sulphur (CLmaxS), a minimum critical load for nitrogen (CLminN) and a maximum critical load for nitrogen (CLmaxN). These components define the critical load function and when compared with deposition data for sulphur and nitrogen, they can be used to assess critical load exceedances.

The modelled acid deposition process contributions (as S) have been compared to the minimum critical load (S) (MinCLmaxS).

The modelled acid deposition process contributions (as N) have been compared to the minimum critical load (N) (MinCLminN). Where a process contribution is greater than 1% of this minimum critical load, the predicted environmental concentration (PEC) should then be calculated by adding the acid deposition background concentration to the process contribution. The PEC should then be compared to the lower end of the maximum critical load (N) range i.e. MaxCLminN. This is in line with the *Screening Acidity Critical Loads* approach taken by APIS (available as a tab in the APIS app) for designated sites. Notably, APIS does not consider the critical load function to be exceeded unless the PEC is larger than the maximum critical load, not the minimum (which is typically considered worst case).

Table 11-4: Critical Loads for Nitrogen Deposition

Ecological Receptor		Feature Code	Feature Name	Critical loads for most sensitive feature			Nitrogen Critical Load Class	EUNIS code	Is species sensitive due to nutrient nitrogen impacts on broad habitat?	Reason
Site Name	Site Code			Min. Critical Load for N (kg N/ha/yr)	Max. Critical Load for N (kg N/ha/yr)	Assessment Criteria				
Natura 2000										
Cork Harbour SPA	004030	A005	Podiceps cristatus (North-western Europe - wintering)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53	n/a	n/a
National Sites										
Ardamadane Wood pNHA	001799	n/a	Broadleaved deciduous woodland	10	20	15	Broadleaved deciduous woodland	G1.8	n/a	n/a
Blarney Bog pNHA	001857	n/a	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	5	15	10	Moist and wet oligotrophic grasslands: Molinia caerulea meadows	E3.51	n/a	n/a
Blarney Castle Woods pNHA	001039	n/a	Broadleaved deciduous woodland	10	20	15	Broadleaved deciduous woodland	G1.8	n/a	n/a
Blarney Lake pNHA	001798	n/a	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	5	15	10	Moist and wet oligotrophic grasslands: Molinia caerulea meadows	E3.51	No	n/a

Table 11-5: Critical Loads for Acid Deposition

Site Name	Site Code	Feature Code	Feature Name	Acidity Critical Load Class	Min. Critical Load Range (N) (keq/ha/yr)		Max. Critical Load Range (N) (keq/ha/yr)		Critical Load Range (S) (keq/ha/yr)		Is species sensitive due to acidity impacts on broad habitat?	Reason
					Min CL minN	Min CL maxN	Max CL minN	Max CL maxN	Min CL maxS	Max CL maxS		
Natura 2000												
Cork Harbour SPA	004030	A017	Phalacrocorax carbo (North-western Europe)	Freshwater	0.143	2.383	0.714	5.962	2.241	5.247	Yes	Potential negative impact on species due to impacts on the species' broad habitat.
National Sites												
Ardama-dane Wood pNHA	001799	n/a	Old sessile oak woods with Ilex and Blechnum in the British Isles	Unmanaged Broadleafed/ Coniferous Woodland	0.143	0.50 7	0.71 4	5.634	0.365	6.518	n/a	n/a
Blarney Bog pNHA	001857	n/a	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Acid grassland	0.143	0.52 4	0.14 3	1.829	0.381	1.543	n/a	n/a
Blarney Castle Woods pNHA	001039	n/a	Old sessile oak woods with Ilex and Blechnum in the British Isles	Unmanaged Broadleafed/ Coniferous Woodland	0.143	0.50 7	0.71 4	5.634	0.365	6.518	n/a	n/a
Blarney Lake pNHA	001798	n/a	Old sessile oak woods with Ilex and Blechnum in the British Isles	Unmanaged Broadleafed/ Coniferous Woodland	0.143	0.50 7	0.71 4	5.634	0.365	5.247	n/a	n/a

11.5.2.3 Ecology Significance Criteria

Annual mean NO_X concentrations, nitrogen and acid deposition are compared to the relevant critical levels and loads in line with IAQM (IAQM, 2020), UKEA (UKEA, 2025) and EPA (EPA, 2024b) guidance. As per this guidance, where the (PC) of a pollutant emitted from a facility is less than 1% of the relevant critical level and critical load the further assessment is not required and the effect on ecology can be considered not significant.

In October 2024, the EPA published the draft guidance Licence Application Instruction Note 2 (IN2) (DRAFT): Assessing the Impact of Ammonia Emissions to Air and Nitrogen Deposition from EPA licensable activities on European Sites (hereafter referred to as IN2).

IN2 and the flowchart shown in Figure 11-1 (reproduced from Appendix 1 of IN2) is designed to assist in determining the course of action to be taken when evaluating the impacts on European sites (Special Areas of Conservation (SACs) Special Protection Areas (SPAs)) and of ammonia emissions to air and nitrogen deposition from main air emission points at EPA licensable industrial sites (Industrial Emissions, Integrated Pollution Control and Waste), excluding intensive agriculture installations, for the purposes of an Appropriate Assessment (AA).

The methodology from IN2 and the flowchart steps are considered appropriate for determining ecological impacts from a variety of air pollutant emission sources on European Sites, and have therefore been applied in this assessment:

1. The installation is not within 250 m of a European site. Proceed to Q2.

2. (i) Is the process contribution (PC) ≤1% of the relevant critical level and critical load at all European sites within the zone of influence, and (ii) can significant in-combination effects be ruled out?

    - PCs have been compared to the relevant critical levels and critical loads. The results of this screening exercise are presented in Section 11.8.3.2.

    - Planning applications and the EPA register of Industrial Emissions (IE) licences was reviewed for developments and facilities with the potential for cumulative impact with the Proposed Development. There are no IE licenced facilities within 1 km of the Proposed Development which operates sources of NO_2, therefore a cumulative impact assessment of this pollutant was not required.

This approach may also be applied to NO_X specifically in the context of AA.

As per the IN2 guidance, where a PC is greater than 1% of the critical level, this site has been included in further assessment, where the PEC is determined by combining the background concentration with the PC. If a PC is less than the 1% threshold then the IN2 guidance states *"emissions are not considered to be likely to have a significant effect on European sites. No need to progress to further questions. Submit application to EPA for consideration".* "Further questions" refers to Question 3 in the IN2 guidance, which states "*Does modelling indicate that the PEC will exceed a critical level and/or critical load for any relevant qualifying interests for European sites within the zone of influence?"*. Calculation of PECs is therefore only technically required if Question 3 requires addressing i.e. if PCs are >1% threshold.

If there are no PCs greater than 1% of the critical level at any of the modelled European sites, no further assessment (i.e. calculation of PEC) is required as per IN2 guidance.

The IN2 process applies specifically to European sites with international designation, namely Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). However, the same approach has been taken to assess the effect of emissions impacts on nationally designated sites such as Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs). SACs and SPAs are protected under the EU Habitats Directive (92/43/EEC), and EU Birds Directive (2009/147/EC) respectively, and are also known as Natura 2000 sites. NHAs are designated under the Wildlife (Amendment) Act 2000, and pNHAs were identified as sites of conservation interest in the 1990s but have not since been statutorily proposed or designated.

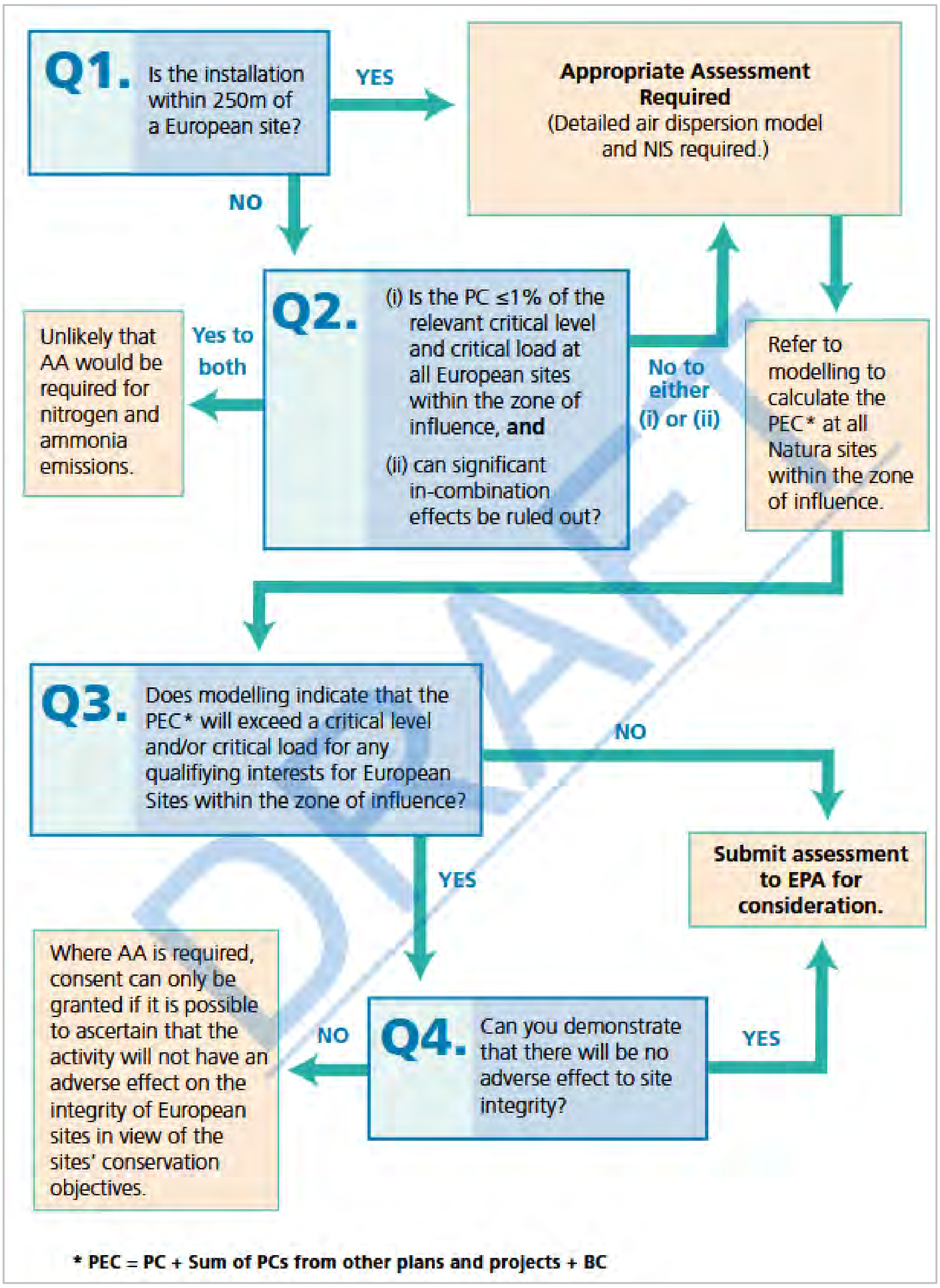

Figure 11-1: IN2 flowchart for assessing the impacts of nitrogen deposition and ammonia emissions to air on European Sites

11.6 Assessment Methodology

11.6.1 Construction Phase

11.6.1.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (IAQM, 2024) outlines an assessment method for predicting the impact of dust emissions from construction 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 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 recommended by Transport Infrastructure Ireland in their guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022).

The IAQM states that as assessment of construction dust impacts is normally required where there is a human or ecological receptor within 250m of the boundary of the site (this should consider offsite construction compounds) and/or within 50 m of the route(s) used by construction vehicles on the public road network (on roads up to 250 m from the site entrance). This constitutes the Zone of Influence (ZoI) for the construction dust assessment.

The major dust generating activities are divided into four types within the IAQM guidance (IAQM, 2024) to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The criteria for determining the category for the works involved are outlined in Table 11-6, these are based on the IAQM guidance (IAQM, 2024). The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined.

Table 11-6: IAQM Criteria to Determine Dust Emissions Magnitude

Dust Emission Magnitude		
Small	**Medium**	**Large**
Demolition		
• Total building volume <12,000 m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities <6 m above ground • Demolition during wetter months	• Total building volume 12,000 - 75,000 m^3 • Potentially dusty construction material • Demolition activities 6 – 12 m above ground level	• Total building volume >75,000 m^3 • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities >12 m above ground level
Earthworks		
• Total site area <18,000 m^2 • Soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • Formation of bunds <3 m in height • Earthworks during wetter months	• Total site area 18,000 m^2 - 110,000 m^2 • Moderately dusty soil type (e.g. silt) • 5 – 10 heavy earth moving vehicles active at any one time • Formation of bunds 3 – 6 m in height	• Total site area >110,000 m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • Formation of bunds >6 m in height
Construction		
• Total building volume <12,000 m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)	• Total building volume 12,000 - 75,000 m^3 • Potentially dusty construction material (e.g. concrete) • On-site concrete batching	• Total building volume >75,000 m^3 • On-site concrete batching • Sandblasting
Trackout (Truck Movements)		
• <20 HDV (>3.5 t) outward movements in any one day • Surface material with low potential for dust release • Unpaved road length <50 m	• 20 – 50 HDV (>3.5 t) outward movements in any one day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50 – 100 m	• >50 HDV (>3.5 t) outward movements in any one day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length >100 m

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (IAQM, 2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, human health and ecological effects. The level of risk associated with each activity is determined using the criteria in Table 11-7. The level of risk of each dust generating activity is established in Section 11.8.2.1.2 as part of the impact assessment.

Table 11-7: IAQM Criteria to Determine Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

11.6.1.2 Construction Phase Traffic Assessment

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022), 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. While the guidance is specific to infrastructure projects, the approach 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;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5m or greater.

As per Chapter 14, Traffic and Transport, of Volume 2 of this EIAR, it has been determined by the traffic consultant that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT. The construction stage traffic has been reviewed, and it has been determined that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT; additionally, the development will not result in speed changes or changes in road alignment. Therefore, the traffic does not meet the above scoping criteria. A detailed air quality assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality with respect with human or ecological receptors.

11.6.2 Operational Phase

11.6.2.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the Proposed Development. The TII scoping criteria detailed in Section 11.6.1.2 were used to determine if any road links are affected by the proposed development and require inclusion in a detailed air dispersion modelling assessment. The proposed development will not result in the operational phase traffic increasing by more than 1,000 AADT or 200 HDV AADT. In addition, there are no proposed changes to the traffic speeds or road alignment. Therefore, no road links impacted by the Proposed Development satisfy the screening criteria (Section 11.6.1.2). A quantitative assessment of the impact of traffic emissions on ambient air quality is not necessary as there is no potential for significant impacts to local air quality.

11.6.2.2 Air Dispersion Modelling Methodology

The United States Environmental Protection Agency (USEPA) approved AERMOD (Version 24142) dispersion model has been used to predict the ground level concentrations (GLC) of pollutants emitted from the principal emission sources on-site, following guidance issued by the EPA (EPA, 2020). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources and has replaced ISCST3 as the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA, 1998; 2000; 2025). The model has more advanced algorithms and gives better agreement with monitoring data in extensive validation studies (Paine & Lew, 1997a; Paine & Lew, 1997b; Schulman et al., 2000; USEPA, 1998; USEPA, 1999). An overview of the AERMOD dispersion model is outlined in Appendix 11.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR.

The air dispersion modelling input data consisted of information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and five years of appropriate hourly meteorological data. Using this input data the model predicted ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological years. The model post-processed the data to identify the location and maximum of the worst-case ground level concentration. This worst-case concentration was then added to the background concentration to give the worst-case predicted environmental concentration (PEC). The PEC was then compared with the relevant ambient air quality standard to assess the significance of the releases from the site.

The modelling incorporated the following features:

- All on-site buildings and significant process structures were mapped into the computer to create a three-dimensional visualization of the site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.
- Detailed terrain has been mapped into the model using SRTM data with 30m resolution. The site is located in an area of complex terrain. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP (USEPA, 2017).
- Hourly-sequenced meteorological information has been used in the model. Meteorological data over a five year period (Cork Airport 2020 – 2024) was used in the model (see Section 11.7.1 and Appendix 11.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR).
- The source and emissions data, including stack dimensions, gas volumes and emission temperatures have been incorporated into the model.

11.6.2.2.1 NO_X to NO_2 Conversion

The Plume Volume Molar Ratio Method (PVMRM) was used to model NO_2 concentrations. The PVMRM is a regulatory option in AERMOD which assumes that the amount of NO converted to NO_2 is proportional to the ambient ozone concentration (Hanrahan, 1999a; Hanrahan 1999b). The PVMRM uses both plume size and O_3 concentration to derive the amount of O_3 available for the reaction between NO and O_3. NO_X moles are determined by emission rate and travel time through the plume segment. The concentration is usually limited by the amount of ambient O_3 that is entrained in the plume. Thus, the ratio of the moles of O_3 to the moles of NO_X gives the ratio of NO_2/NO_X that is formed after the NO_X leaves the stack. The equation used in the algorithm to derive the ratio of NO_2/NO_X gas combustion is:

$$NO_2/NO_X = (\text{moles } O_3/ \text{ moles } NO_X) + 0.10$$

An initial NO_2/NO_X ratio of 0.1 for the boiler was assumed for the purposes of this assessment.

11.6.2.2.2 Terrain

The terrain across the 3 x 3 km domain modelled has been illustrated as contours in Figure 11-2.

The AERMOD air dispersion model has a terrain pre-processor AERMAP (USEPA, 2017) which was used to map the physical environment in detail over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was obtained from SRTM. This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, H_{crit}, for each receptor. The terrain height scale is derived from the Digital Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

In areas of complex terrain, AERMOD models the impact of terrain using the concept of the dividing streamline (H_c). As outlined in the AERMOD model formulation (USEPA, 2022) a plume embedded in the flow below H_c tends to remain horizontal; it might go around the hill or impact on it. A plume above H_c will ride over the hill. Associated with this is a tendency for the plume to be depressed toward the terrain surface, for the flow to speed up, and for vertical turbulent intensities to increase.

AERMOD model formulation states that the model "captures the effect of flow above and below the dividing streamline by weighting the plume concentration associated with two possible extreme states of the boundary layer (horizontal plume and terrain-following). The relative weighting of the two states depends on: 1) the degree of atmospheric stability; 2) the wind speed; and 3) the plume height relative to terrain. In stable conditions, the horizontal plume "dominates" and is given greater weight while in neutral and unstable conditions, the plume traveling over the terrain is more heavily weighted" (USEPA, 2005).

11.6.2.2.3 Geophysical Considerations

AERMOD simulates the dispersion process using planetary boundary layer (PBL) scaling theory (USEPA, 2022). PBL depth and the dispersion of pollutants within this layer are influenced by specific surface characteristics such as surface roughness, albedo and the availability of surface moisture. Surface roughness is a measure of the aerodynamic roughness of the surface and is related to the height of the roughness element. Albedo is a measure of the reflectivity of the surface whilst the Bowen ratio is a measure of the availability of surface moisture.

AERMOD incorporates a meteorological pre-processor AERMET (USEPA, 2018) to enable the calculation of the appropriate parameters. The AERMET meteorological pre-processor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10 km from the meteorological station for Bowen Ratio and albedo and to a distance of 1 km for surface roughness in line with USEPA recommendations (USEPA, 2008; 2018) as outlined in Appendix 11.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR.

In relation to AERMOD, detailed guidance for calculating the relevant surface parameters has been published (USEPA, 2008). The most pertinent features are:

- The surface characteristics should be those of the meteorological site rather than the installation;
- Surface roughness should use a default 1 km radius upwind of the meteorological tower and should be based on an inverse-distance weighted geometric mean. If land use varies around the site, the land use should be sub-divided by sectors with a minimum sector size of 30º;
- Bowen ratio and albedo should be based on a 10 km grid. The Bowen ratio should be based on an un-weighted geometric mean. The albedo should be based on a simple un-weighted arithmetic mean.

AERMOD has an associated pre-processor, AERSURFACE (USEPA, 2008) which has representative values for these parameters depending on land use type. The AERSURFACE pre-processor currently only accepts NLCD92 land use data which covers the USA. Thus, manual input of surface parameters is necessary when modelling in Ireland. Ordnance survey discovery maps (1:50,000) and digital maps such as those provided by the EPA, National Parks and Wildlife Service (NPWS) and Google Earth® are useful in determining the relevant land use in the region of the meteorological station. The Alaska Department of Environmental Conservation has issued a guidance note for the manual calculation of geometric mean for surface roughness and Bowen ratio for use in AERMET (ADEC, 2008). This approach has been applied to the current site with full details provided in Appendix 11.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR.

11.6.2.2.4 Building Downwash

When modelling emissions from an industrial installation, stacks which are relatively short can be subjected to additional turbulence due to the presence of nearby buildings. Buildings are considered nearby if they are within five times the lesser of the building height or maximum projected building width (but not greater than 800 m). The USEPA has defined the "Good Engineering Practice" (GEP) stack height as the building height plus 1.5 times the lesser of the building height or maximum projected building width. It is generally considered unlikely that building downwash will occur when stacks are at or greater than GEP (USEPA, 1985).

When stacks are less than this height, building downwash will tend to occur. As the wind approaches a building it is forced upwards and around the building leading to the formation of turbulent eddies. In the lee of the building these eddies will lead to downward mixing (reduced plume centreline and reduced plume rise) and the creation of a cavity zone (near wake) where re-circulation of the air can occur. Plumes released from short stacks may be entrained in this airflow leading to higher ground level concentrations than in the absence of the building.

The Plume Rise Model Enhancements (PRIME) (Paine & Lew, 1997a; 1997b) plume rise and building downwash algorithms, which calculates the impact of buildings on plume rise and dispersion, have been incorporated into AERMOD. The building input processor BPIP-PRIME produces the parameters which are required in order to run PRIME. The model takes into account the position of each stack relative to each relevant building and the projected shape of each building for 36 wind directions (at 10º intervals). The model determines the change in plume centreline location with downwind distance based on the slope of the mean streamlines and coupled to a numerical plume rise model (Paine & Lew, 1997a).

Given that the stacks are less than 2.5 times the lesser of the building height or maximum projected building width, building downwash will need to be taken into account and the PRIME algorithm run prior to modelling with AERMOD. Shown in Figure 11-3 is an example of the buildings (in blue) which influence the building downwash for emission point A2-1. The dominant building for each relevant stack will vary as a function of wind direction and relative building heights.

11.6.2.2.5 Ecology - Nitrogen and Acid Deposition

In order to consider the effects of nitrogen deposition and acid deposition owing to emissions from the facility on the designated habitat sites, the maximum annual mean NO_2 predicted environmental concentrations must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency publication *AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air* (UKEA, 2014):

Dry deposition flux (μg/m^2/s) = ground-level concentration (μg/m^3) x deposition velocity (m/s)

The deposition velocities for NO_2 are outlined in AQTAG06 (UKEA, 2014) and shown below in Table 11-8. The dry deposition flux is then multiplied by conversion factors shown in Table 11-8 (taken from AQTAG06 (UKEA, 2014)) to convert it to a nitrogen (N) deposition flux (kg/ha/yr), and to an acid deposition flux (keq/ha/yr).

Table 11-8: Dry Deposition Fluxes for NO_2.

Chemical Species	Habitat Type	Recommended Deposition Velocity (m/s)	Nitrogen Deposition Conversion factor µg/m²/s to kg/ha/yr	Acid Deposition Conversion factor µg/m²/s to keq/ha/yr
NO_2	Grassland	0.0015	95.9	6.84

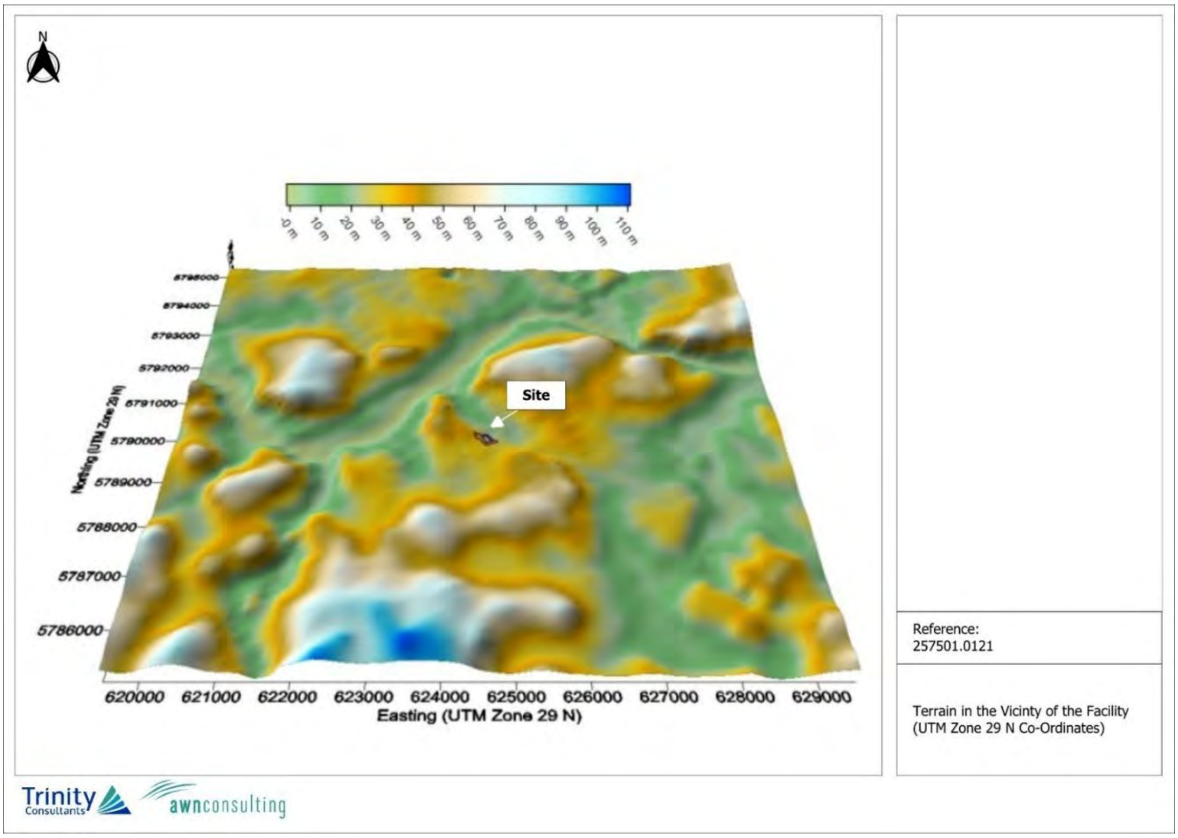

Figure 11-2: Terrain in the Vicinity of the Installation

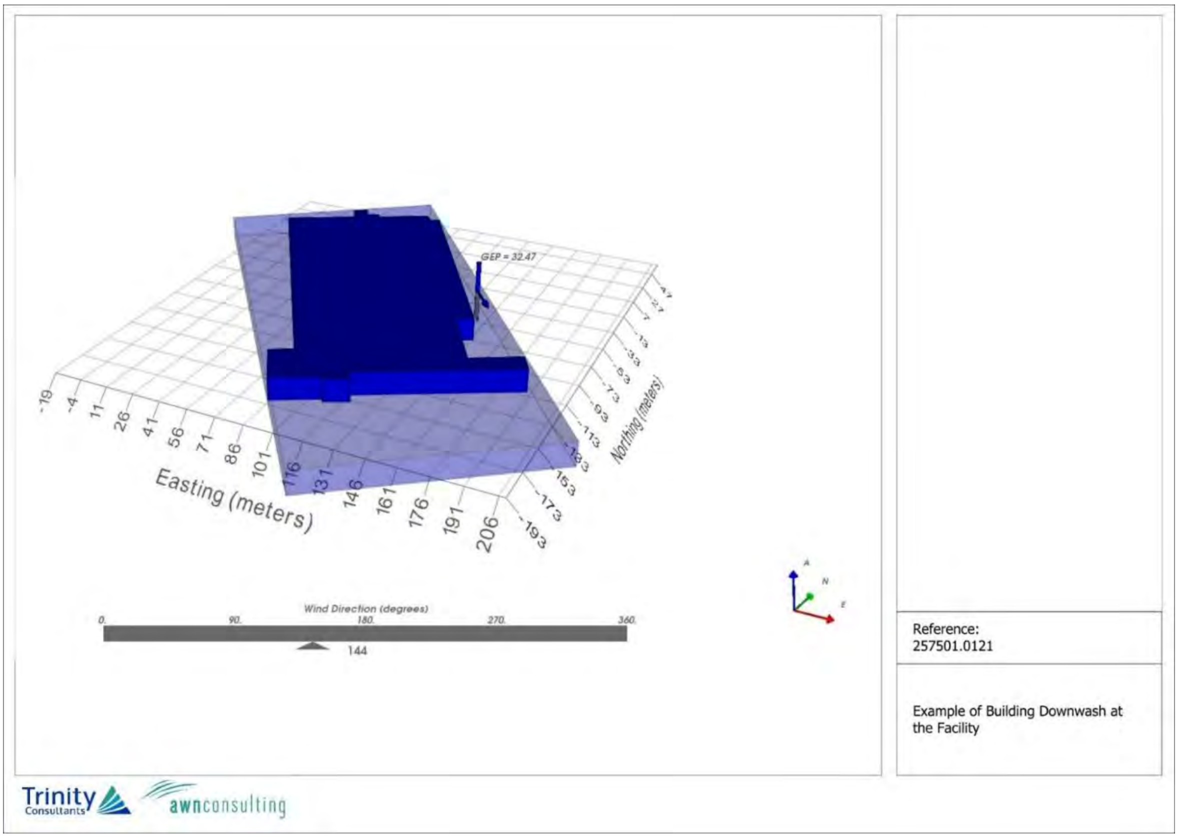

Figure 11-3: Example of building downwash for Emission Point A2-1

11.6.2.2.6 Process Emissions

The proposed development will operate 2 no. main emission points; an extraction vent for the treatment process abatement system and a steam generation boiler. Each will have a separate flue, 19.8 m above ground level, and both flues are housed in the same stack enclosure on the warehouse roof.

The Proposed Operations scenario consists of the following types of emissions:

- TVOC emissions from the VOC abatement system and NOx emissions from the boiler.
- The VOC extraction system and boiler have been modelled as operating 24 hours per day, 365 days per year, i.e. continuous operations, to ensure a worst-case conservative assessment.
- The model input information for this scenario is detailed in Table 11-9.

There are no other significant sources of emissions to air on site. All waste arriving at the facility will be accepted/unloaded, handled, stored and processed inside the existing building present on-site. There will be no outdoor handling, storage or loading of waste at the facility. Fast-acting roller doors will be installed at entry locations into the building. Waste arriving at the facility will be containerised in individual, sealed and tracked waste bins within vehicles. Waste leaving the facility will be containerised in bulk containers. No open waste will accepted on-site or leave the site. Waste will be contained when stored on-site. The treatment process on-site is also highly enclosed and contained. Waste management operations on-site do not have the potential to generate odour or dust therefore, given the highly contained nature of operations, and also given the nature and composition of the waste material (i.e. non dusty with minimal odour by comparison to other waste types).

Table 11-9: Summary of Process Emissions Information for Proposed Development

Parameter	Boiler
Coordinates	E 531113 N 5754214
Stack Height above ground level (m)	19.8
Stack Diameter (m)	0.30
Stack Exit Temperature (degC)	285
Volume Flow Rate (Nm3/hr)	4,000
Stack Exit Velocity (m/s actual)	41.09
NO_2 Concentration (mg/Nm3)	100
NO_2 Emission Rate (g/s)	0.111
Parameter	**VOC extraction vent**
Coordinates	E 531113 N 5754214
Stack Height above ground level (m)	19.8
Stack Diameter (m)	0.60
Stack Exit Temperature (degC)	35
Volume Flow Rate (Nm3/hr)	7,000
Stack Exit Velocity (m/s actual)	7.76
TVOC Concentration (mg/Nm3)	30
TVOC Emission Rate (g/s)	0.058

All VOCs to be released have been modelled at the emission limit value of 30 mg/m^3 for Total Volatile Organic Carbon (TVOC) which is derived from the BAT-associated emission levels (BAT-AELs) given in *Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council*. This is the maximum VOC emission concentration expected. The carbon fractions listed in Table 11-10 were then applied to the modelled ambient VOC concentrations in turn for each emitted VOC. It is assumed that where more than one compound is being emitted from any emission point, as a worst-case assumption, the Total VOC (as C) consists of only one compound (in turn) with each compound compared to the 1-hour EAL and annual EAL.

Table 11-10: Emissions Details for VOCs Used in the Air Modelling

Compound	Carbon Weight	Molecular Weight	Carbon fraction
2-Propanol	36.03	60.096	0.59
Acetone	36.03	58.08	0.62
Butane	48.04	58.12	0.82
Ethyl Alcohol	24.02	46.07	0.52
Ethyl Chloride	24.02	64.51	0.37

In terms of VOC abatement system bypass operation, in the event of a system shutdown due to a Critical System Alarm or if Shutdown mode is activated, VOC emissions during the event are assumed to be zero and thus there is no potential for significant air quality impact.

11.7 Baseline Environment

11.7.1 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 Cork Airport meteorological station, which is located approximately 10.6 km south-east of the site. Cork Airport meteorological data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (Figure 11-4). For data collated during five representative years (2020 – 2024), the predominant wind direction is westerly to south-westerly with generally moderate wind speeds (Met Éireann, 2025).

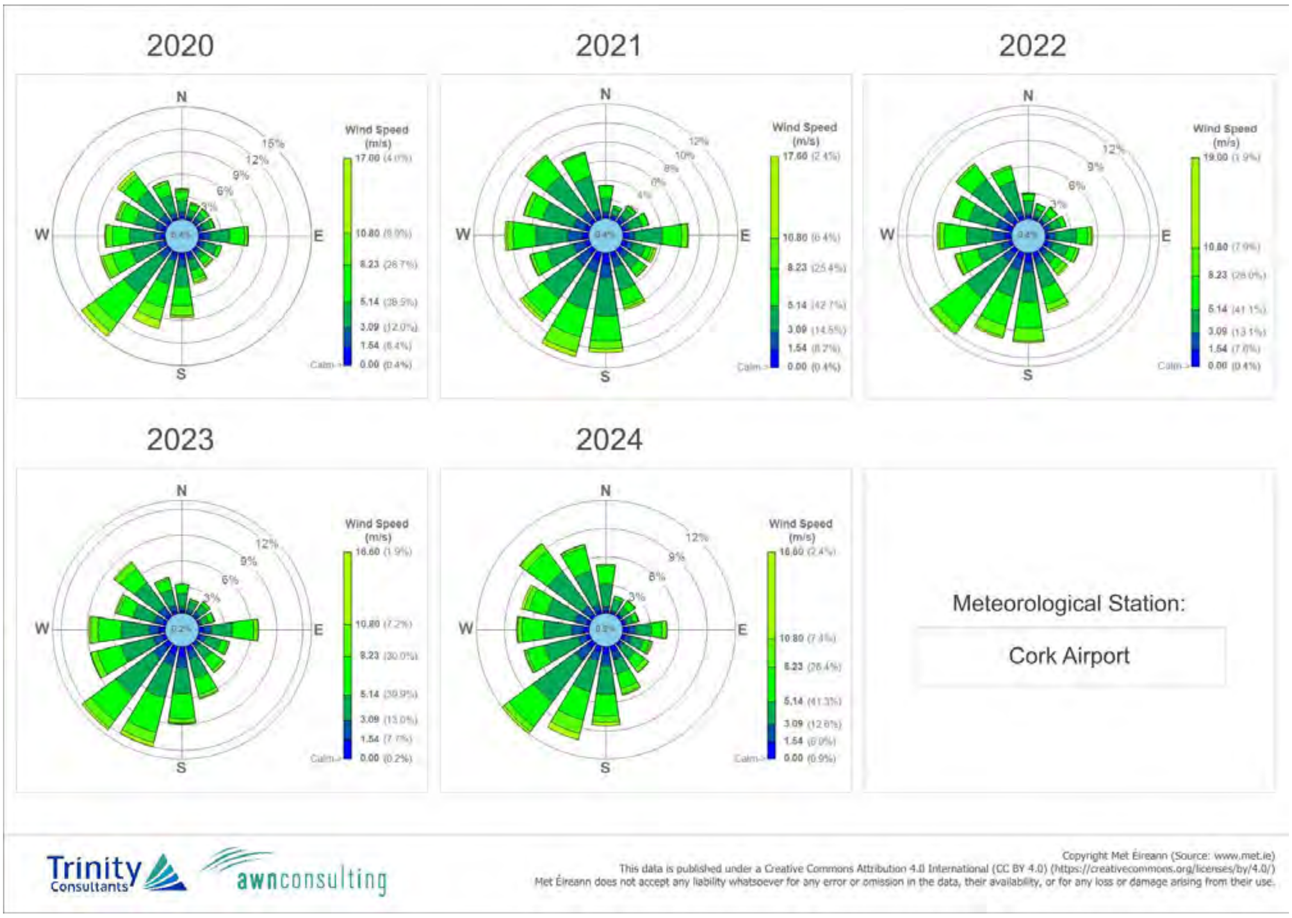

Figure 11-4: Wind Roses for Cork Airport Meteorological Station

11.7.2 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 2023'* (EPA, 2024a). 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.

As part of the implementation of the Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022), as amended, four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2024a). 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 B (EPA, 2024a). 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.).

11.7.2.1 NO_2

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2024a) is carried out at a number of monitoring stations within Zone B. The following Zone B monitoring station of UCC Distillery Fields were considered representative of the site location.

The selected monitoring sites are suburban background monitoring locations which are not heavily influenced by traffic or other major air emission sources and can provide an indicative estimate of the background NO_2 concentrations in the vicinity of the facility. Road traffic is a significant contributor to NO_2 concentrations with concentrations of the pollutant decreasing rapidly with increasing distance from the road source. As mentioned by the EPA on their website (EPA, 2025), background sites generally represent overall area-wide exposure more closely than roadside sites.

Selection of a reasonably representative background concentration is important to producing a reasonably conservative predicted environmental concentration (PEC). Utilising a maximum monitored background concentration for the purposes of representing an absolute worst-case PEC is considered overly conservative. For the purposes of this assessment, the 5-year average concentration at the selected EPA monitoring stations has been reviewed in order to determine a suitable background pollutant concentration for this assessment.

Table 11-11 shows that current NO_2 concentrations at the Zone B monitoring locations of Dundalk, Kilkenny Seville Lodge and Portlaoise are below both the annual and 1-hour limit values, with annual average levels ranging from 2 – 7 $\mu g/m^3$ in 2023. The 5-year average data for Dundalk, Kilkenny Seville Lodge and Portlaoise for the period 2019 – 2023 was used to estimate the current background NO_2 concentration in the region of the facility. Over the period 2019 – 2023 annual mean NO_2 concentrations at the selected sites ranged from 4 – 12 $\mu g/m^3$ with an overall 5-year average across the four sites of 9 $\mu g/m^3$.

Additionally, long term trends in ambient NO_2 concentrations indicate either reductions or relatively stable levels over time, with significant increases unlikely in the future. *Ireland's Air Pollutant Emissions 2022 (1990-2030)* report also demonstrates that Ireland's emissions of NO_X have been generally decreasing since 1990, with a reduction of 53.8% over the period 2005-2021 observed (EPA, 2024b).

The 5-year average data for Dundalk, Kilkenny and Seville Lodge and Portlaoise, which are considered the most representative stations, for the period 2019 – 2023 is 8 $\mu g/m^3$. Based on these results, a reasonably conservative estimate of the background NO_2 concentration in the region of the facility is 8 $\mu g/m^3$.

For the modelling assessment as per Section 11.6.2.2, the modelled process concentration is added to the background concentration to give the worst-case predicted environmental concentration (PEC). The PEC is then compared with the relevant ambient air quality standard to assess the significance of the releases from the site. NO_2 has ambient air quality standards for both annual mean and hourly concentrations that must be complied with (see Table 11-1). In relation to the annual average background, the ambient background concentration was added directly to the process concentration with the short-term (hourly) peaks assumed to have an ambient background concentration of twice the annual mean background concentration.

Table 11-11: Background NO_2 Concentrations (µg/m^3)

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
UCC Distillery Fields	Annual Mean NO_2 (µg/m^3)	10	8	9	9	8
	1-hr Mean NO_2 values >200 µg/m^3	-	0	0	0	0
Annual Mean NO_2 (µg/m3)	2008/50/EC Limit Value (applicable until 2030)	40				
1 hr Mean NO_2 (as 99.8th%ile) (µg/m^3)	Limit Value (to be attained by 2026 and applicable until 2030)	200				
1-hr Mean NO_2 values >200 µg/m^3		No more than 18 exceedances				

11.7.2.2 PM_{10}

Continuous PM_{10} monitoring carried out at the suburban background locations of Bishopstown MTU and Heatherton Park showed annual mean concentrations ranging from 11 – 15 µg/m^3 in 2023 (Table 11-12). The 5-year average data for these sites for the period 2019 – 2023 was used to estimate the current annual mean background PM_{10} concentration in the region of the facility. Over the period 2019 – 2023 annual mean PM_{10} concentrations at the selected sites ranged from 19 – 25 µg/m^3 with an overall 5-year average across the sites of 15 µg/m^3.

Based on these results, a reasonably conservative estimate of the annual mean background PM_{10} concentration in the region of the facility is 15 µg/m^3.

Table 11-12: Background PM_{10} Concentrations (µg/m^3)

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
Bishopstown MTU	Annual Mean PM_{10} (µg/m^3)	15	14	13	14	11
	24 hr Mean PM_{10} (as 90.4th%ile) (µg/m^3)	-	25	23	24	-
	24-hr Mean > 50 µg/m^3 (days)	-	0	1	0	-
Heatherton Park	Annual Mean PM_{10} (µg/m^3)	-	11	11	12	11
	24 hr Mean PM_{10} (as 90.4th%ile) (µg/m^3)	-	20	19	20	-
	24-hr Mean > 50 µg/m^3 (days)	-	2	1	0	-

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
Annual Mean PM_{10} (µg/m³)	Limit Value (to be attained by 2026 and applicable until 2030)	40				
24 hr Mean PM_{10} (as 90.4th%ile) (µg/m³)		50				
24-hr Mean PM_{10} values > 50 µg/m³		No more than 35 exceedances				

11.7.2.3 $PM_{2.5}$

Continuous $PM_{2.5}$ monitoring carried out at the Zone B suburban background locations of Athlone, Bray, Carlow Town and Tralee showed annual mean concentrations ranging from 6 – 10 µg/m³ in 2023 (see Table 11-13). The 5-year average data for these sites for the period 2019 – 2023 was used to estimate the current annual mean background $PM_{2.5}$ concentration in the region of the facility. Over the period 2019 – 2023 annual mean $PM_{2.5}$ concentrations at the selected sites ranged from 5 – 23 µg/m³ with an overall 5-year average across the sites of 9 µg/m³.

Based on these results, a reasonably conservative estimate of the annual mean background $PM_{2.5}$ concentration in the region of the facility is 9 µg/m³.

Table 11-13: Background $PM_{2.5}$ Concentrations (µg/m³)

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
Heatherton Park	Annual Mean $PM_{2.5}$ (µg/m³)	8	8	8	5	6
UCC Distillery Fields	Annual Mean $PM_{2.5}$ (µg/ m³)	8	7	7	5	-
Bishopstown MTU	Annual Mean $PM_{2.5}$ (µg/ m³)	-	-	-	-	7
Annual Mean $PM_{2.5}$ (µg/ m³)	Limit Value (to be attained by 2026 and applicable until 2030)	25				

11.7.3 Sensitivity of the Receiving Environment

11.7.3.1 Construction Phase

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (IAQM, 2024) 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 (ZoI previously defined in Section 11.6.1) are taken into consideration.

The type of receptors and their sensitivity to dust soiling, human health effects of PM_{10} and ecological effects are defined in the IAQM guidance (IAQM, 2024). High sensitivity receptors are regarded as residential properties, hospitals, schools and residential care homes 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 (such as public footpaths or parks) or do not expect a high level of amenity. Table 11-14 outlines the criteria for determining the sensitivity of the area to dust soiling and dust-related human health effects as per the IAQM guidance (IAQM, 2024).

Table 11-14: Criteria for Determining the Sensitivity of the Area Update

Sensitivity of the Area to Dust Soiling Effects on People and Property					
Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<250
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

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	<250
High	< 24 µg/ m³	>100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Medium	< 24 µg/ m³	>10	Low	Low	Low	Low
		1 - 10	**Low**	Low	Low	Low
Low	< 24 µg/ m³	>1	Low	Low	Low	Low

In terms of receptor sensitivity to dust soiling, the area directly surrounding the proposed development (within 250 m of the boundary) is predominantly sub-urban in nature. There is more than 1 no. medium sensitivity commercial properties within 20 m of the site boundary (see Figure 11-5). Based on these receptor numbers and using the IAQM criteria in Table 11-14, the sensitivity of the area to dust soiling impacts from the Proposed Development is medium.

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 (residential receptors are classified as high sensitivity) 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 15 µg/m^3. There are between 1 and 10 medium sensitivity commercial properties within 20 m of the site boundary (see Figure 11-5). Based on the IAQM criteria outlined in Table 11-14 the worst-case sensitivity of the area to dust-related human health effects is low.

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant, as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site, and 50 m from site access roads, up to 250 m for the site entrance. The sensitivity of the area is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present. There are no sensitive ecological receptors that meet these criteria within the study area and there is no potential for impacts to sensitive ecology from construction dust emissions and no further assessment is required.

Figure 11-5: Construction Dust Assessment – Sensitive Receptors within 250 m of Proposed Development

11.7.3.2 Operational Phase

The dispersion modelling has incorporated a variety of receptors, including a gridded receptor network, site boundary receptors, and individual discrete receptors representing specific residential properties or sensitive ecological sites. Ecological sites were modelled 0 m above ground, while all other receptors were modelled at 1.5 m to represent breathing height.

11.7.3.2.1 Human Receptors

The Zone of Influence (ZoI) for the human health effects of the operational phase emissions of the Proposed Development was modelled as follows, and determined in line with AG4 guidance (EPA, 2020).

Three receptor grids were created at which concentrations would be modelled. Receptors were mapped with sufficient resolution to ensure all localised "hot spots" were identified without adding unduly to processing time. The receptor grids were based on a Cartesian grid with the site at the centre. An outer grid measured 10 x 10 km with the site at the centre and with concentrations calculated at 200 m intervals. A medium density grid measured 3 x 3 km with the site at the centre and with concentrations calculated at 50 m intervals. A smaller, denser grid measured 1 x 1 km with concentrations calculated at 25 m intervals.

Boundary receptor locations were also placed along the ownership boundary of the site at 25 m intervals giving a total of 4,072 calculation points for the model.

The impact of the emission sources was also measured at nearby residential receptors (AQ) (identified via a combination of satellite imagery and Eircode search) which were added to the model as discrete receptors (shown in Figure 11-6; 1 km buffer for scale purposes, ZoI as per above).

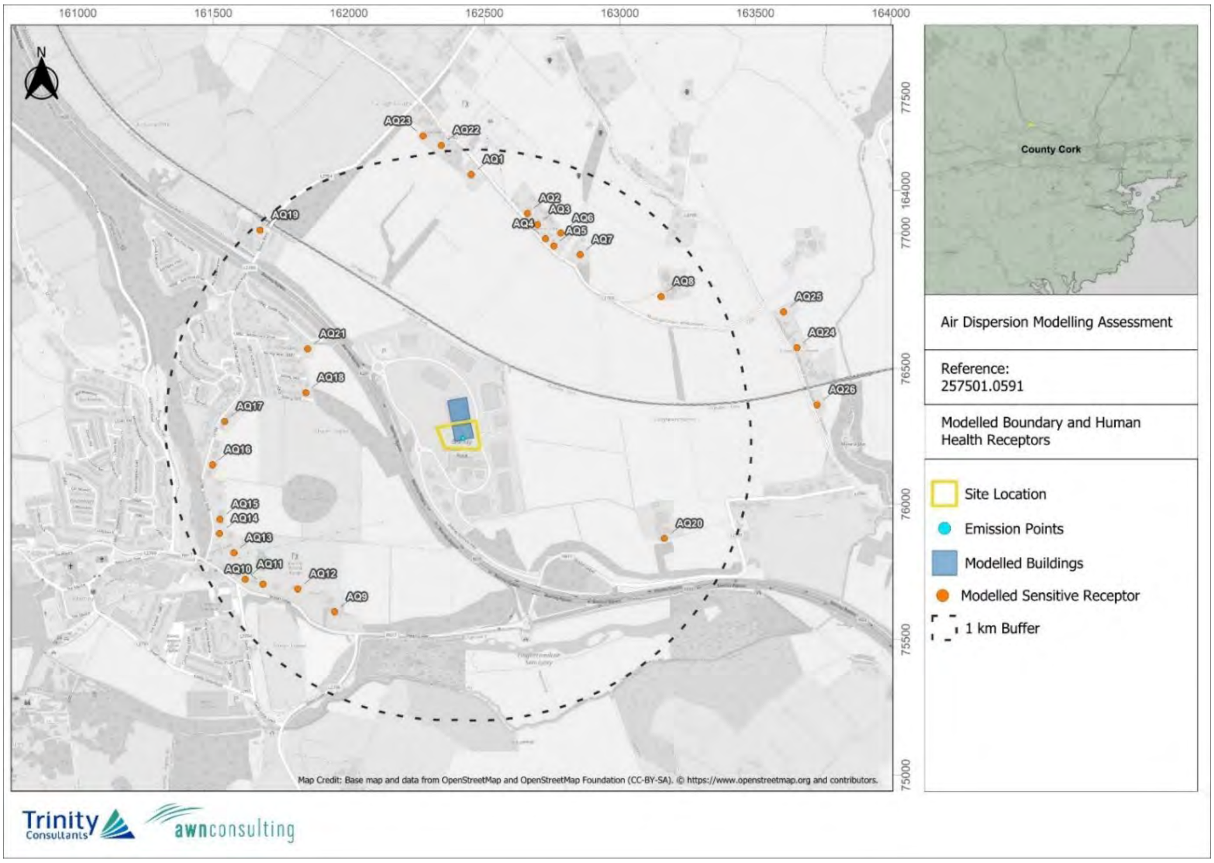

Figure 11-6: Human Health Receptors Included in Operational Phase Air Dispersion Modelling Assessment.

11.7.3.2.2 Ecology Receptors

The impact of emissions of NO_X, nitrogen deposition and acid deposition from the facility on ambient ground level concentrations was assessed using AERMOD within designated conservation areas such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and Natural Heritage Areas (NHAs), and proposed Natural Heritage Areas (pNHAs). SACs and SPAs are protected under the EU Habitats Directive (92/43/EEC), and EU Birds Directive (2009/147/EC) respectively, and are also known as Natura 2000 sites. NHAs are designated under the Wildlife (Amendment) Act 2000, and pNHAs were identified as sites of conservation interest in the 1990s but have not since been statutorily proposed or designated.

A geospatial search was conducted (NPWS, 2025) to identify the nearest Natura 2000 receptors within 10 km of the facility and the nearest national site (NHA or pNHA) within 2 km of the facility, based on the methodology recommended by the UK Environment Agency in their guidance *Air emissions risk assessment for your environmental permit* (UKEA, 2025). Beyond these distances, the effects on ecology due to emissions from the facility are expected to be imperceptible. There are no national sites identified within 2 km of the facility, indicating there is no likely significant effect on national sites. National sites are therefore scoped out of this assessment. The ecology receptors included in the dispersion model are shown in Table 11-15 and Figure 11-7.

Table 11-15: Ecology Receptors Included in Dispersion Model

Special Area of Conservation (SAC)	Special Protection Area (SPA)	Proposed Natural Heritage Area (pNHA)	Natural Heritage Area (NHA)
No SACs within 10km.	Cork Harbour SPA	Ardamadane Wood pNHA	No NHAs within 2km.
		Blarney Bog pNHA	
		Blarney Castle Woods pNHA	
		Blarney Lake pNHA	

Dispersion modelling of relevant pollutant emissions from all emission points at the facility were predicted at receptors within the ecological sites for all five years of meteorological data modelled. For modelling purposes, worst-case exposure is expected at the boundaries of the sensitive ecosystems. Ecological receptors were modelled 0 m above ground.

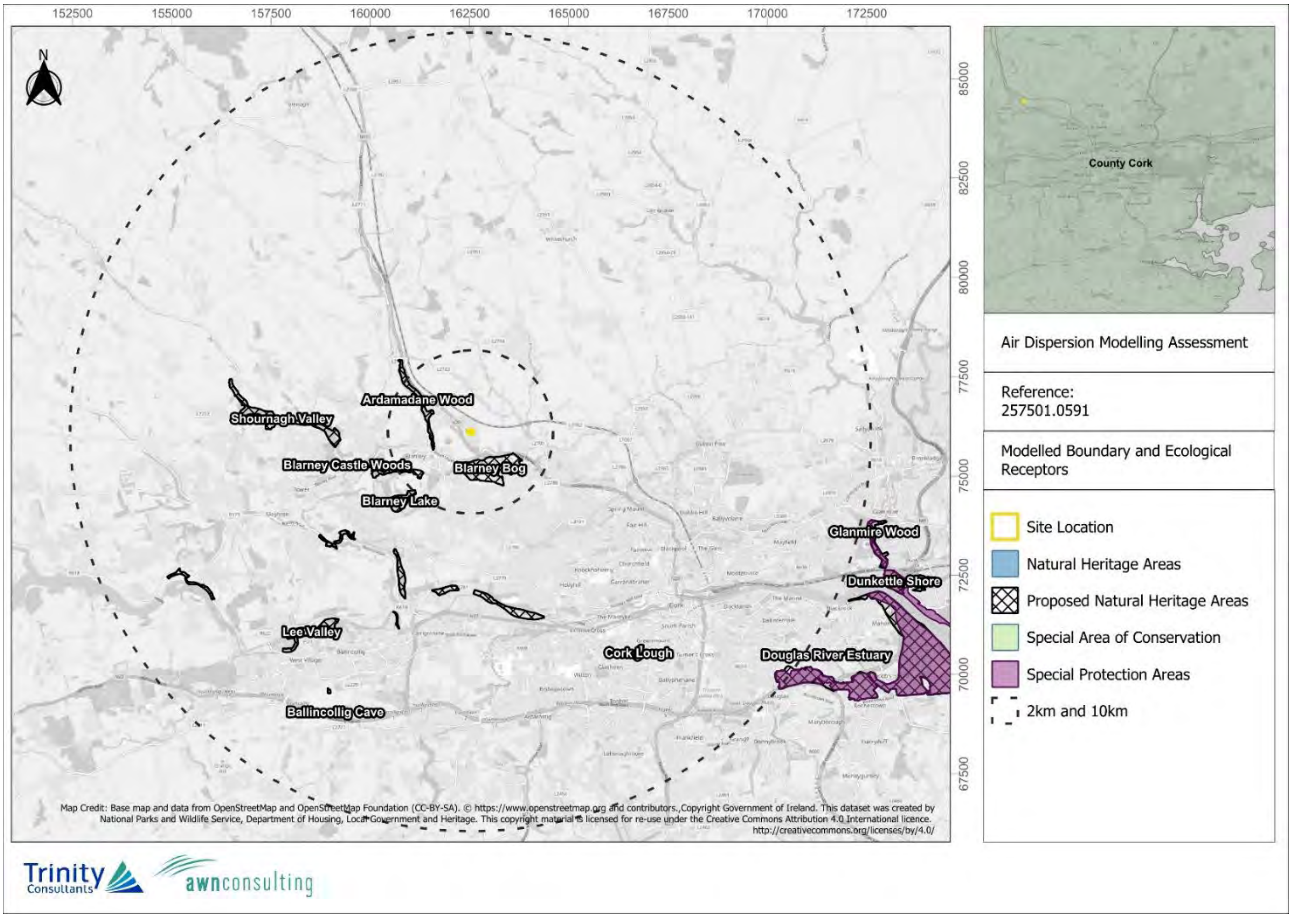

Figure 11-7: Sensitive Ecological Receptors within Operational Phase Air Dispersion Modelling Assessment Zone

11.8 Potential Impacts

11.8.1 'Do Nothing' Impacts

In the Do-Nothing 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 either at the existing site or in the surrounding area, changes in road traffic, etc).

Under the Do Nothing Scenario the proposed development will not be constructed, no construction works associated with the proposed development will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The operational emissions to air associated with the proposed development will also not occur. Given the zoning of the site, and existing development on-site, in the absence of the proposed development, it is likely that a commercial, light-industrial or industrial activity would be carried out at the site in the future in line with national policy and the development plan objectives. This development may generate impacts commensurate or beyond what was envisaged for the existing development on-site, in the absence of the proposed development.

11.8.2 Construction Phase Impacts

11.8.2.1 Construction Dust Assessment

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. While construction dust tends to be deposited within 250 m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2024). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Cork Airport meteorological data indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature (Section 11.7.1). In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30-year average data for Cork Airport meteorological station indicates that on average 194 days per year have rainfall over 0.2 mm (Met Éireann, 2025). Therefore, it can be determined that 53% of the time dust generation will be reduced due to natural meteorological conditions.

To determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (Section 11.7.3). The major dust generating activities are divided into four types within the IAQM (IAQM, 2024) guidance to reflect their different potential impacts. These are: demolition, earthworks, construction and trackout (movement of heavy vehicles).

11.8.2.1.1 Determining the Potential Dust Emission Magnitude

The magnitude of the works under each category can be classified as either small, medium or large depending on the scale of the works involved. The magnitude of each activity has been determined below for the Proposed Development using the criteria in Table 11-6.

- Demolition: There is no demolition of any structures on site as part of the proposed development.
- Earthworks: No significant earthworks will be required as the site is already development, with an existing warehouse and associated hardstanding in place.
- Construction: The dust emission magnitude for the proposed construction activities can be classified as small as a worst-case as the total volume of structures to be constructed will be less than 12,000 m^3. The construction phase will primarily involve the installation of the healthcare waste facility and associated ancillary facilities inside the existing building on-site. Minor additions/alterations will be made to existing development externally – the installation of an air emission stack, and modifications to increase the size of 2 no. roller shutter doors. There is no significant risk of dust generation from any of these works/
- Trackout: The dust emission magnitude for the proposed trackout can be classified as small, as there will be less than 20 outward HGV movements per day during the construction phase of the proposed development. The site is currently developed, with existing hardstanding and paved surfaces for vehicles, so no significant dust generation by movement of construction vehicles on site is expected.

11.8.2.1.2 Determining the Risk of Dust Impacts

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (IAQM, 2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling and dust-related human health effects (Section 11.7.3). The level of risk associated with each activity is determined using the criteria in Table 11-7. The overall risk of dust impacts from the construction works is shown in Table 11-16 for each category.

There is at most a low risk of dust soiling impacts and a negligible risk of dust-related human health impacts associated with the proposed works. As a result, best practice dust mitigation measures associated with low risk works will be implemented to ensure there are no significant impacts at nearby sensitive receptors. In the absence of mitigation, the likely effect of the dust impacts within the ZoI are predicted to be **direct, short-term, negative** and **slight**.

Table 11-16: Risk of Dust Impacts used to Define Site-Specific Mitigation

Receptor	Receptor Sensitivity	Dust Emission Magnitude	Risk of Dust-Related Impacts
Demolition			
Dust Soiling	n/a	n/a	n/a
Human Health	n/a		n/a
Earthworks			
Dust Soiling	n/a	n/a	n/a
Human Health	n/a		n/a
Construction			
Dust Soiling	Medium	Small	Low Risk
Human Health	Low		Negligible Risk
Trackout			
Dust Soiling	Medium	Small	Low Risk
Human Health	Low		Negligible Risk

11.8.3 Operational Phase Impacts

11.8.3.1 Air Dispersion Modelling Assessment – Human Health

11.8.3.1.1 NO_2 – Proposed Operations

The results indicate that ambient ground level concentrations of NO_2, detailed in Table 11-17, are in compliance with the relevant air quality standards for all modelled years at the worst-case receptor (considers boundary, gridded and sensitive receptors).

For the worst-case year, emissions from the site lead to an ambient NO_2 concentration (including background) which is 31% of the annual limit value at the worst-case receptor (location shown in Figure 11-8) and 18% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) at the worst-case receptor (location shown in Figure 11-9).

The geographical variations in ground level NO_2 predicted environmental concentrations (PEC) beyond the facility boundary for the worst-case year modelled are illustrated as concentration contours in Figure 11-8 and Figure 11-9, to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO_2 are close to the boundary of the site with concentrations decreasing with distance from the facility.

Table 11-17: Proposed Operations – Dispersion Model Results for Nitrogen Dioxide (NO_2)

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m3)				PEC as % of Limit
		Type	X,Y (UTM Zone 29 N)	PC	Back-ground	PEC	Limit Value	
NO_2 / 2020	Annual Mean	Boundary	531166, 5754251	3.2	9	12.2	40	31%
	99.8th%ile of 1-hr means	Boundary	531090, 5754266	17.9	18	35.9	200	18%
NO_2 / 2021	Annual Mean	Boundary	531115, 5754270	3.1	9	12.1	40	30%
	99.8th%ile of 1-hr means	Boundary	531090, 5754266	18.2	18	36.2	200	18%
NO_2 / 2022	Annual Mean	Boundary	531115, 5754270	3.0	9	12.0	40	30%
	99.8th%ile of 1-hr means	Boundary	531090, 5754266	18.8	18	36.8	200	18%
NO_2 / 2023	Annual Mean	Boundary	531139, 5754275	3.2	9	12.2	40	31%
	99.8th%ile of 1-hr means	Boundary	531090, 5754266	18.4	18	36.4	200	18%
NO_2 / 2024	Annual Mean	Boundary	531139, 5754275	2.9	9	11.9	40	30%
	99.8th%ile of 1-hr means	Boundary	531090, 5754266	18.0	18	36.0	200	18%

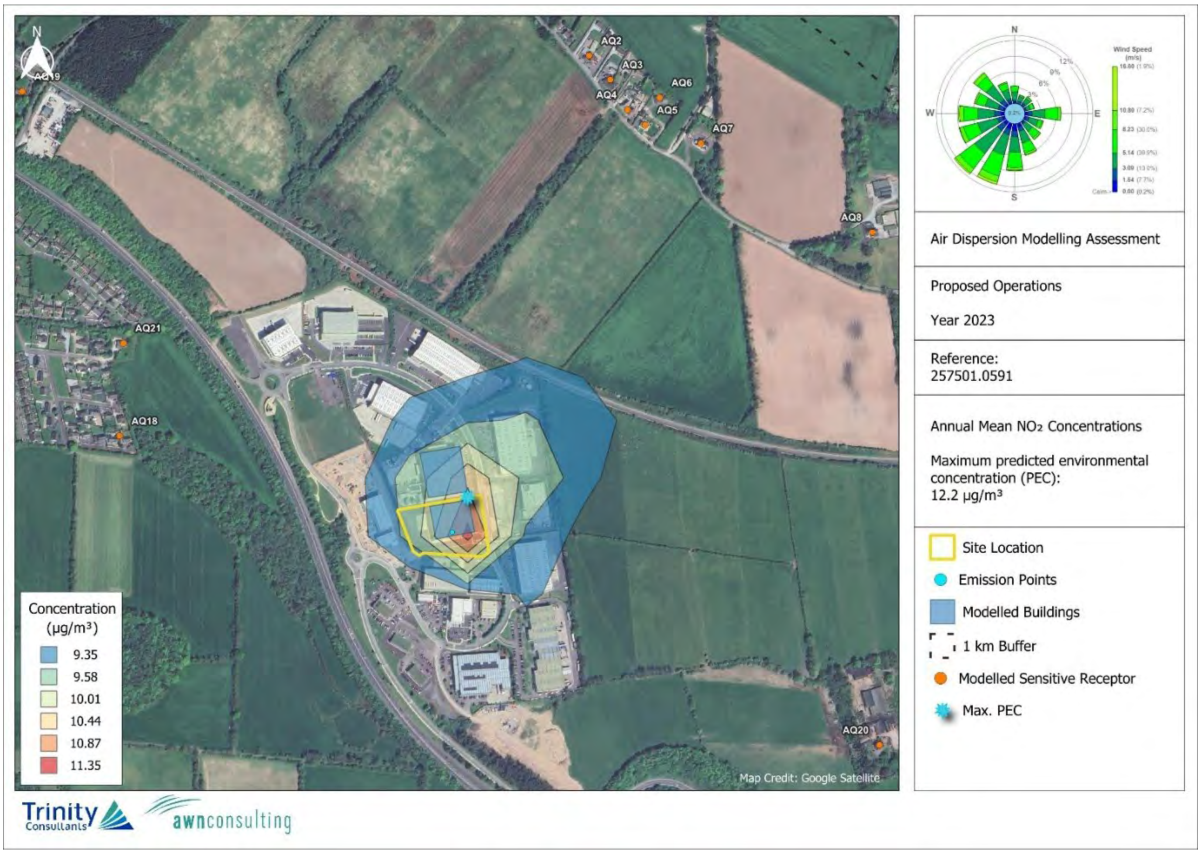

Figure 11-8: Proposed Operations Scenario - Annual Mean NO_2 Concentrations

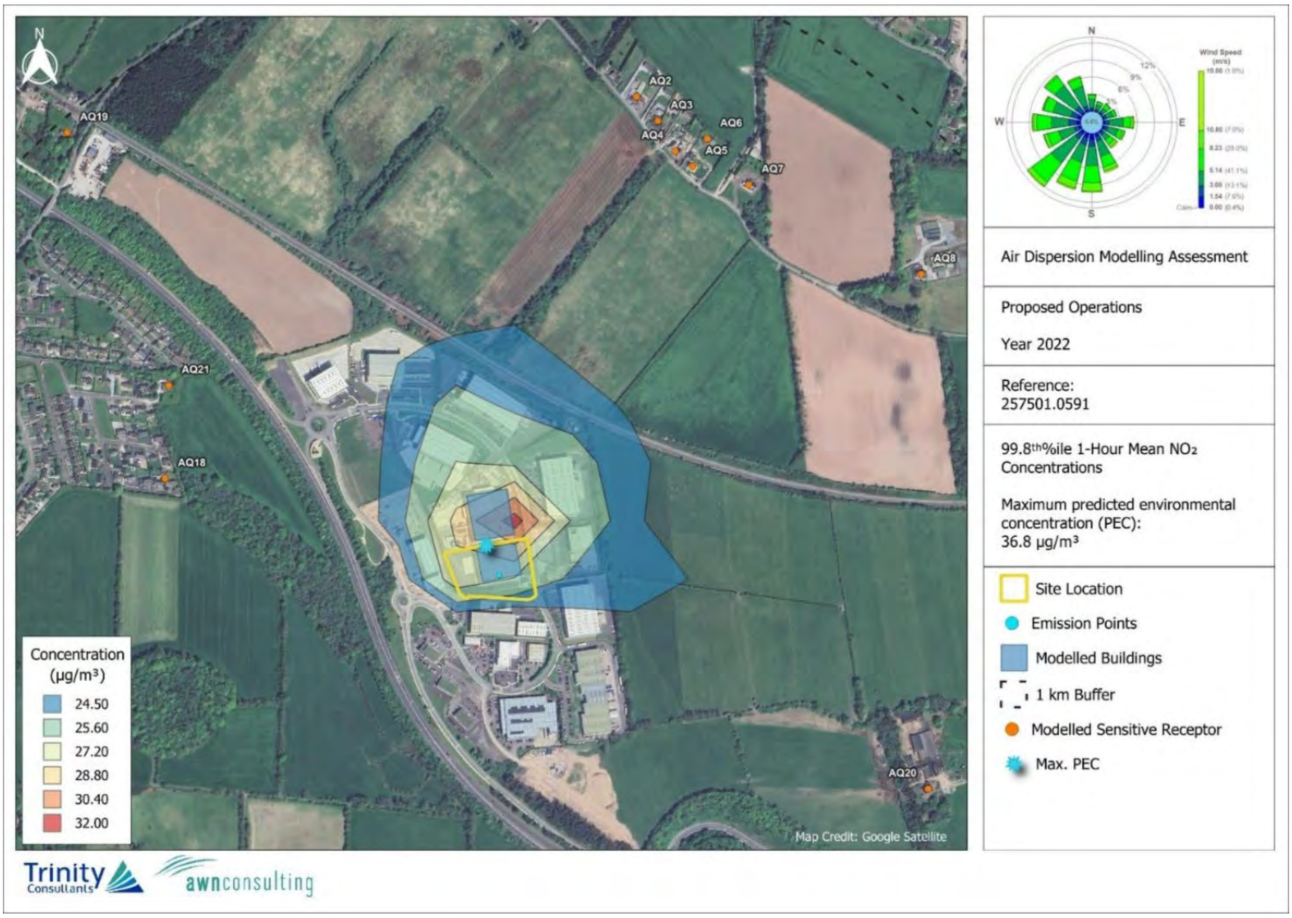

Figure 11-9: Proposed Operations Scenario - Maximum 1-Hour NO_2 Concentrations (as 99.8th%ile)

11.8.3.1.2 VOC – Proposed Operations

The VOC modelling results are detailed in Table 11-18 and Table 11-19. The results indicate that the ambient ground level concentrations are below the relevant air quality guidelines for individual VOCs even when it is assumed that each emission point is emitting solely the VOC of concern at the IED emission limit for the full year. Emissions from the proposed VOC abatement system onsite lead to ambient individual VOC concentrations which are no more than 0.06% of the maximum 1-hour limit value at the worst-case receptor (see Figure 11-11) and no more than 0.1% of the annual mean limit value at the worst-case off-site location (see Figure 11-10) .

Table 11-18: VOCs Dispersion Model Results – Process Contributions Under Normal Operations – Maximum 1-Hour Scenario

Pollutant	1-Hour EAL µg/ m³	2020	2021	2022	2023	2024	Max PEC % of EAL
2-Propanol	125,000	65	70	68	72	64	0.06%
Acetone	362,000	63	67	66	70	62	0.02%
Butane	181,000	47	50	49	53	46	0.03%
Ethyl alcohol	576,000	75	80	78	83	73	0.01%
Ethyl chloride	338,000	104	112	109	117	103	0.03%

Background levels of all VOCs are likely to be well below 1 µg/ m³ in the vicinity of the facility.
As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the maximum 1-hour mean scenario.

Table 11-19: VOCs Dispersion Model Results – Process Contributions Under Normal Operations – Annual Mean Scenario

Pollutant	Annual Mean EAL µg/ m³	2020	2021	2022	2023	2024	Max PEC % of EAL
2-Propanol	9,900	5.0	5.2	5.2	5.2	4.8	0.05%
Acetone	18,100	4.8	5.1	5.0	5.1	4.6	0.03%
Butane	14,500	3.6	3.8	3.8	3.8	3.5	0.03%
Ethyl alcohol	19,200	5.7	6.0	6.0	6.0	5.5	0.03%
Ethyl chloride	27,000	8.0	8.4	8.3	8.4	7.7	0.03%

Background levels of all VOCs are likely to be well below 1 µg/ m³ in the vicinity of the facility.
As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.

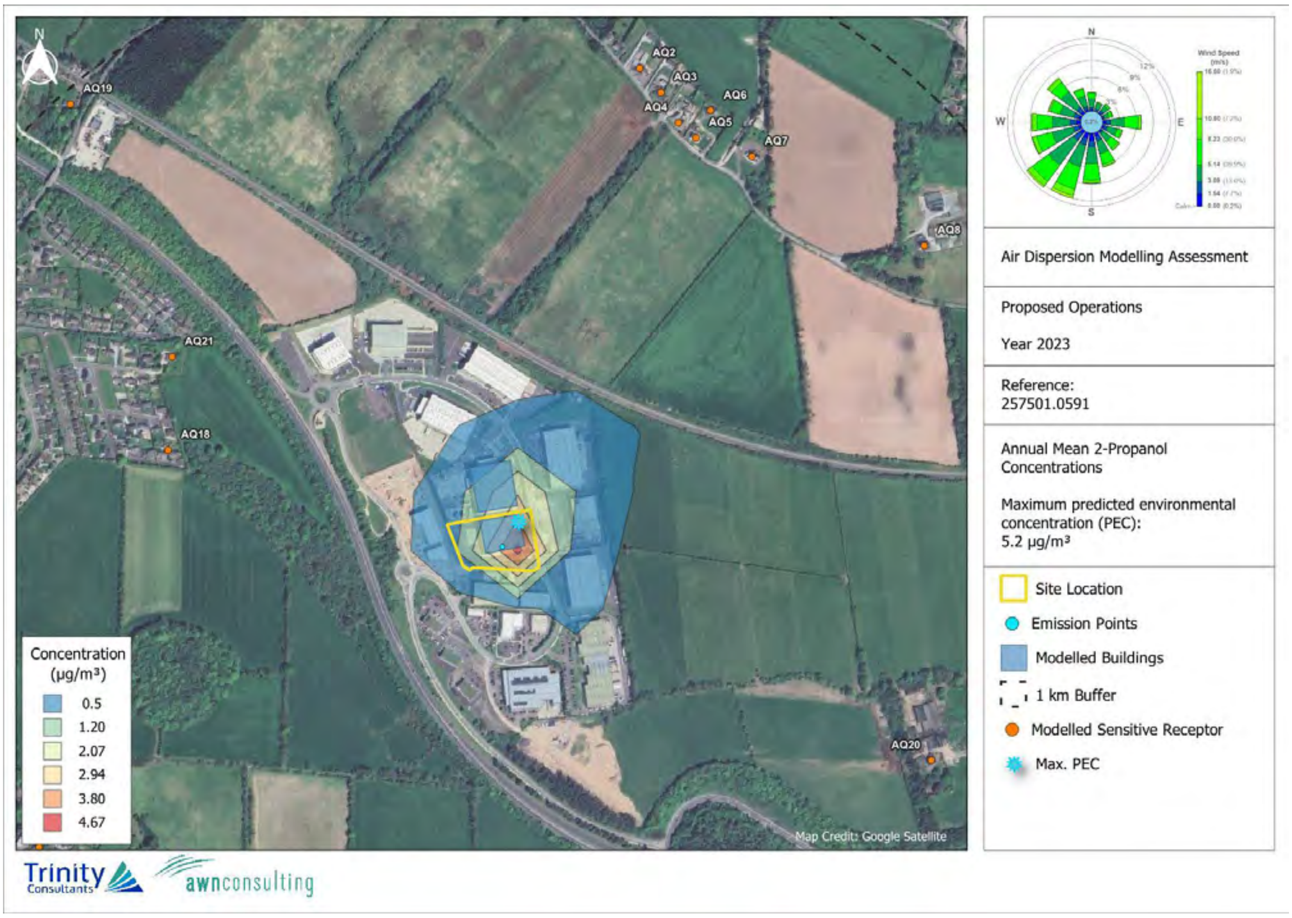

Figure 11-10: Maximum Annual Mean VOC (2-Propanol) Concentrations (µg/ m^3, as carbon)

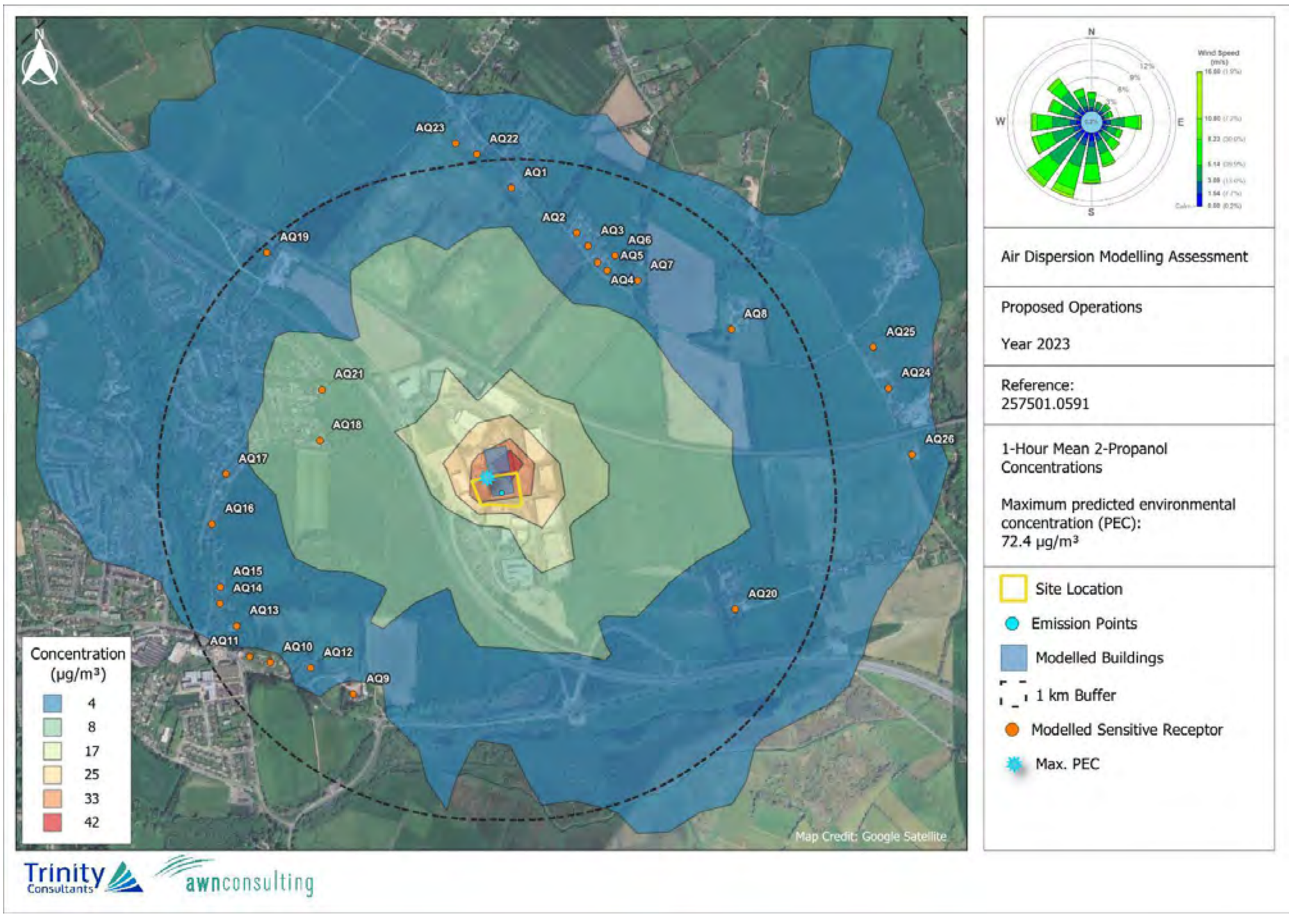

Figure 11-11: Maximum 1-Hour Mean VOC (2-Propanol) Concentrations (µg/ m^3, as carbon)

11.8.3.2 Air Dispersion Modelling Assessment – Ecology

11.8.3.2.1 NO_X – Proposed Operations

The NO_X modelling results for ecological receptors under the Proposed Operations scenario are detailed in Table 11-20.

As per Section 11.5.2.3, process contributions (PCs) of NO_X at ecological receptors were compared to the relevant critical level (identified in Section 11.5.2.1).

There are no PCs greater than 1% of the relevant critical level at any of the modelled ecological receptors, therefore no further assessment is required. The effect of nitrogen oxide (NO_X) emissions from the facility on sensitive ecological receptors is therefore considered to be not significant.

Table 11-20: Proposed Operations – NO_X Designated Habitat Dispersion Model Results

Ecological Receptor	NOX Process Contributions (µg/ m³)					Critical Level (µg/m³)	Max PC % of Critical Level	Considered for further assessment?	Background (µg/ m³)	PEC (µg/ m³)	PEC % of critical level
	2020	2021	2022	2023	2024						
Natura 2000											
Cork Harbour SPA	0.002	0.002	0.002	0.002	0.002	30	0.01%	No	n/a	n/a	n/a
National Sites											
Ardamadane Wood pNHA	0.03	0.03	0.03	0.03	0.03	30	0.1%	No	n/a	n/a	n/a
Blarney Bog pNHA	0.09	0.10	0.09	0.07	0.10	30	0.3%	No	n/a	n/a	n/a
Blarney Castle Woods pNHA	0.01	0.01	0.01	0.01	0.01	30	0.03%	No	n/a	n/a	n/a
Blarney Lake pNHA	0.004	0.005	0.005	0.005	0.004	30	0.02%	No	n/a	n/a	n/a

11.8.3.2.2 Nitrogen Deposition – Proposed Operations

In order to consider the effects of nitrogen deposition (as N) owing to emissions from the facility on the European and National ecological receptors, the maximum annual mean NO_2 process contribution concentrations (PC) are converted into the dry deposition fluxes and then nitrogen deposition fluxes (as described in Section 11.6.2.2.5) and shown in Table 11-21 and Table 11-22.

As per Section 11.5.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors were compared to the relevant critical load (identified in Section 11.5.2.2).

There are no PCs greater than 1% of the relevant critical load at any of the modelled ecological receptors, therefore no further assessment is required. The effect of nitrogen deposition due to emissions from the Proposed Development on sensitive ecological receptors is therefore considered to be not significant.

Table 11-21: Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors

NO_2							
Ecological Receptor	NO_2 Process Contributions (µg/m³)					NO_2 Dry Deposition (µg/m²/s)	NO_2 Nitrogen Deposition (kg/ha/yr)
	2020	2021	2022	2023	2024		
Natura 2000							
Cork Harbour SPA	0.03	0.04	0.04	0.03	0.04	0.00006	0.006
National Sites							
Ardamadane Wood pNHA	0.02	0.03	0.03	0.03	0.03	0.00005	0.0004
Blarney Bog pNHA	0.04	0.05	0.06	0.05	0.05	0.00009	0.0006
Blarney Castle Woods pNHA	0.02	0.02	0.02	0.02	0.02	0.00004	0.0003
Blarney Lake pNHA	0.02	0.02	0.03	0.03	0.02	0.00004	0.0003

Table 11-22: Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors

Ecological Receptor	Total PC Nitrogen Deposition kg/ha/yr)	Assessment critical load (kg/ha/yr)	PC % of critical load	Further Assessment?	APIS Background Nitrogen Deposition (kg/ha/yr)	Total PEC Nitrogen Deposition (kg/ha/yr)
Natura 2000						
Cork Harbour SPA	0.006	7.5	0.08%	No	n/a	n/a
National Sites						
Ardamadane Wood pNHA	0.005	15.0	0.03%	No	n/a	n/a
Blarney Bog pNHA	0.008	10.0	0.08%	No	n/a	n/a
Blarney Castle Woods pNHA	0.004	15.0	0.02%	No	n/a	n/a
Blarney Lake pNHA	0.004	10.0	0.04%	No	n/a	n/a

11.8.3.2.3 Acid Deposition (as N) – Proposed Operations

In order to consider the effects of acid deposition (as N) owing to emissions from the facility on the most impacted ecological receptors, the maximum annual mean NO_2 process contribution concentrations (PC) are converted into the dry deposition fluxes and then acid deposition fluxes (as described in Section 11.6.2.2.5) and shown in Table 11-23 and Table 11-24.

As per Section 11.5.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors were compared to the relevant critical load (identified in Section 11.5.2.2).

There are no PCs greater than 1% of the relevant critical load at any of the modelled ecological receptors, therefore no further assessment is required. The effect of acid deposition (as N) due to emissions from the proposed development on sensitive ecological receptors is therefore considered to be not significant.

Table 11-23: Proposed Operations – Acid Deposition (as N) Dispersion Model Results at Ecological Receptors

NO_2							
Ecological Receptor	NO_2 Process Contributions (µg/ m³)					NO_2 Dry Deposition (µg/ m²/s)	NO_2 Acid Deposition (keq/ha/yr)
	2020	2021	2022	2023	2024		
Natura 2000							
Cork Harbour SPA	0.03	0.04	0.04	0.03	0.04	0.00006	0.0004
National Sites							
Ardamadane Wood pNHA	0.02	0.03	0.03	0.03	0.03	0.00005	0.0004
Blarney Bog pNHA	0.04	0.05	0.06	0.05	0.05	0.00009	0.0006
Blarney Castle Woods pNHA	0.02	0.02	0.02	0.02	0.02	0.00004	0.0003
Blarney Lake pNHA	0.02	0.02	0.03	0.03	0.02	0.00004	0.0003

Table 11-24: Proposed Operations – Acid Deposition (as N) Dispersion Model Results at Ecological Receptors (continued)

Ecological Receptor	PC Acid Dep. (N) (keq/ ha/yr)	Critical load (MinCL minN) for PC (keq/ ha/yr)	PC % of critical load	Further assessment?	APIS Back-ground Acid Dep. (keq/ ha/yr)	Total PEC Acid Dep. (N) (keq/ ha/yr)	Critical load (MaxCL minN) for PEC (keq/ ha/yr)
Natura 2000							
Cork Harbour SPA	0.00006	0.143	0.04%	No	n/a	n/a	0.714
National Sites							
Ardamadane Wood pNHA	0.00005	0.143	0.04%	No	n/a	n/a	0.714
Blarney Bog pNHA	0.00009	0.143	0.06%	No	n/a	n/a	0.143
Blarney Castle Woods pNHA	0.00004	0.143	0.03%	No	n/a	n/a	0.714
Blarney Lake pNHA	0.00004	0.143	0.03%	No	n/a	n/a	0.714

11.8.4 Decommissioning Phase Impacts

Dust impacts during the decommissioning phase are expected to be of similar type and similar or lesser in magnitude to those anticipated during the construction phase, but generally of a shorter duration. The same mitigation measures implemented during the construction phase will be applied during the decommissioning works and are also considered appropriate for the decommissioning demolition works. It can therefore be determined that the decommissioning phase will have a **short-term, direct, negative** and **not significant** effect on air quality.

11.8.5 Cumulative Impacts

11.8.5.1 Construction Phase

Cumulative construction dust impacts may occur if large-scale developments within 500 m of the site are under construction simultaneously.

A review of the planned and permitted projects within the vicinity of the site was undertaken to identify developments with the potential for cumulative construction phase impacts. The dust mitigation measures outlined in Section 11.9.1 will be applied during the construction phase, and other permitted developments will also apply similar measures as part of their planning conditions, which will avoid significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality associated with the construction phase of the Proposed Development is **short-term, direct, negative** and **not significant**. No significant cumulative impacts to air quality predicted for the construction phase.

11.8.5.2 Operational Phase

A review of the potential for cumulative effects of operational phase emissions from the proposed development and other nearby industrial sites was undertaken, which found no industrial sites with relevant air emissions within 1 km of the proposed development. There is therefore no potential for significant cumulative operational phase effects due to the proposed development.

11.8.6 Summary of Potential Impacts

The following table summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.

Table 11-25: Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of construction dust from construction and trackout in terms of dust soiling, and human health	Negative	Slight	Study area as per Section 11.7.3.1.	Likely	Short-term	Direct

The following table summarises the identified likely significant effects during the operational phase of the Proposed Development before mitigation measures are applied.

Table 11-26: Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of operational phase EPA licensed emissions from facility on air quality	Negative	Not significant	Dispersion model study area as per Section 11.7.3.2.	Likely	Long-term	Direct

11.9 Mitigation Measures

11.9.1 Construction Phase Mitigation

The proposed development has been assessed as having a low risk of dust soiling impacts and a negligible risk of dust related human health impacts during the construction phase as a result of construction and trackout activities (see Section 11.8.2.1). Therefore, the following dust mitigation measures shall be implemented during the construction phase of the Proposed Development. These measures are appropriate for sites with a medium risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DCC (2018), DLRCC (2022)), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

Table 11-27: Construction Dust Management Measures

Mitigation Type	Location	Description of Mitigation or Monitoring Measures
Communications	Construction Compound/Site Boundary and throughout (as required)	An Environmental Manager (EM) will be assigned by the appointed contractor. The EM will be responsible for co-ordinating the day-to-day management of environmental impacts during the Construction Phase. The EM will be responsible for performing inspections as deemed necessary and manage responses to environmental incidents. The name and contact details of the EM will be responsible for construction dust management and air quality issues will be displayed at the construction compound/site boundary hoarding, as well as head/regional office contact details. A complaints register will be kept by the appointed contractor 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
Construction Works Area Management	Construction Compound/Site Boundary and throughout (as required)	Storage areas/containers will be covered to prevent wind whipping. Cutting, grinding or sawing equipment will be fitted with or used in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. Equipment will be readily available in the construction works areas site to clean any dry spillages. Spillages will be cleaned up as soon as reasonably practicable after the event using wet cleaning methods.
Operating Vehicles / Machinery	Construction Compound/Site Boundary and throughout (as required)	Engines of all vehicles will be switched off engines when stationary - idling vehicles are not permitted.
Construction Activities	Areas where construction is required	Smaller supplies of fine power materials bags will be sealed after use and stored appropriately to prevent dust escaping.
Measures specific to trackout (transport of dust and dirt from the construction works areas onto the public road network)	Construction Compound/Site Boundary and throughout (as required)	Vehicles transporting any loose materials entering and leaving the Proposed Development works area will be covered with tarpaulin to prevent escape of materials during transport. Before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place.
Monitoring	Construction Compound/Site Boundary and throughout (as required)	To determine if any short-term dust impacts will occur, a minimum of daily visual inspections for dust soiling of receptors (including roads, and surfaces such as street furniture, cars and windowsills) adjoining the construction works areas will be undertaken. Inspection results will be recorded in the site inspection log. Cleaning will be provided if necessary, such as in the event of a dust complaint resulting from the Proposed Scheme construction works.

11.9.2 Operational Phase Mitigation

No site-specific mitigation measures are proposed for the operational phase as impacts are predicted to be not significant.

11.9.3 Decommissioning Phase Mitigation

As the dust emissions during the decommissioning phase are expected to be of a similar or lesser magnitude to those identified during the construction phase, the mitigation measures applicable to construction phase dust emissions are also considered suitable for those during the decommissioning phase.

11.10 Residual Impacts

11.10.1 Construction Phase

To minimise dust emissions during construction, a series of mitigation measures have been prepared as outlined in Section 11.9.1. Provided the dust minimisation measures are adhered to, the predicted residual air quality impacts during the construction phase are **short-term, direct, negative** and **not significant**.

Best practice mitigation measures are proposed for the construction phase of the proposed development, which will focus on the proactive 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 will ensure that the impact complies with all EU ambient air quality legislative limit values (set out in Directive 2008/50/EC), which are based on the protection of human health (Table 11-1). Therefore, the predicted residual, dust-related, human health impact of the construction phase of the Proposed Development is **short-term, direct, negative** and **not significant**.

11.10.2 Operational Phase

Detailed air dispersion modelling of emissions from the Proposed Development determined that pollutant concentrations will be in compliance with the relevant limit values set out in Table 11-1. Therefore, emissions from the proposed development will have a **direct, long-term, negative** and **not significant** impact on air quality.

11.10.3 Cumulative

The primary potential cumulative residual effect relates to construction dust emissions. According to the IAQM guidance (IAQM, 2024), if the construction phase of the proposed development coincides with the construction phase of any other large scale permitted projects within 500 m of the site, there is a possibility of cumulative residual dust effects occurring at any nearby sensitive receptors. Should simultaneous construction phases occur, it would lead to cumulative residual dust soiling and dust-related effects on human health, specifically localised to the works area associated with the proposed works.

However, should the construction phases of the development and any localised permitted developments coincide, it is predicted that once the mitigation measures outlined in Section 11.9.1 are put in place impacts will not be significant. Impacts will be **short-term, direct, negative** and **not significant**. No significant cumulative adverse impacts to air quality are predicted for the construction or operational phases.

11.10.4 Summary of Residual Impacts

The following table summarises the identified likely significant residual effects during the construction phase of the Proposed Development following the application of mitigation measures.

Table 11-28: Summary of Construction Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of construction dust from construction and trackout in terms of dust soiling, and human health	Negative	Not significant	Study area as per Section 11.7.3.1.	Likely	Short-term	Direct

The following table summarises the identified likely residual significant effects during the operational phase of the Proposed Development post mitigation.

Table 11-29: Summary of Operational Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of operational phase emissions from facility on air quality	Negative	Not significant	Dispersion model study area as per Section 11.7.3.2.	Likely	Long-term	Direct

11.11 Interactions and Interrelationships

11.11.1 Air Quality and Population & Human Health

11.11.1.1 Construction Phase

The most significant interaction is Population and Human Health and Air Quality. An adverse air quality impact during the construction phase can cause health and dust nuisance issues. There is a low risk of dust-related human health impacts during the construction phase of the Proposed Development. Best practice mitigation measures will be implemented during the construction phase to ensure that the impact of the Proposed Development complies with all ambient air quality legislative limits. Therefore, the predicted impact is **direct, short-term, negative** and **not significant** with respect to Population and Human Health during the construction phase.

11.11.1.2 Operational Phase

Vehicles accessing the site will emit pollutants which may impact Air Quality and Human Health. However, the increased number of vehicles associated with the Proposed Development will not cause a significant change in air pollutant emissions in the locality. It has been assessed that emissions will be in compliance with the ambient air quality standards which are set for the protection of human health. The likely effect will be **long-term, direct, negative** and **imperceptible**.

11.11.2 Air Quality and Climate

Air Quality and Climate have interactions as the emissions from the burning of fossil fuels during the construction and operational phases generate both air quality and climate impacts. There is no impact on climate due to air quality. However, the sources of impacts on air quality and climate are strongly linked.

11.11.3 Air Quality and Land & Soils

11.11.3.1 Construction Phase

Construction phase activities such as construction and movement of materials by construction vehicles have the potential for interactions between Air Quality and Land & Soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils during the construction phase.

11.11.3.2 Operational Phase

There are no potentially significant interactions identified between Air Quality, and Land & Soils during the operational phase.

11.11.4 Air Quality and Biodiversity

11.11.4.1 Construction Phase

Dust generation can occur during extended dry weather periods due to construction traffic . Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability as well as other effects. There are no designated ecological sites within 50 m of the Proposed Development site area. Significant dust impacts are not predicted beyond this distance. Dust mitigation measures will be implemented on site as set out in Section 11.9.1. *With the implementation of these mitigation measures dust emissions will be minimised and impacts will be **direct, short-term, negative** and **not significant** with respect to biodiversity.*

11.11.4.2 Operational Phase

There are no potentially significant interactions identified between Air Quality, and Biodiversity during the operational phase.

11.11.5 Air Quality and Material Assets – Traffic & Transport

11.11.5.1 Construction Phase

Interactions between Air Quality and Traffic can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of the Proposed Development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between Traffic and Air Quality are linked but there is no potential for significant impacts from traffic on air quality. The effects are considered to be **direct, short-term, neutral** and **not significant** during the construction phase.

11.11.5.2 Operational Phase

*The impact of the interactions between Traffic and Air Quality are considered to be **long-term, direct, neutral** and **not significant** during the operational phase.*

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