

EIAR FOR POWERSTOWN BIOENERGY

Volume 2 - Main Body of the EIAR

Chapter 8 – Air Quality

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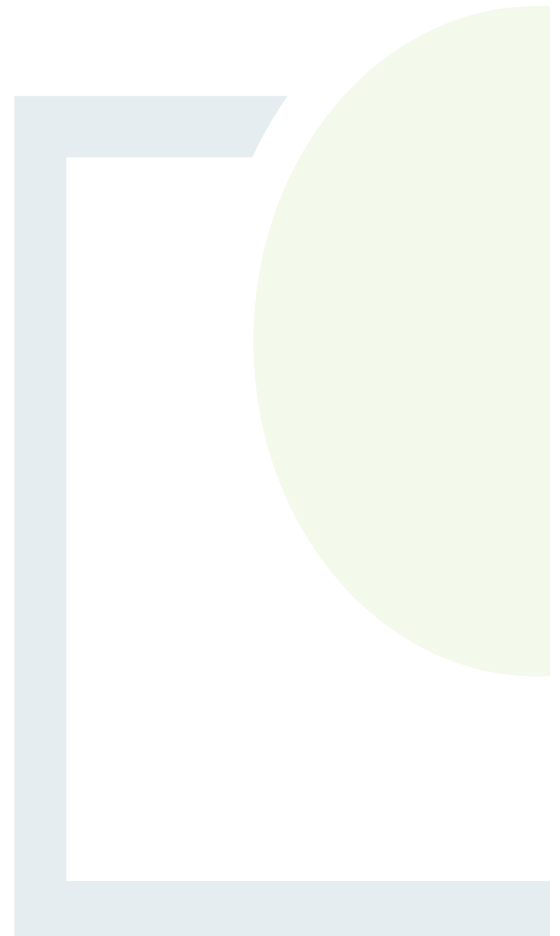


TABLE OF CONTENTS

8.	AIR QUALITY	1
8.1	Introduction.....	1
8.2	Characteristics of the Proposed Development	1
8.2.1	Construction Phase	1
8.2.2	Operational Phase.....	1
8.3	Statement of Authority	3
8.4	Relevant Legislation & Guidance.....	3
8.5	Assessment Criteria	4
8.5.1	Human Health	4
8.5.2	Ecology	10
8.6	Assessment Methodology Construction Phase.....	21
8.6.1	Construction Dust Assessment	21
8.6.2	Construction Phase Traffic Assessment	25
8.7	Assessment Methodology Operational Phase	25
8.7.1	Operational Phase Traffic Assessment.....	25
8.8	Assessment Methodology Decommissioning Phase	34
8.9	Baseline Environment.....	35
8.9.1	Meteorological Data	35
8.9.2	Baseline Air Quality	37
8.9.3	Sensitivity of the Receiving Environment	42
8.10	Assessment of Likely Significant Impacts	50
8.10.1	‘Do Nothing’ Impacts	50
8.10.2	Construction Phase Impacts.....	50
8.10.3	Operational Phase Impacts	52
8.10.4	Decommissioning Phase Impacts.....	81
8.10.5	Cumulative Impacts	81
8.10.6	Summary of Potential Impacts.....	91
8.11	Mitigation Measures	91
8.11.1	Construction Phase Mitigation	91
8.11.2	Operational Phase Mitigation	93
8.11.3	Decommissioning Phase Mitigation.....	94
8.12	Residual Impacts.....	94

8.12.1	Construction Phase	94
8.12.2	Operational Phase.....	94
8.12.3	Cumulative	94
8.12.4	Summary of Residual Impacts.....	95
8.13	Interactions and Interrelationships	95
8.13.1	Air Quality and Population & Human Health	95
8.13.2	Air Quality and Climate	96
8.13.3	Air Quality and Land & Soils	96
8.13.4	Air Quality and Biodiversity	97
8.13.5	Air Quality and Material Assets – Traffic & Transport	97
8.14	References	99

LIST OF APPENDICES (VOLUME 3)

Appendix 8.1 – Air Dispersion Modelling Supporting Information

LIST OF FIGURES

	<u>Page</u>
Figure 8-1: IN2 flowchart for assessing the impacts of nitrogen deposition and ammonia emissions to air on European Sites (EPA, 2024)	20
Figure 8-2: Terrain in the Vicinity of the Proposed Development	28
Figure 8-3: Example of building downwash for Selected Emission Point (Biomass Boiler No. 2)	30
Figure 8-4: Wind Roses for Oak Park Meteorological Station	36
Figure 8-5: Construction Dust Assessment – Sensitive Receptors within 250 m of Proposed Development	44
Figure 8-6: Construction Dust Assessment – Sensitive Receptors within 250 m of Proposed Gas Pipeline Route	45
Figure 8-7: Human Health Receptors Included in Operational Phase Air Dispersion Modelling Assessment.....	47
Figure 8-8: Sensitive Ecological Receptors within Operational Phase Air Dispersion Modelling Assessment.....	49
Figure 8-9: Proposed Operations Scenario - Annual Mean NO ₂ Concentrations	55
Figure 8-10: Proposed Operations Scenario - Maximum 1-Hour NO ₂ Concentrations (as 99.97 th ile)	56
Figure 8-11: Proposed Operations Scenario - Maximum 24-Hour NO ₂ Concentrations (as 95.1 st ile).....	57
Figure 8-12: Proposed Operations Scenario - Maximum Annual Mean PM ₁₀ Concentrations	60
Figure 8-13: Proposed Operations Scenario - Maximum 24-Hour Mean PM ₁₀ Concentrations (as 95.1 st ile).....	61
Figure 8-14: Proposed Operations Scenario – Annual Mean NH ₃ Concentrations	66
Figure 8-15: Proposed Operations Scenario - Maximum 1-Hour NH ₃ Concentrations	67
Figure 8-16: Proposed Operations Scenario - 1-Hour Mean Odour Concentrations (as 98 th ile).....	69
Figure 8-17: Proposed Operations Scenario - NO _x Process Contributions as 1% of Critical Level	71
Figure 8-18: Proposed Operations Scenario – NH ₃ Process Contributions as 1% of Critical Level.....	74
Figure 8-19: Proposed Operations Scenario – Nitrogen Deposition Process Contributions as 1% of Critical Load	77
Figure 8-20: Proposed Operations Scenario –Acid Deposition (as N) Process Contributions as 1% of Critical Load	80
Figure 8-21: Cumulative Assessment - Annual Mean NO ₂ Concentrations.....	84
Figure 8-22: Cumulative Assessment - Maximum 1-Hour NO ₂ Concentrations (as 99.97 th ile)	85
Figure 8-23: Cumulative Assessment - Maximum 24-Hour NO ₂ Concentrations (as 95.1 st ile)	86

LIST OF TABLES

	<u>Page</u>
Table 8-1: Ambient Air Quality Limit Values	5
Table 8-2: WHO Air Quality Guidelines 2021	7
Table 8-3: Ammonia Ambient Air Quality Standards (Environment Agency (UK), 2025)	7
Table 8-4: Indicative Odour Standards Based on Offensiveness of Odour and adapted for Irish EPA (EPA, 2019)	9

Table 8-5:	Critical Levels for NH ₃	10
Table 8-6:	Empirical Critical Loads for Nutrient Nitrogen Deposition Reproduced from Table 3.2 of Research 390 (EPA, 2021)	12
Table 8-7:	Critical Loads for Nitrogen Deposition	14
Table 8-8:	Critical Loads for Acid Deposition	16
Table 8-9:	IAQM Criteria to Determine Dust Emissions Magnitude (IAQM, 2024).....	22
Table 8-10:	Criteria for Determining the Sensitivity of the Area	23
Table 8-11:	IAQM Criteria to Determine Risk of Dust Impacts	24
Table 8-12:	Dry Deposition Fluxes for NO ₂ and NH ₃	32
Table 8-13:	Summary of Process Emissions Information for Proposed Development	32
Table 8-14:	Summary of Emission Concentrations and Mass Emission Rates for the Facility.....	33
Table 8-15:	Summary of Process Emissions Information for Cumulative Assessment	34
Table 8-16:	Background NO ₂ Concentrations (µg/m ³)	38
Table 8-17:	Background PM ₁₀ Concentrations (µg/m ³).....	39
Table 8-18:	Background PM _{2.5} Concentrations (µg/m ³)	40
Table 8-19:	Background Pollutant Concentrations	41
Table 8-20:	Background Concentrations for NO _x , NH ₃ , Nitrogen and Acid Deposition	42
Table 8-21:	Sensitivity of the Area	43
Table 8-22:	Modelled Sensitive Human Health (Discrete) Receptors.....	46
Table 8-23:	Ecology Receptors Included in Dispersion Model	48
Table 8-24:	Dust Emission Magnitude.....	51
Table 8-25:	Risk of Dust Impacts used to Define Site-Specific Mitigation	51
Table 8-26:	Proposed Operations – Dispersion Model Results for Nitrogen Dioxide (NO ₂)	52
Table 8-27:	Proposed Operations – Dispersion Model Results for Particulate Matter (PM ₁₀)	59
Table 8-28:	Proposed Operations – Dispersion Model Results for Particulate Matter (PM _{2.5})	63
Table 8-29:	Proposed Operations – Dispersion Model Results for Ammonia (NH ₃)	65
Table 8-30:	Proposed Operations – Dispersion Model Results for Odour	68
Table 8-31:	Proposed Operations – NO _x Designated Habitat Dispersion Model Results	70
Table 8-32:	Proposed Operations – NH ₃ Designated Habitat Dispersion Model Results.....	73
Table 8-33:	Proposed Operations – Nitrogen Deposition (As NO ₂) Dispersion Model Results at Ecological Receptors	75
Table 8-34:	Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors (continued).....	76
Table 8-35:	Proposed Operations – Acid Deposition (NO ₂) (as N) Dispersion Model Results at Ecological Receptors	79
Table 8-36:	Proposed Operations – Acid Deposition (as N) Dispersion Model Results at Ecological Receptors (continued).....	79
Table 8-37:	Dust Emission Magnitude.....	81
Table 8-38:	Cumulative Assessment– Dispersion Model Results for Nitrogen Dioxide (NO ₂).....	83
Table 8-39:	Proposed Operations – NO _x Designated Habitat Dispersion Model Results	87
Table 8-40:	Cumulative Assessment – Nitrogen Deposition Dispersion Model Results at Ecological Receptors	88

Table 8-41:	Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors (continued).....	89
Table 8-42:	Proposed Operations – Acid Deposition (as N) Dispersion Model Results at Ecological Receptors	90
Table 8-43:	Proposed Operations – Acid Deposition (as N) Dispersion Model Results at Ecological Receptors (continued).....	90
Table 8-44:	Summary of Construction Phase Likely Significant Effects in the absence of mitigation	91
Table 8-45:	Summary of Operational Phase Likely Significant Effects in the absence of mitigation.....	91
Table 8-46:	Construction Dust Management Measures	92
Table 8-47:	Summary of Construction Phase Effects Post Mitigation	95
Table 8-48:	Summary of Operational Phase Effects Post Mitigation	95



8. AIR QUALITY

8.1 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 3 Description of the Existing and Proposed Development.

8.2 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 3 – Description of Existing and Proposed Development, of Volume 2 of the EIAR and Volume 4 Drawings. Chapter 3 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.

8.2.1 Construction Phase

The assessment of construction phase effects considers the combined effects of the proposed development (renewable biogas plant site) and the proposed gas pipeline.

During the construction phase construction dust emissions have the potential to impact air quality. Dust emissions will primarily occur as a result of excavation, infilling, temporary stockpiles of materials, construction and the movement of trucks on site and exiting the site.

8.2.2 Operational Phase

The following process emissions from the proposed development have the potential to affect air quality during the operational phase of the development:

- nitrogen dioxide (NO₂) from 2 no. biomass boilers and 2 no. emergency flares (enclosed)
- particulate matter (as PM₁₀ and PM_{2.5}) from the 2 no. biomass boilers

In relation to odour, the following emissions have the potential to affect air quality during the operational phase of the development:

- ammonia (NH₃) emissions from the 1 no. odour control stack
- odour emissions from the 1 no. odour control stack



The proposed development has a number of design features that inherently control odour. These include:

- Feedstock will be delivered to the site in covered / sealed tankers and deposited in the enclosed solid and liquid feedstock reception buildings.
- All feedstock and digestate processing activities will be undertaken within enclosed buildings which will be maintained under negative pressure, with fast acting roller shutter doors to prevent fugitive odour emissions from building entry points.
- Air extracted from buildings held under negative pressure will be directed to the Odour Control System (OCS) for treatment (see details below) prior to discharge to atmosphere via an emission stack sufficiently high to ensure adequate dispersion.

The OCS will be based on principles of good odour management including:

- odour containment
- odour capture and extraction
- odour treatment

In terms of odour containment, all feedstock and digestate process buildings will be sealed with a near 100% leak proof building fabric. All process stages external to the building fabric will be enclosed and in sealed pipes and tanks with negative extraction applied to ensure no fugitive emissions of odours during operation. The process buildings will be placed under negative pressure (as described in Chapter 3 – Description of Existing and Proposed Development). All processing of feedstock will be undertaken indoors with containment measures fitted at entry points to maintain good building integrity in terms of odour containment.

In terms of odour capture and extraction, a network of extraction pipework will be fitted throughout the feedstock and digestate process buildings and process equipment so as to provide negative pressure extraction to all odour generation areas located within the facility boundary. This will be ducted to the OCS for treatment. The OCS is described in detail in Chapter 3 of this EIAR.

All treated air will exhaust through a 35 m high stack, which has been designed to be sufficiently tall to ensure there will be no ground level impact

The overall system will be monitored by a Supervisory Control and Data Acquisition (SCADA) system and alarmed to ensure consistent performance of the OCS.

The proposed development will be subject to an Industrial Emissions (IE) licence from the EPA, if planning is granted, which will regulate all process emissions from the development.



8.3 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 9 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. Her CV is included in Appendix 1.1 of Volume 3 of this EIAR.

8.4 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); and
- Air Quality Standards Regulations 2022 (S.I. 739 of 2022).

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

- AGTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air (Environment Agency (UK), 2014)
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (Institute of Air Quality Management) (IAQM, 2020)
- Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (EPA, 2020)
- Air emissions risk assessment for your environmental permit (Environment Agency (UK), 2025)
- Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (Dublin City Council, 2018)
- Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance (UK Office of Deputy Prime Minister) (OPDM, 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 (IAQM, 2024)
- 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, 2024)
- Odour Emissions Guidance Note (AG9) (EPA, 2019)



- Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(22) (DEFRA (UK), 2022)
- PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects (Transport Infrastructure Ireland (TII), 2025)
- 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 Sottish 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, 2022)
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018)
- Environmental Impact Assessment (EIA) Directive Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission, 2017).

8.5 Assessment Criteria

8.5.1 Human Health

8.5.1.1 *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.

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.



The ambient Air Quality Standards (AQS) applicable for the current assessment to determine the potential impact of NO₂, NO_x, PM₁₀ and PM_{2.5} emissions from the proposed development on ambient air quality for protection of human health, and for the protection of vegetation and natural ecosystems in general are outlined in Table 8-1. The limit values stipulated by Directive (EU) 2024/2881 Annex I Table 1 have been conservatively applied for the proposed development as its Opening Year is 2029.

Table 8-1: Ambient Air Quality Limit Values

Pollutant	Directive (EU) 2024/2881 Annex I Table 2		Directive (EU) 2024/2881 Annex I Table 1	
	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/m ³	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m ³
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m ³
	Annual limit for protection of human health	40 µg/m ³	Annual limit for protection of human health	20 µg/m ³
Nitrogen Oxides (NO _x)	Critical level for protection of vegetation (Annual)	30 µg/m ³	Critical level for protection of vegetation (Annual)	30 µg/m ³
Particulate Matter (as PM ₁₀)	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 µg/m ³
	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 Annex I Table 2		Directive (EU) 2024/2881 Annex I Table 1	
	Limit Type	Limit Value (to be attained by 2026 and applicable until 2030)	Limit Type	Limit Value (to be attained by 2030)
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/m ³
	Annual limit for protection of human health	25 µg/m ³	Annual limit for protection of human health	10 µg/m ³

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

8.5.1.2 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). These are shown in Table 8-2. 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/m³. 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 NO₂”.

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 8-2: 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 limit values stipulated by Directive (EU) 2024/2881 Annex I Table 1 have been conservatively applied for the proposed development as its Opening Year is 2029.

8.5.1.3 Ammonia

There are no specific EU or Irish regulatory standards for ammonia (NH₃) emissions in relation to human health. In the absence of such standards, this assessment has adopted the Environmental Assessment Levels (EALs) set out by the guidance Air emissions risk assessment for your environmental permit (Environment Agency (UK), 2025) and replicated as Table 8-3 here.

Table 8-3: Ammonia Ambient Air Quality Standards (Environment Agency (UK), 2025)

Pollutant	Guidelines	Guideline Value	Value
Ammonia (NH ₃)	UK Environment Agency (2025)	Annual guideline for protection of human health	180 µg/m ³
		Hourly guideline for protection of human health	2,500 µg/m ³

8.5.1.4 Odour

Emissions from the odour control stack associated with the operational phase of the proposed development have the potential to impact the air quality of the surrounding area.

The following sections provide some background on odour as a pollutant and detail how the potential for odour impacts was assessed for the purpose of this EIAR. Odour dispersion modelling has been used to predict the impacts of the proposed development on the surrounding environment and the assessment has been conducted in compliance with the EPA guidance documents *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)* (EPA, 2020) and *Odour Emissions Guidance Note (AG9)* (EPA, 2019). Further details of the dispersion modelling methodology and input data can be found in Section 8.7.1.8.



8.5.1.4.1 Defining and Describing Odour

Odours are sensations resulting from the reception of a stimulus by the olfactory sensory system, which consists of two separate subsystems: the olfactory epithelium and the trigeminal nerve. The olfactory epithelium, located in the nose, is capable of detecting and discriminating between many thousands of different odours and can detect some of them in concentrations lower than those detectable by currently available analytical instruments (UK Environment Agency, 2003). The function of the trigeminal nerve is to trigger a reflex action that produces a painful sensation. It can initiate protective reflexes such as sneezing to interrupt inhalation. The olfactory system is extremely complex and peoples' responses to odours can be variable. This variability is the result of differences in the ability to detect odour; subjective acceptance or rejection of an odour due to past experience; circumstances under which the odour is detected; and the age, health and attitudes of the human receptor.

8.5.1.4.1.1 Odour Intensity and Threshold

Odour intensity is a measure of the strength of the odour sensation and is related to the odour concentration. The odour threshold refers to the minimum concentration of an odorant that produces an olfactory response or sensation. This threshold is normally determined by an odour panel consisting of a specified number of people, and the numerical result is typically expressed as occurring when 50% of the panel correctly detect the odour. This odour threshold is given a value of one odour unit and is expressed as 1 OU_E/m³ (odour unit equivalent per cubic metre).

The odour threshold is not a precisely determined value but depends on the sensitivity of the odour panellists and the method of presenting the odour stimulus to the panellists. An odour detection threshold relates to the minimum odorant concentration required to perceive the existence of the stimulus, whereas an odour recognition threshold relates to the minimum odorant concentration required to recognise the character of the stimulus. Typically, the recognition threshold exceeds the detection threshold by a factor of 2 to 10 (UK Environment Agency, 2002) (UK Environment Agency, 2003).

8.5.1.4.1.2 Odour Character

The character of an odour distinguishes it from another odour of equal intensity. Odours are characterised on the basis of odour descriptor terms (e.g. putrid, fishy, fruity etc.). Odour character is evaluated by comparison with other odours, either directly or through the use of descriptor words.

8.5.1.4.1.3 Hedonic Tone

The hedonic tone of an odour relates to its pleasantness or unpleasantness. When an odour is evaluated in the laboratory for its hedonic tone in the neutral context of an olfactometric presentation, the panellist is exposed to a stimulus of controlled intensity and duration. The degree of pleasantness or unpleasantness is determined by each panellist's experience and emotional associations. The responses among panellists may vary depending on odour character; an odour pleasant to many may be declared highly unpleasant by some.

8.5.1.4.1.4 Adaptation

Adaptation, or Olfactory Fatigue, is a phenomenon that occurs when people with a normal sense of smell experience a decrease in perceived intensity of an odour if the stimulus is received continually. Adaptation to a specific odorant typically does not interfere with the ability of a person to detect other odours. Another phenomenon known as habituation or occupational anosmia occurs when a worker in an industrial situation experiences a long-term exposure and develops a higher threshold tolerance to the odour.



8.5.1.4.2 Odour Guidelines

The exposure of the population to a particular odour consists of two factors; the concentration and the length of time that the population may perceive the odour. By definition, 1 OU_E/m³ is the detection threshold of 50% of a qualified panel of observers working in an odour-free laboratory using odour-free air as the zero reference (the selection criteria result in the qualified panel being more sensitive to a particular odorant than the general population).

Currently there is no general statutory odour standard in Ireland relating to industrial installations. Guidance from the UK (UK Environment Agency, 2011), and adapted for Irish EPA use (EPA, 2019), recommends that odour standards should vary from 1.5 – 6.0 OU_E/m³ as a 98th percentile of one hour averaging periods at the worst-case sensitive receptor based on the offensiveness of the odour and with adjustments for local factors such as population density. A summary of the indicative criterion is provided in Table 13-5 (taken from EPA Guidance document AG9 (EPA, 2019)).

The relevant exposure criteria vary from 1.5 OU_E/m³ for highly odorous sources, 3.0 OU_E/m³ for moderately odorous sources to 6.0 OU_E/m³ for the least offensive odours. For this assessment 1.5 OU_E/m³ is the relevant exposure criteria, as the odour control units manage odours from anaerobic treatment of waste.

Table 8-4: Indicative Odour Standards Based on Offensiveness of Odour and adapted for Irish EPA (EPA, 2019)

Industrial Sectors	Relative Offensiveness of Odour	Indicative Criterion
- Processes involving decaying animal or fish remains. - Processes involving septic effluent or sludge. - Waste sites including landfills, waste transfer stations and non-green waste composting facilities.	Most Offensive	1.5 OU _E /m ³ as a 98 th percentile of hourly averages at the worst-case sensitive receptor
- Intensive Livestock Rearing - Fat Frying/Meat Cooking (Food Processing) - Animal Feed - Sugar Beet Processing - Well aerated green waste composting Most odours from regulated processes fall into this category i.e., any industrial sector which does not obviously fall within the “most offensive” or “less offensive” categories.	Moderately Offensive	3.0 OU _E /m ³ as a 98 th percentile of hourly averages at the worst-case sensitive receptor
- Brewery/Grain/Oats Production - Coffee Roasting - Bakery - Confectionery	Less Offensive	6.0 OU _E /m ³ as a 98 th percentile of hourly averages at the worst-case sensitive receptor

8.5.1.5 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust that are less than 10 microns (PM₁₀) and less than 2.5 microns (PM_{2.5}). The EU ambient air quality standards outlined in Table 8-1 have set ambient air quality limit values for PM₁₀ 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/m²/day averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations in 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/m²/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

8.5.2 Ecology

8.5.2.1 Critical Levels

The Air Quality Standards Regulations 2022 outline an annual critical level of 30 µg/m³ for NO_x and 1 µg/m³ (where lichens or bryophytes are present) or 3 µg/m³ for NH₃ (see Table 8-5) for the protection of vegetation and natural ecosystems in general. The Directive (EU) 2024/2881 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".

Table 8-5: Critical Levels for NH₃

Ecological Receptor		Feature Code	Feature Name	Critical Level for NH ₃ (µg/m ³)
Site Name	Site Code			
River Barrow and River Nore SAC	002162	H1130	Estuaries	3
		H1330	Atlantic salt meadows (Glaucopuccinellietalia maritimae)	3
		H4030	European dry heaths	3
		H7220	Petrifying springs with tufa formation (Cratoneurion)	1
		H91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	3
		S1421	Trichomanes speciosum	3
		H91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	1
Coan Bogs NHA	002382	NHA001	Raised and blanket bogs	1



8.5.2.2 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, 2026) for the specific ecological sites that are relevant to the subject facility and are reproduced as shown in Table 8-7 and Table 8-8.

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 is discussed in Section 8.9.3.2.2.

Critical loads are only available for European sites, and for nationally designated Natural Heritage Areas (NHA).

8.5.2.2.1 Nitrogen Deposition Critical Loads

In order to determine the appropriate nitrogen deposition critical load, and in addition to APIS, the 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 this publication, empirical critical loads (CL_{empN} ABR) of nutrient nitrogen are outlined with a worst-case range of 5-10 kgN/ha/yr for certain habitat types. These have been reproduced in Table 8-6. Where the CL_{empN} ABR is underlined in Table 3.2 (EPA, 2021) the lower limit of the critical load range should be used. Where there is no underlining of the CL_{empN} ABR, the midpoint can be used to define the critical load for specific habitat types.

APIS and Table 3.2 (EPA, 2021)) both specify EUNIS codes for habitat types. APIS was reviewed for the sensitive features (i.e. habitat types) within each designated site, and their EUNIS codes compared against those given in Table 3.2 (EPA, 2021). Where a feature's EUNIS code was specifically listed in Table 3.2 (EPA, 2021), the recommended critical load from this report table was used for this assessment. This was either the mid-range critical load or the lower load of the range as determined by the rules outlined in the above paragraph.

Where there are habitat types which are not specified in Table 3.2 (EPA, 2021), the lower critical load of the range outlined in APIS is used as a worst-case.

The resulting lowest critical loads used to compare with modelled process contributions are shown in Table 8-6 and are termed assessment criteria.



Table 8-6: Empirical Critical Loads for Nutrient Nitrogen Deposition Reproduced from Table 3.2 of Research 390 (EPA, 2021)

Annex I Code	EUNIS Code 2007 ^a	CLempN ABR
1xxx ^b	A2.5x	5 – 10
21xx ^c	B1.x [N]	5 – 10
4010	F4.11 [S]	<u>5</u> – 10
4030	F4.2 [S]	5 – 10
4060	F2.2 [S]	<u>5</u> – 10
5130 ^c	F3.16 [S]	5 – 10
6210	E1.26 (E1.2) [R]	5 – 10
6230	E1.7 (E1.71) [R]	<u>5</u> – 15
6410	E3.51 [R]	5 – 15
6430	E5.5 [R]	5 – 15
6510	E2.2 [R]	5 – 15
7110 ^e	D1.11 [Q]	5 – 15
7130	D1.22 [Q]	<u>5</u> – 10
7230	D4.1 [Q]	5 – 10
8220	H3.1	5 – 10
8240	H3.511	5 – 10
91A0	G1.83 [T]	<u>10</u> – 15
a) Parentheses indicate alternative crosswalk correspondence between Annex I and EUNIS and square brackets indicate the EUNIS 2020 code letter. b) Salt marshes (1310, 1330, 1410). c) Sand dunes (2110, 2120, 2130, 2170, 2190, 21A0). d) Juniperus communis formations, similar results for acidic and calcareous vegetation groups; Juniperus communis was one of the species that showed a decrease (z–) in abundance; bryophytes were not recorded in the survey. e) Species abundance included only 15 indicator species		



8.5.2.2.2 Acid (as N and S) Deposition Critical Loads

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 8.7.1.6).

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 assessment criteria for nitrogen deposition are the minimum critical load (N) (MinCLminN) and the maximum critical load (N) range (MaxCLminN). 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) is calculated by adding the acid deposition background concentration to the process contribution. The PEC is then 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). The critical loads for Nitrogen Deposition are in Table 8-7. The critical loads for Acid Deposition are in Table 8-8

Emissions of sulphur dioxide, and therefore acid deposition (as S) have been scoped out of this assessment (see Section 8.7.1.8).



Table 8-7: Critical Loads for Nitrogen Deposition

Ecological Receptor		Feature Code	Feature Name	Critical loads for most sensitive feature		Nitrogen Critical Load Class		EUNIS code
Site Name	Site Code			Min. Critical Load for N (kg N/ha/yr)	Max. Critical Load for N (kg N/ha/yr)	Assessment Criteria	Nitrogen Critical Load Class	
Natura 2000 Sites								
River Barrow and River Nore SAC	002162	H1130	Estuaries	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		H4030	European dry heaths	5	10	7.5	Dry heaths	F4.2
		H7220	Petrifying springs with tufa formation (Cratoneurion)	5	10	7.5	Rich fens	D4.1
		H91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	10	15	10	Acidophilous Quercus-dominated woodland	G1.8
		S1421	Trichomanes speciosum	10	20	10	Broadleaved deciduous woodland	G1
		H7220	Petrifying springs with tufa formation (Cratoneurion)	15	25	15	Mountain rich fens	D4.2



Ecological Receptor		Feature Code	Feature Name	Critical loads for most sensitive feature		Nitrogen Critical Load Class		EUNIS code
Site Name	Site Code			Min. Critical Load for N (kg N/ha/yr)	Max. Critical Load for N (kg N/ha/yr)	Assessment Criteria	Nitrogen Critical Load Class	
		H91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	APIS reviewed for species sensitivity – no comparable habitat with established critical load estimate available for the listed species.				
National Sites								
Coan Bogs NHA	002382	NHA001	Raised and blanket bogs	5	10	5	Raised and blanket bogs	D1



Table 8-8: 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)	
					Min CL minN	Min CL maxN	Max CL minN	Max CL maxN
Natura 2000 Sites								
River Barrow and River Nore SAC	002162	H4030	European dry heaths	Dwarf shrub heath	0.143	0.319	0.714	6.19
		H6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Montane	0.143	0.295	0.714	6.13
		H91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	Unmanaged Broadleaved/Coniferous Woodland	0.143	0.343	0.714	6.25
		H3260	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> Show more	Freshwater	0.143	0.295	0.714	6.13
		S1421	<i>Trichomanes speciosum</i>	Unmanaged Broadleaved/Coniferous Woodland	0.143	0.343	0.714	6.25



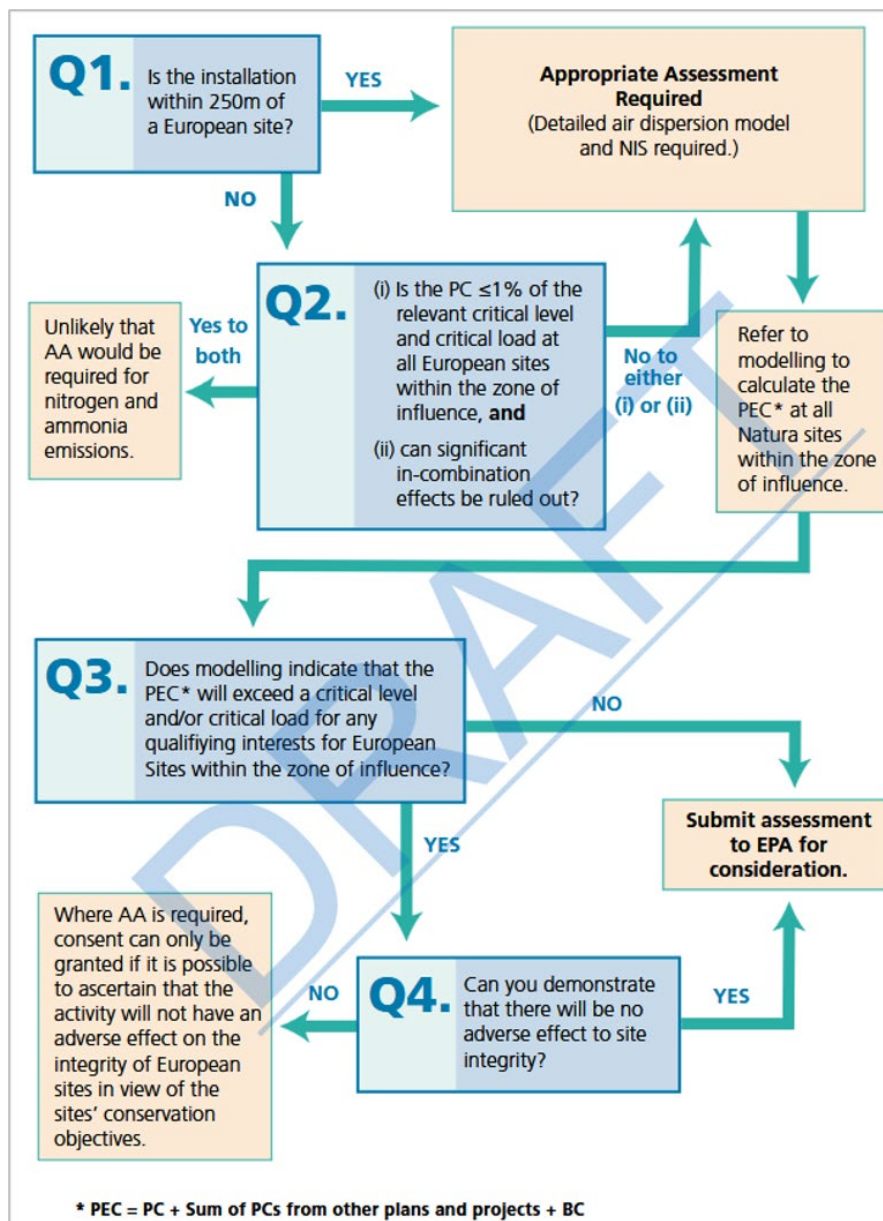
Site Name	Site Code	Feature Code	Feature Name	Acidity Critical Load Class	Min. Critical Load Range (N) (keq/ha/yr)		Max. Critical Load Range (N) (keq/ha/yr)	
					Min CL minN	Min CL maxN	Max CL minN	Max CL maxN
		H91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	APIS reviewed for species sensitivity – no comparable habitat with established critical load estimate available for the listed species.				
National Sites								
Coan Bogs NHA	0023 82	NHA0 01	Raised and blanket bogs	Bogs	0.143	0.487	0.286	5.094



8.5.2.3 Ecology Significance Criteria

Annual mean NO_x concentrations, nitrogen and acid deposition are compared to the relevant critical levels and loads in line with guidance from the IAQM (IAQM, 2020), UK Environment Agency (Environment Agency (UK), 2025) and the EPA (EPA, 2024) guidance. As per this guidance, where the Process Contribution (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.

Draft guidance (EPA, 2024) hereafter referred to as IN2 and the flowchart shown in Figure 8-1 (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) $\leq 1\%$ 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 8.10.3.1.2.
 - 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 IE licenced facilities within 1 km of the proposed development which operates sources of NO₂, therefore a cumulative impact assessment of this pollutant was required.

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

As per the IN2 guidance (EPA, 2024) 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 (EPA, 2024).

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). 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. Proposed NHAs (pNHAs) were identified as sites of conservation interest in the 1990s but have not since been statutorily proposed or designated and are therefore scoped out of this assessment.

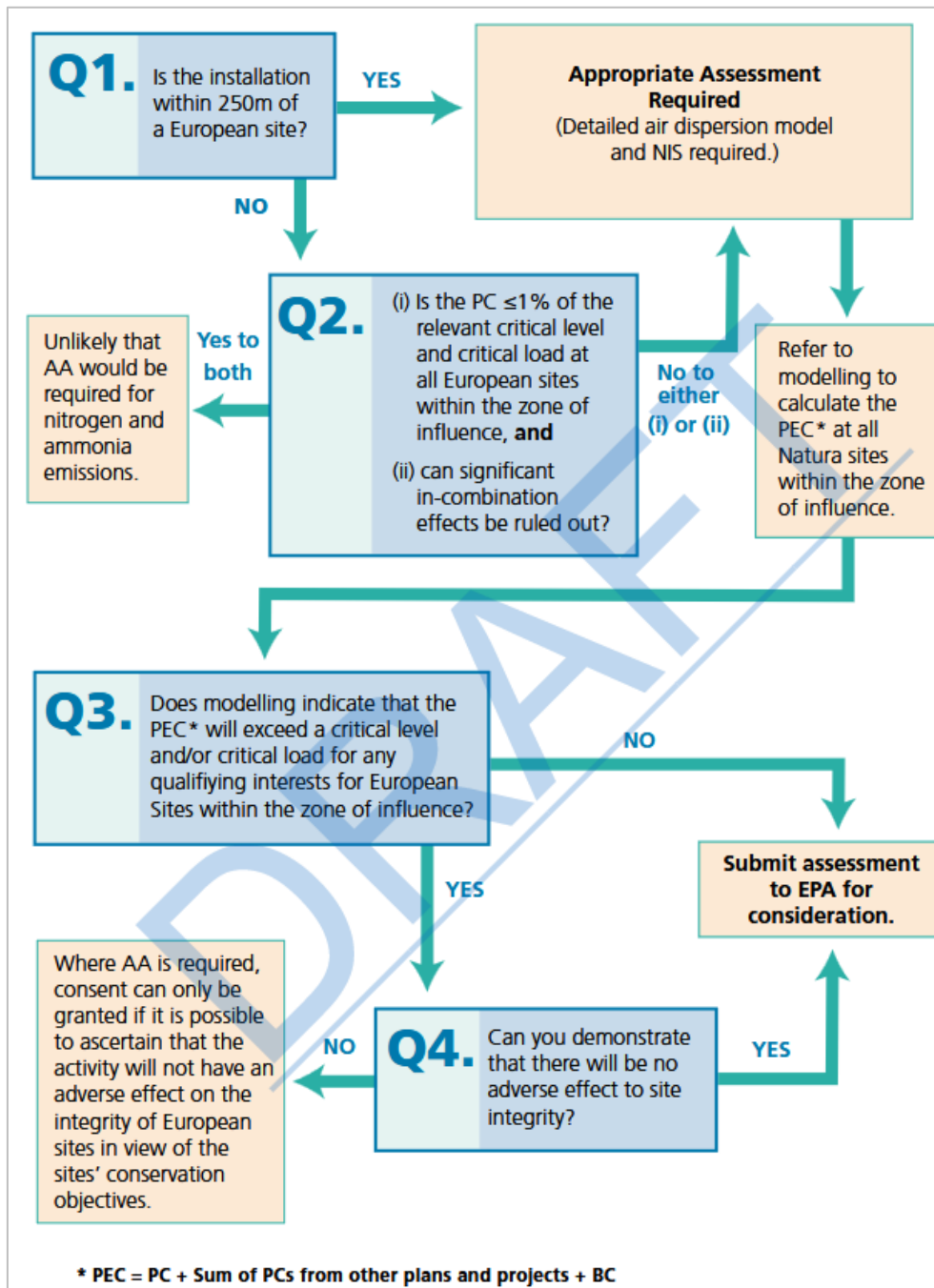


Figure 8-1: IN2 flowchart for assessing the impacts of nitrogen deposition and ammonia emissions to air on European Sites (EPA, 2024)



8.6 Assessment Methodology Construction Phase

8.6.1 Construction Dust Assessment

The 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 methodology (IAQM, 2024) 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 in guidance document Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106 (TII, 2025)

The guidance (IAQM, 2024) 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 (Zol) or study area for the construction dust assessment.

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

- Demolition
- Earthworks
- Construction
- 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 8-9, these are based on the 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 8-9: IAQM Criteria to Determine Dust Emissions Magnitude (IAQM, 2024)

Dust Emission Magnitude		
Small	Medium	Large
Demolition		
- Total building volume <12,000 m³ - 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 m³ - Potentially dusty construction material - Demolition activities 6 – 12 m above ground level	- Total building volume >75,000 m³ - 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 m² - 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 m² - 110,000 m² - 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 m² - 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 m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)	- Total building volume 12,000 - 75,000 m³ - Potentially dusty construction material (e.g. concrete) - On-site concrete batching	- Total building volume >75,000 m³ - 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



The sensitivity of the area must be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

Dust emissions also have the potential to impact sensitive ecology. Dust can affect vegetation through chemical means such as chemical changes like increased acidity in soils or watercourses. Physical effects include reduced photosynthesis, respiration and transpiration through smothering. These changes are likely to occur only as a result of long-term demolition and construction works adjacent to a sensitive habitat. Often impacts will be reversible once the works are completed, and dust emissions cease. High sensitivity ecological receptors are those with international or national designation (SPAs, SACs, NHAs) and where the designated feature is dust sensitive. Effects to ecology can occur up to 50m from the source.

Table 8-10 outlines the criteria for determining the sensitivity of the area to dust soiling and dust-related human health effects and dust-related ecological effects as per the guidance (IAQM, 2024).

Table 8-10: Criteria for Determining the Sensitivity of the Area

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/ m ³	>100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Medium	< 24 µg/ m ³	>10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Low	< 24 µg/ m ³	>1	Low	Low	Low	Low



Sensitivity of the Area to Ecology Impacts		
Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Once the dust emission magnitude has been determined the next step, according to the 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 8-11. The level of risk of each dust generating activity is established in Section 8.10.2.1.2 as part of the impact assessment.

Table 8-11: 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



8.6.2 Construction Phase Traffic Assessment

Construction phase traffic also has the potential to impact air quality. The guidance Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106 (TII, 2025), 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 6.7.2 of Chapter 6 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. 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.

8.7 Assessment Methodology Operational Phase

8.7.1 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 scoping criteria (TII, 2025) detailed in Section 8.6.2 were used to determine if any road links are affected by the proposed development and require inclusion in a detailed air dispersion modelling assessment. As per Section 6.7.3 of Chapter 6 Traffic and Transport, of Volume 2 of this EIAR, it has been determined that 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 8.6.2). 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.

8.7.1.1 Air Dispersion Modelling Methodology

The United States Environmental Protection Agency (USEPA) approved AERMOD (Version 24142) dispersion model (USEPA, 1998) (USEPA, 2000) (USEPA, 2025). has been used to predict the ground level concentrations (GLC) of pollutants emitted from the principal emission sources on-site, following Irish guidance AG4 (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 The model has more advanced algorithms and gives better agreement with monitoring data in extensive validation studies (Paine, 1997a) (Paine, 1997b) (Schulman, et al., 2000) (USEPA, 1998) (USEPA, 1999). An overview of the AERMOD dispersion model is outlined in Appendix 8.1 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 software to create a three-dimensional visualisation 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 (Oak Park 2021 – 2025) (Met Éireann, 2026) was used in the model (see Section 8.9.1 and Appendix 8.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR).
- The source and emissions data, including stack dimensions, gas volume flowrates and emission temperatures have been incorporated into the model.

8.7.1.2 *NO_x to NO₂ Conversion*

The Plume Volume Molar Ratio Method (PVMRM) was used to model NO₂ concentrations. The PVMRM is currently a non-regulatory option in AERMOD which assumes that the amount of NO converted to NO₂ is proportional to the ambient ozone concentration (Hanrahan, 1999a) (Hanrahan, 1999b). The PVMRM uses both plume size and O₃ concentration to derive the amount of O₃ available for the reaction between NO and O₃. 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 O₃ that is entrained in the plume. Thus, the ratio of the moles of O₃ to the moles of NO_x gives the ratio of NO₂/NO_x that is formed after the NO_x leaves the stack. In addition, it has been assumed that 20% of the NO_x in the stack gas is already in the form of NO₂ before the gas leaves the stack (in reality the levels are usually closer to 5% (Hanrahan, 1999a) (Hanrahan, 1999b)). The model has also assumed a final equilibrium ratio for NO₂/NO_x of 0.90 which again is pessimistic and more likely to be in the range 0.7 – 0.8 (Hanrahan, 1999a) (Hanrahan, 1999b). The equation used in the algorithm to derive the ratio of NO₂/NO_x gas combustion is:

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

A background O₃ concentration of 54 µg/m³ was used in the modelling assessment, based on a review of 5-year average background O₃ data for Zone D sites (further detail on background concentrations given in Section 8.9) (EPA, 2025).

8.7.1.3 *Terrain*

The terrain across the 10 x 10 km domain modelled has been illustrated as contours in Figure 8-2.



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, 2025) 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).

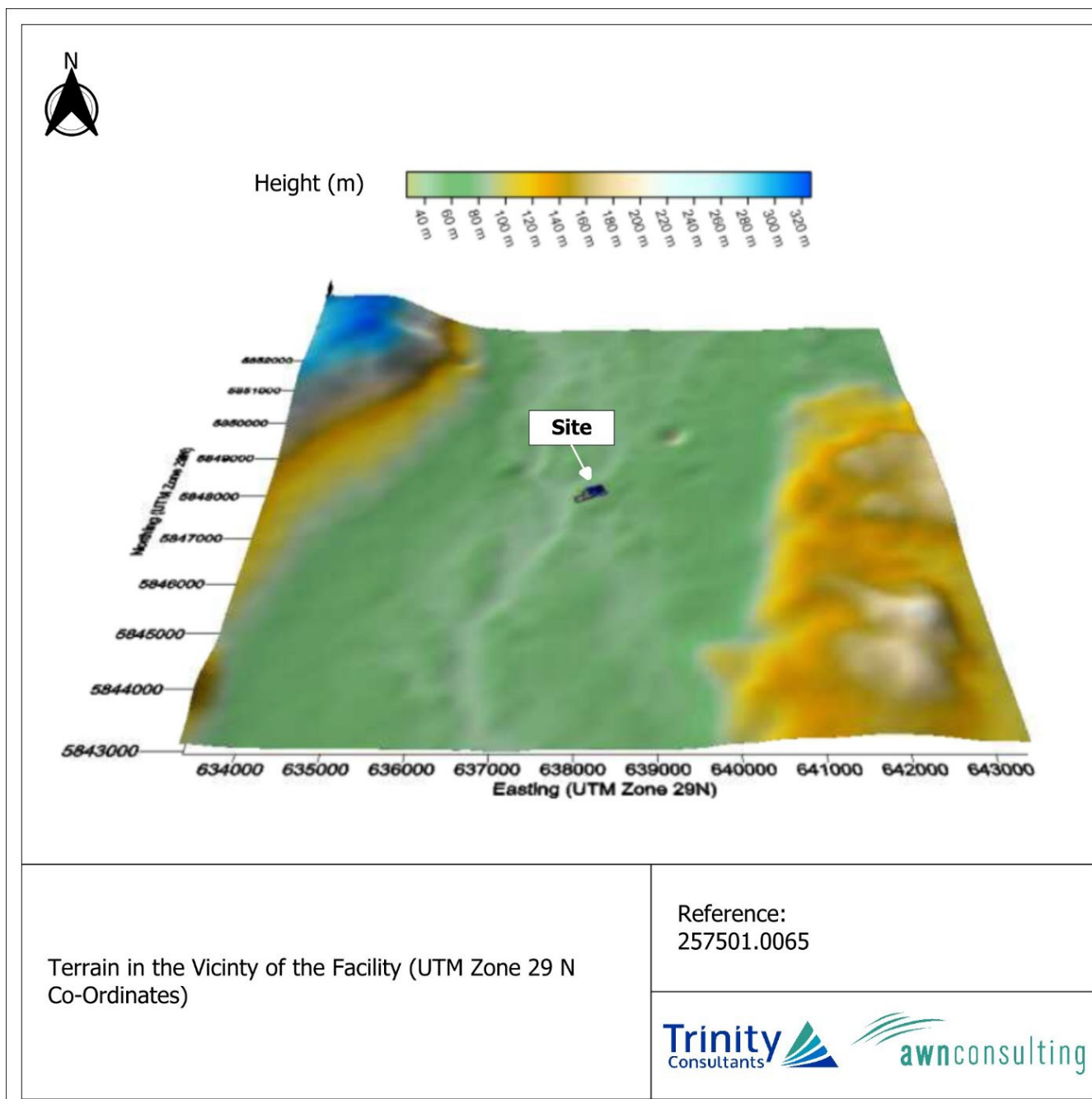


Figure 8-2: Terrain in the Vicinity of the Proposed Development

8.7.1.4 Geophysical Considerations

AERMOD simulates the dispersion process using planetary boundary layer (PBL) scaling theory (USEPA, 2025). 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 8.1 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 30°.
- 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 (ADEC) 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 8.1 Air Dispersion Modelling Supporting Information in Volume 3 of this EIAR.

8.7.1.5 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 10° 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. The dominant building for each relevant stack will vary as a function of wind direction and relative building heights (see Figure 8-3).

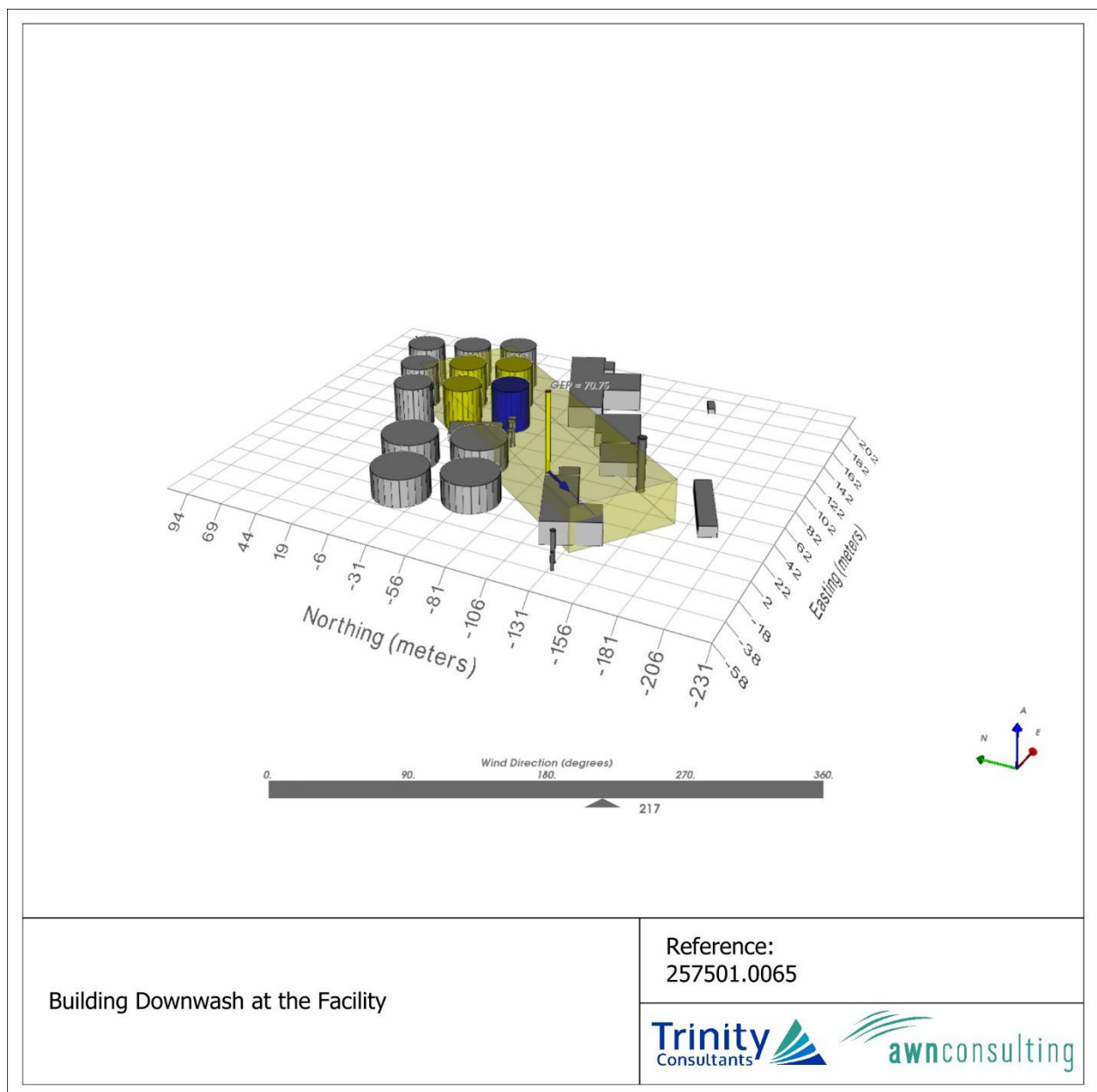


Figure 8-3: Example of building downwash for Selected Emission Point (Biomass Boiler No. 2)



8.7.1.6 Concentration Contours

Modelled predicted ambient ground level concentrations beyond the site boundary are presented as concentration contours in Section 8.10.3. The purpose of the concentration contour plots is to show the direction and extent of the emission plume.

The air dispersion model (AERMOD) produces numerical output files which contain predicted pollutant concentrations at a large number of discrete receptor points across the modelling domain (defined by the gridded receptors discussed in Section 8.9.3.2.1). These results are typically exported in tabular format, listing the predicted value (e.g. annual mean of pollutant in $\mu\text{g}/\text{m}^3$) for each receptor location defined by its X and Y coordinates. These are the values to be relied upon for compliance assessment and reporting against air quality standards or guidelines.

To aid interpretation, these tabular results can be imported into contouring software (e.g. Breeze 3D Analyst, Surfer, ArcGIS or QGIS) where an interpolation algorithm is applied. The software estimates values between the discrete receptor points, allowing for the creation of concentration contours. These are graphical representations that join locations of equal concentration with smooth lines, giving a clear picture of concentration gradients and the spatial extent of impact.

Contours provide a visual interpretation of how pollutant concentrations vary across the site and surrounding area. They are useful for communicating results, identifying zones of higher or lower impact, and for inclusion in planning documents. However, since contours involve interpolation between points over a large study area (defined by the gridded receptors discussed in Section 8.9.3.2.1, they are approximate representations and should not be used in place of the tabulated receptor results for regulatory comparison. The maximum model concentration presented by concentration contours will always be less than the maximum concentration predicted at an individual receptor, due to the interpolation process of concentrations over a larger area.

8.7.1.7 Ecology - Nitrogen and Acid Deposition

In order to consider the effects of nitrogen and acid deposition owing to emissions from the proposed development on the designated habitat sites, the maximum annual mean NO_2 and NH_3 predicted environmental concentrations must be converted firstly into a dry deposition flux using the equation below which is taken from guidance AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air (Environment Agency (UK), 2014):

$$\text{Dry deposition flux } (\mu\text{g}/\text{m}^2/\text{s}) = \text{ground-level concentration } (\mu\text{g}/\text{m}^3) \times \text{deposition velocity } (\text{m}/\text{s})$$

The deposition velocities for NO_2 and NH_3 are outlined in AQTAG06 (Environment Agency (UK), 2014) and shown below in Table 8-12. The dry deposition flux is then multiplied by conversion factors shown in Table 8-12 (taken from AQTAG06 to convert it to a nitrogen (N) deposition flux ($\text{kg}/\text{ha}/\text{yr}$), and to an acid deposition flux ($\text{keq}/\text{ha}/\text{yr}$).

Background concentrations for NO_x , NH_3 , nitrogen deposition and acid deposition at the most impacted ecological receptors were derived from the 1 km grid square concentrations provided on the Air Pollution Information System (APIS) website (APIS, 2026), in line with guidance (Environment Agency (UK), 2014)(UK DEFRA, 2022) and are given in Section 8.9.2.7. The background concentrations are added directly to the modelled NO_x , NH_3 , nitrogen deposition and acid deposition process contributions to give a total predicted environmental concentration (PEC).



Table 8-12: Dry Deposition Fluxes for NO₂ and NH₃.

Chemical Species	Habitat Type	Recommended Deposition Velocity (m/s)	Nitrogen Deposition Conversion factor $\mu\text{g}/\text{m}^2/\text{s}$ to $\text{kg}/\text{ha}/\text{yr}$	Acid Deposition Conversion factor $\mu\text{g}/\text{m}^2/\text{s}$ to $\text{keq}/\text{ha}/\text{yr}$
NO ₂	Grassland	0.0015	95.9	6.84
NH ₃	Grassland	0.02	260	18.5

8.7.1.8 Process Emissions

Proposed Operations

The proposed development will include 2 no. biomass boilers and 2 no. flares (enclosed), and 1 no. odour control stack. The site will require an IE Licence from the EPA, if planning permission is granted. This modelling assessment has been undertaken at the proposed licensed conditions for the main emission points.

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

- 2 no. biomass boilers and 1 no. odour control stack have been modelled as operating 24 hours per day, 365 days per year, i.e. continuous operations, to ensure a worst-case conservative assessment.
- 2 no. flares (enclosed) have been modelled as operating for a maximum of 100 hours per year each, for commissioning, stack testing and emergency operations.
- The model input information for this scenario is detailed in Table 8-13.

Table 8-13: Summary of Process Emissions Information for Proposed Development

Stack Reference	UTM Zone 29 N (X, Y)		Exit Diameter (m)	Height Above Ground Level (m)	Temp (K)	Exit Velocity (m/sec actual)	Maximum Volume Flow (Nm ³ /hr)
A1-1 (biomass boiler) ^a	638116	5847972	0.60	20	463.15	16.73	5,600
A1-2 (biomass boiler) ^a	638173	5848003	0.60	20	463.15	16.73	5,600
FLARE 1 (Emergency Flare) ^b	638109	5847969	2.00	11.075	1123.15	1.62	3,000
FLARE 2 (Emergency Flare) ^b	638116	5847972	2.00	11.075	1123.15	1.62	3,000



Stack Reference	UTM Zone 29 N (X, Y)		Exit Diameter (m)	Height Above Ground Level (m)	Temp (K)	Exit Velocity (m/sec actual)	Maximum Volume Flow (Nm ³ /hr)
Odour Stack	624273	5997601	1.50	35	Ambient	15.72	94,794
a) Emissions referenced to 273.15 K, 101.3 Pa, 6% O ₂ , dry gas b) Emissions referenced to 273.15 K, 101.3 Pa, 3% O ₂ , dry gas							

Table 8-14: Summary of Emission Concentrations and Mass Emission Rates for the Facility

Stack Ref.	Operations	Hours of Operations (per year, per plant)	NO _x		PM ₁₀		Odour	
			Conc. (mg/Nm ³)	Mass Emission (g/s)	Conc. (mg/Nm ³)	Mass Emission (g/s)	Conc. (OUE/Nm ³)	Mass Emission (OUE/s)
A1-1 & A1-2 (2 no. biomass boilers) ^a	Continuous	8,760	500	0.778	50	0.08	n/a	n/a
FLARE 1 & FLARE 2 ^b	Emergency operation	100 hours per year per flare	150	0.001	-	-	n/a	n/a
Odour Stack	Continuous	8,760	n/a	n/a	n/a	n/a	1,000	31,598
c) Emissions referenced to 273.15 K, 101.3 Pa, 6% O ₂ , dry gas d) Emissions referenced to 273.15 K, 101.3 Pa, 3% O ₂ , dry gas								

Cumulative Assessment

The cumulative impact scenario assessed the combined impact of the emissions from the proposed development as follows:

Emissions from facilities included in the cumulative assessment are as per the relevant IE licence application, IE final determination or planning permission.

- Proposed development emissions as outlined in the Proposed Operation scenario above.
- Nearby IE licenced main emission points (W0025-04 landfill flare, see Figure 8-7).
- The potential for cumulative PM₁₀ and PM_{2.5} impact with the Kilcarrig Quarries Ltd. operational quarry 300 m south of the proposed development (EPA extractive industries register no. QS0472) was considered, however the information required for incorporation into a cumulative assessment is not publicly available and therefore a detailed cumulative assessment has been scoped out. The emissions



from the quarry are considered to be accounted for in the background concentrations presented in Sections 8.9.2.2 and 8.9.2.3.

The process emissions used in the cumulative assessment are outlined in Table 8-15.

Table 8-15: Summary of Process Emissions Information for Cumulative Assessment

Station		W0025-04 Landfill Flare
Coordinates (UTM 29 N" (X, Y))		638322, 5848183
Stack Height above ground level (m)		5
Stack Diameter (m)		1.20
Stack Exit Temperature (K)		1287.75
Volume Flow Rate (Nm ³ /hr)		3000
NO ₂	Concentration (mg/m ³)	150
	Emission Rate (g/s)	0.125
Emissions referenced to 273.15 K, 101.3 Pa, 3% O ₂ , dry gas		

8.8 Assessment Methodology Decommissioning Phase

The greatest potential impact on air quality during the decommissioning phase is from dust emissions from the demolition and removal of buildings and materials and road traffic emissions. These are expected to be of a similar or lesser magnitude to those identified during the construction phase (but generally of a shorter duration) and have been assessed as per the construction phase methodology outlined in Section 8.6.2

Decommissioning phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the proposed development. The traffic scoping criteria (TII, 2025) detailed in Section 8.6.2 were used to determine if any road links are affected by the proposed project and require inclusion in a detailed air dispersion modelling assessment. The proposed project will not result in the decommissioning 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 project satisfy the screening criteria (Section 8.6.2). 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 with respect with human or ecological receptors.



8.9 Baseline Environment

8.9.1 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, 2021). 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 Oak Park meteorological station, which is located approximately 11 km north of the site. Oak Park met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (Figure 8-4) (Met Éireann, 2026). For data collated during five representative years (2021 - 2025), the predominant wind direction is westerly to south-westerly as per Figure 8-4.

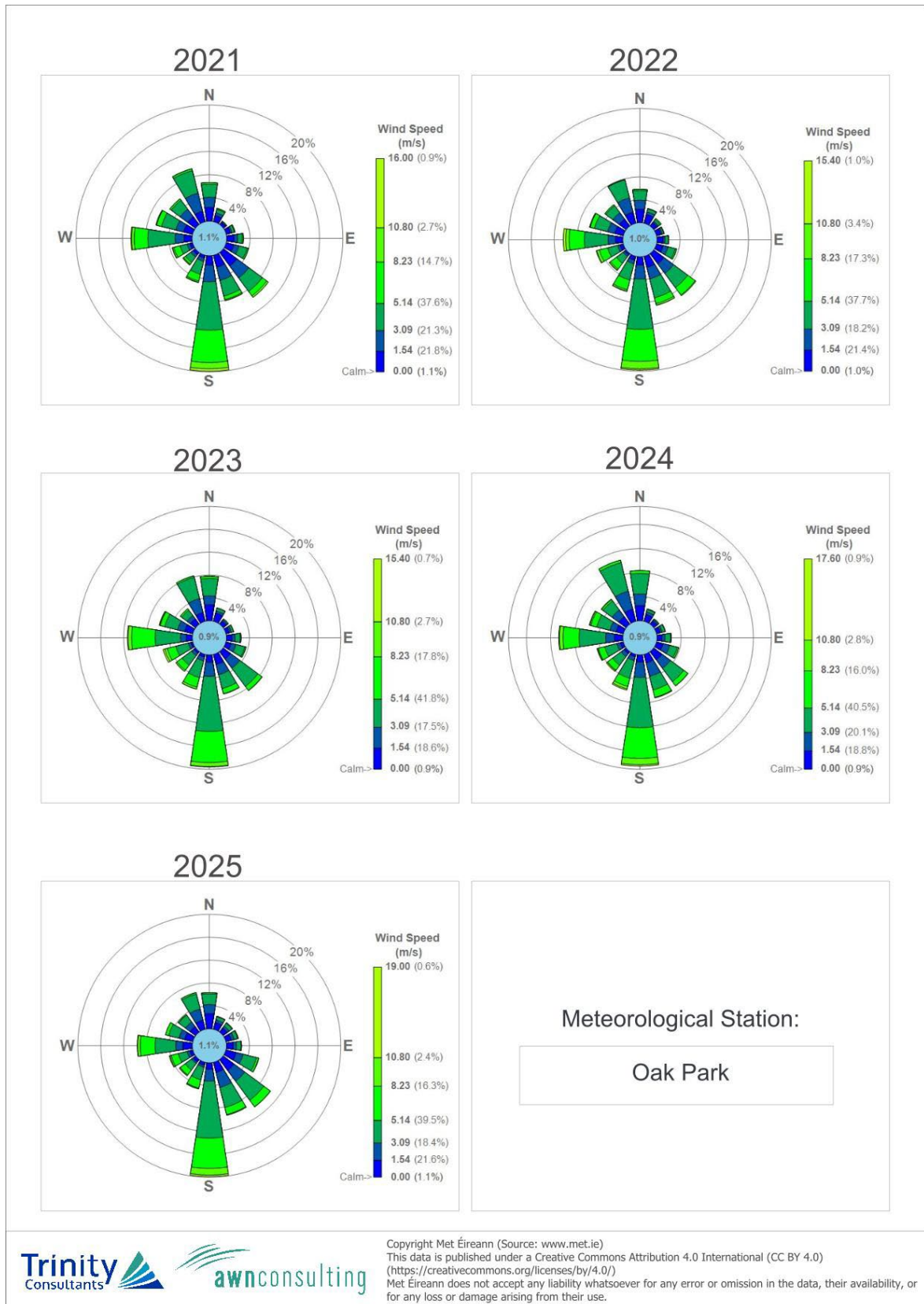


Figure 8-4: Wind Roses for Oak Park Meteorological Station



8.9.2 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 2024' (EPA, 2025). 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, 2025). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development site is within Zone D (EPA, 2025). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. Rural background monitoring sites are therefore considered most representative of the proposed project site. However, due to the proximity of the proposed project to the M9, background concentrations from Zone D suburban traffic location (Carrick-on-Shannon) (the monitoring site is heavily influenced by traffic emissions in Zone D) have also factored into the estimation of an appropriate background concentration representative of the proposed project.

Additionally, the Kilcarrig Quarries Ltd. operational quarry 300 m south of the proposed development (EPA extractive industries register no. QS0472) contributes to background PM₁₀ and PM_{2.5} concentrations. PM₁₀ or PM_{2.5} monitoring data is generally publicly available for this quarry, therefore a review of Environmental Impact Assessments carried out as part of planning applications for similar quarries (e.g. An Coimisiún Pleanála - Case reference: PL07.500309 / Planning Authority Case Reference: 2561198) was conducted, as well as of AWN's library of quarry assessments. This review concluded that the background PM₁₀ and PM_{2.5} concentrations presented below in Sections 8.9.2.2 and 8.9.2.3 are considered representative of areas also impacted by quarry operations.

8.9.2.1 *NO₂*

Long-term NO₂ monitoring was carried out at the representative Zone D rural background locations of Emo Court and Kilkitt, and the suburban traffic location of Carrick-on-Shannon for the period 2020 – 2024 (Table 8-16) (EPA, 2025). Long-term average concentrations are significantly below the annual average limits of 40 µg/m³ and 20 µg/m³. Average results range from 2 – 13 µg/m³. The overall annual average concentration for this 5-year period is 7 µg/m³. Additionally, there were no exceedances of the hourly limit value of 200 µg/m³.

Based on the above information a conservative estimate of the current background NO₂ concentration for the region of the proposed development is 7 µg/m³.

For the modelling assessment as per Section 8.10.3, 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. NO₂ has ambient air quality standards for both annual mean and hourly concentrations that must be complied with (see Table 8-1). 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 8-16: Background NO₂ Concentrations (µg/m³)

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
Emo Court, Co. Laois	Annual Mean NO ₂ (µg/m ³)	3	4	3	2	3
	1-hr Mean NO ₂ values >200 µg/m ³	0	0	0	0	0
Kilkitt, Co. Monaghan	Annual Mean NO ₂ (µg/m ³)	2	2	2	2	2
	1-hr Mean NO ₂ values >200 µg/m ³	0	0	0	0	0
Carrick-on-Shannon, Co. Leitrim	Annual Mean NO ₂ (µg/m ³)	17	11	12	10	12
	1-hr Mean NO ₂ values >200 µg/m ³	0	0	0	0	0
Annual Mean NO ₂ (µg/m ³)	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				

8.9.2.2 PM₁₀

Continuous PM₁₀ monitoring was carried out at three representative Zone D locations from 2020 – 2024; Claremorris, Co. Mayo and Kilkitt, Co. Monaghan. Annual average PM₁₀ concentrations across the sites ranged from 7 – 10 µg/m³ over the 2020 – 2024 period (Table 8-17). The overall annual average concentration for this 5-year period is 9 µg/m³. There were no exceedances of the daily limit of 50 µg/m³.

Based on the EPA data, a conservative estimate of the current background PM₁₀ concentration in the region of the proposed development is 9 µg/m³.

In relation to the annual averages, the ambient background concentration is added directly to the process concentration. However, in relation to the short-term peak concentration, concentrations due to emissions from elevated sources cannot be combined in the same way. Guidance (UK DEFRA, 2022) (EPA, 2020) advises that for PM₁₀ an estimate of the maximum combined pollutant concentration can be obtained as shown below:

PM₁₀ - The 90.4th %ile of total 24-hour mean PM₁₀ is equal to the maximum of either A or B below:

- 90.4th %ile of 24-hour mean background PM₁₀ + annual mean process contribution PM₁₀
- 90.4th %ile 24-hour mean process contribution PM₁₀ + annual mean background PM₁₀

This approach can also be applied to the 24-hr mean PM₁₀ concentration as a 95.1st percentile. A 95.1st percentile 24-hour background concentration of 12 µg/m³ was used in the assessment, based on the overall 5-year average concentrations for the monitoring locations (Table 8-17) over the period 2020 – 2024.



Table 8-17: Background PM₁₀ Concentrations (µg/m³)

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
Claremorris	Annual Mean PM ₁₀ (µg/m ³)	10	10	8	8	8
	24 hr Mean PM ₁₀ (as 90.4 th %ile) (µg/m ³)	16	13	13	-	
	24-hr Mean > 50 µg/m ³ (days)	0	0	0	0	0
Kilkitt	Annual Mean PM ₁₀ (µg/m ³)	8	8	9	7	7
	24 hr Mean PM ₁₀ (as 90.4 th %ile) (µg/m ³)	14	-	14	-	
	24-hr Mean > 50 µg/m ³ (days)	0	-	0	0	0
Carrick-on-Shannon	Annual Mean PM ₁₀ (µg/m ³)	10	9	10	-	10
	24 hr Mean PM ₁₀ (as 90.4 th %ile) (µg/m ³)	15	15	17	-	
	24-hr Mean > 50 µg/m ³ (days)	0	0	0	-	0
Annual Mean PM ₁₀ (µg/m ³)	Limit Value (to be attained by 2026 and applicable until 2030)	40				
24-hr Mean PM ₁₀ (as 90.4 th %ile) (µg/m ³)	Directive EU 2024/2881	50				
24-hr Mean PM ₁₀ values > 50 µg/m ³	Limit Value (to be attained by 2026)	35				
24-hr Mean PM ₁₀ (as 95.1 st %ile) (µg/m ³)	Directive EU 2024/2881	45				
24-hr Mean PM ₁₀ values > 45 µg/m ³	Limit Value (to be attained by 2030)	No more than 18 exceedances				

8.9.2.3 PM_{2.5}

Average PM_{2.5} levels in Claremorris, Co. Mayo and Shannon Estuary/Askeaton, Co. Limerick over the period 2020 - 2024 ranged from 4 - 8 µg/m³ (EPA, 2025). The maximum annual average concentration for this 5-year period is 6 µg/m³ (Table 8-18).

Based on this information, an estimate of the background PM_{2.5} concentration in the region of the proposed development is 6 µg/m³.



Table 8-18: Background PM_{2.5} Concentrations (µg/m³)

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
Claremorris	Annual Mean PM _{2.5} (µg/m ³)	5	8	6	5	5
Shannon Estuary/Askeaton	Annual Mean PM _{2.5} (µg/ m ³)	4	6	5	5	5
Annual Mean PM _{2.5} (µg/ m ³)	Directive EU 2024/288 Limit Value (to be attained by 2026)	25				
	Directive EU 2024/2881 Limit Value (to be attained by 2030)	10				
24-hr Mean PM _{2.5} (as 95.1 st ile) (µg/m ³)	Directive EU 2024/2881 Limit Value (to be attained by 2030)	25				
24-hr Mean PM _{2.5} values >25 µg/m ³		No more than 18 exceedances				

8.9.2.4 Future Background Concentrations Projections

PE-ENV-01106 guidance (TII, 2025) provides a methodology for predicting future year background concentrations. This is necessary to allow for changes in background air quality in future years. For the purposes of the air quality assessment, impacts are predicted for the future opening year of the proposed development, and it is overly conservative to assume that the current background pollutant concentrations will remain the same in this future year and beyond.

Future year projection factors are provided in Appendix C of the PE-ENV-01106 guidance (TII, 2025) Projection factors have been provided to allow for calculation of background pollutant concentrations up to 2040. Where background concentrations beyond 2040 are required, TII state that the background concentrations for 2040 can be used as representative concentrations the future year (TII, 2025).

The realistic worst-case scenario has been applied in relation to future year background projections.

Current baseline background pollutant concentrations have been derived from EPA data and are discussed in Section 8.9.1. These baseline concentrations have been used in combination with the future year projection factors to produce background concentrations for the Opening Year of 2029 for the proposed development. The background concentrations used in this assessment are shown in Table 8-19.



Table 8-19: Background Pollutant Concentrations

Pollutant	Base Year (2026) ($\mu\text{g}/\text{m}^3$)	Opening Year (2029) ($\mu\text{g}/\text{m}^3$)	
		Adjustment Factor	Adjusted Background
NO ₂	7	0.89	6.24
PM ₁₀	9	0.97	8.71
PM _{2.5}	6	0.95	5.71

8.9.2.5 Ammonia (NH₃)

Background concentrations for NH₃ were derived from the 1 km grid square concentrations provided on the Air Pollution Information System (APIS) website (APIS, 2026). The modelling results were reviewed and the areas of maximum process contributions were identified (shown in the results tables and concentration contour figures in Section 8.10.3.1.4). The corresponding APIS 1 km grid squares were then identified and a maximum background NH₃ concentration of **3.2 $\mu\text{g}/\text{m}^3$** determined. This background concentration was added directly to the modelled process contributions to give a total predicted environmental concentration.

8.9.2.6 Odour

No background concentration of odour has been added to the modelled process contributions to give a total predicted environmental concentration. As per guidance (AG9) (EPA, 2019), when modelling odour, the measurement of ambient levels of odour and the incorporation of these levels into the modelling results is not a valid approach as odours are not generally additive due to synergistic and non-linear effects of multiple odorous compounds in the ambient environment.

8.9.2.7 Ecology

Background concentrations for NO_x, NH₃ and nitrogen and acid deposition modelled ecology receptors were derived from the 1 km grid square concentrations provided on the Air Pollution Information System (APIS) website (APIS, 2026), in line with UKEA (UKEA, 2014) and UK DEFRA (UK DEFRA, 2022) guidance, and are shown in Table 8-20. The background concentrations are added directly to the modelled process contributions to give a total predicted environmental concentration (PEC).

Where a designated site covers a large area, such as a river system, APIS background concentrations were used at the locations of receptors where the modelling results predicted the maximum process contributions. For smaller sites (such as the Coan Bogs NHA), the maximum background concentration predicted by APIS was used to calculate PEC.



Table 8-20: Background Concentrations for NO_x, NH₃, Nitrogen and Acid Deposition

Ecology Receptor	APIS Background Type	NO _x (µg/m ³)	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)	NH ₃ (µg/m ³)
River Nore and River Barrow SAC	Based on maximum PEC receptor location	3.4	6.4	0.5	3.2
Coan Bogs NHA	Based on maximum PEC receptor location	2.3	9.0	0.6	2.4

8.9.3 Sensitivity of the Receiving Environment

8.9.3.1 *Construction Phase*

In line with the 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 (Zol previously defined in Section 8.6 are taken into consideration.

There is a commercial property within the study area (X:670630.33, Y:668499.83), adjacent to the site. This property is listed as commercial on Eircode data, however, the property includes a temporary residence. This is a landowner owned property and will not be occupied (either as a residential or commercial building) during the construction, operational or decommissioning phases of the proposed development. Therefore, this property is not deemed to be sensitive to air quality impacts during the construction phase and has not been considered in the assessment.

In terms of receptor sensitivity to dust soiling, the area directly surrounding the proposed development (within 250 m of the proposed development boundary and proposed gas pipeline route) is predominantly rural in nature. There are between 10 and 100 no. high sensitivity residential properties within 20 m of the proposed development boundary and proposed gas pipeline (see Figure 8-5 and Figure 8-6). Based on these receptor numbers and using the IAQM criteria in Table 8-10, the sensitivity of the area to dust soiling impacts from the proposed development is high.

In addition to sensitivity to dust soiling, the IAQM guidance (IAQM, 2024) also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current background annual mean PM₁₀ 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 background annual mean PM₁₀ concentration in the vicinity of the proposed development is 8 µg/m³. There are between 10 and 100 no. high sensitivity residential properties within 20 m of the proposed development boundary and proposed gas pipeline route (see Figure 8-5 and Figure 8-6). Based on the IAQM criteria outlined in Table 8-10 the worst-case sensitivity of the area to dust-related human health effects is low.



The guidance (IAQM, 2024) 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. Designated ecology sites within 20 m of the proposed development include the River Barrow and River Nore SAC (see Figure 8-5 and Figure 8-6). High sensitivity ecological receptors are sites with European or National designation with particularly dust sensitive species present. The River Barrow and River Nore SAC is a Natura 2000 site (European designation) and is therefore of high sensitivity.

Table 8-21: Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	High	High	High
Human Health	N/A	Low	Low	Low
Ecology	N/A	High	High	High

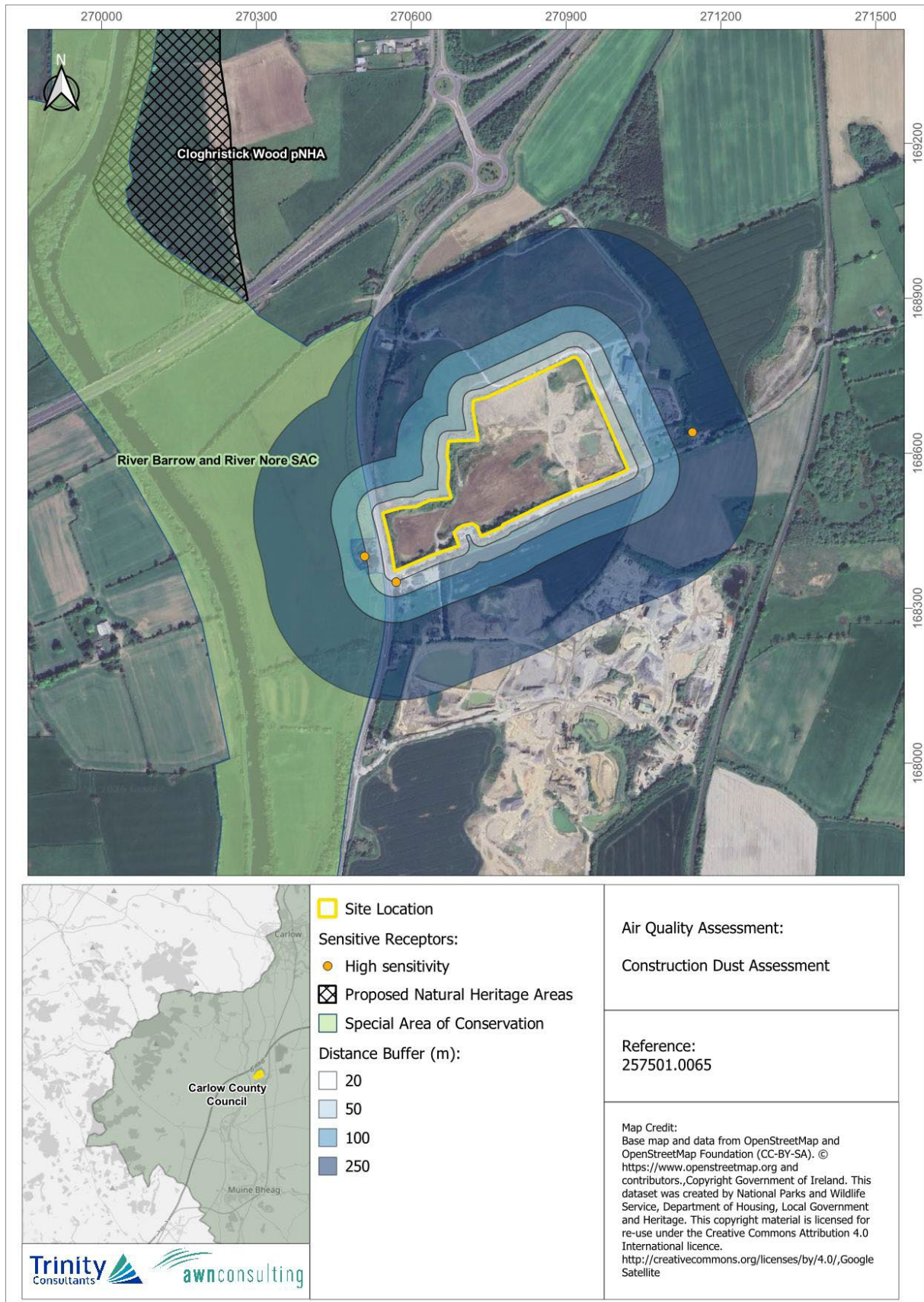


Figure 8-5: Construction Dust Assessment – Sensitive Receptors within 250 m of Proposed Development

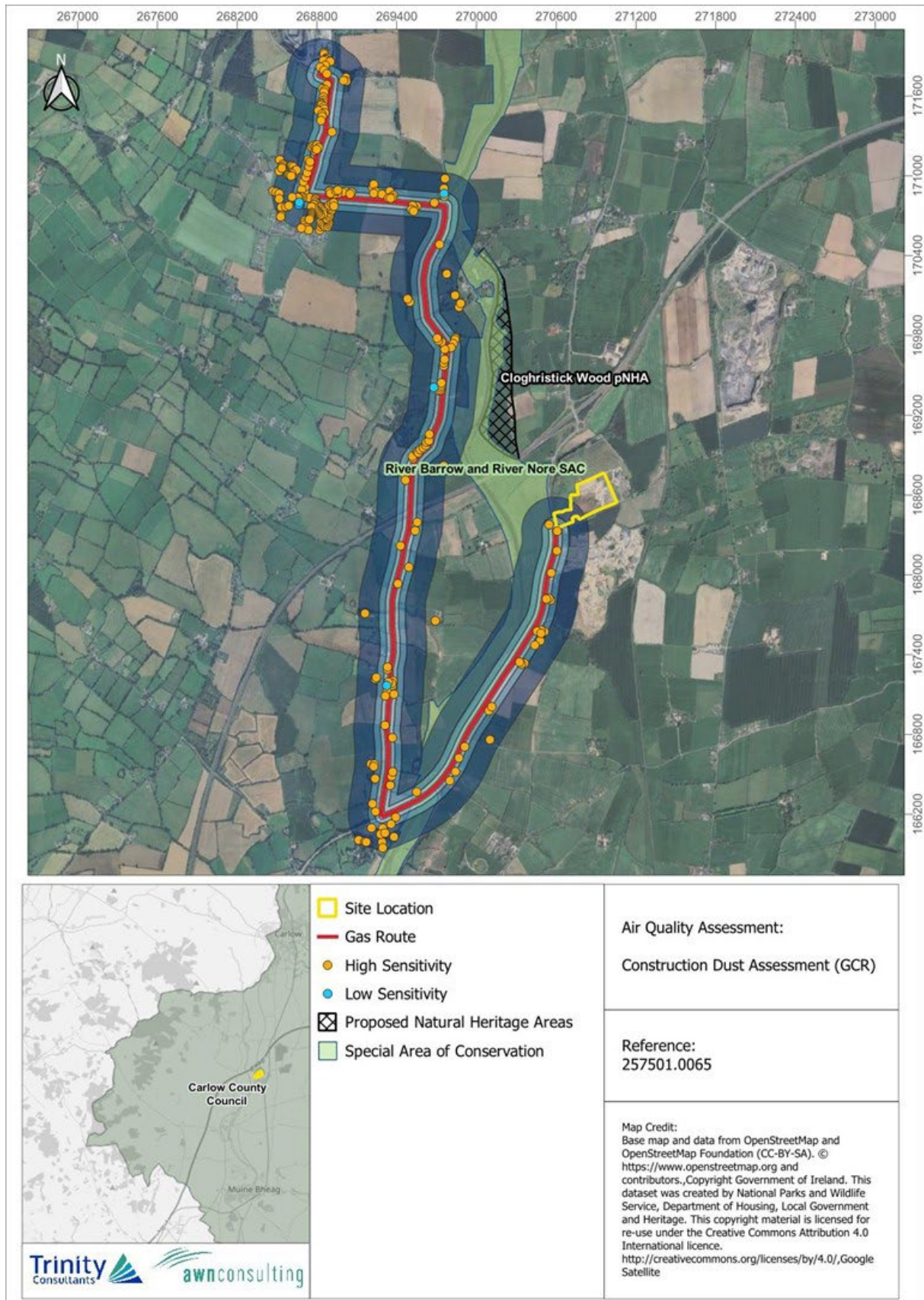


Figure 8-6: Construction Dust Assessment – Sensitive Receptors within 250 m of Proposed Gas Pipeline Route



8.9.3.2 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.

8.9.3.2.1 Human Receptors

The modelling has incorporated a variety of receptors, including a gridded receptor network, site boundary receptors, and individual discrete receptors representing specific residential properties, hospitals or schools.

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.

The impact of the emission sources was also measured at nearby residential receptors (AQ) which were added to the model as discrete receptors (shown in Table 8-22 and Figure 8-7). All receptors were modelled at 1.5 m to represent breathing height.

Table 8-22: Modelled Sensitive Human Health (Discrete) Receptors

Receptor	Co-Ordinates (UTM Zone 29 N)		Receptor	Co-Ordinates (UTM Zone 29 N)	
	X	Y		X	Y
AQ1	638522	5848055	AQ9	637406	5847644
AQ2	637948	5847765	AQ10	636988	5848437
AQ3 (non-residential property)	638084	5847847	AQ11	637060	5848820
AQ4	637945	5847625	AQ12	638234	5849026
AQ5	639114	5847915	AQ13	639161	5848984
AQ6	638883	5848282	AQ14	639279	5847394
AQ7	639172	5848084	AQ15	637887	5847815
AQ8	637998	5848772			

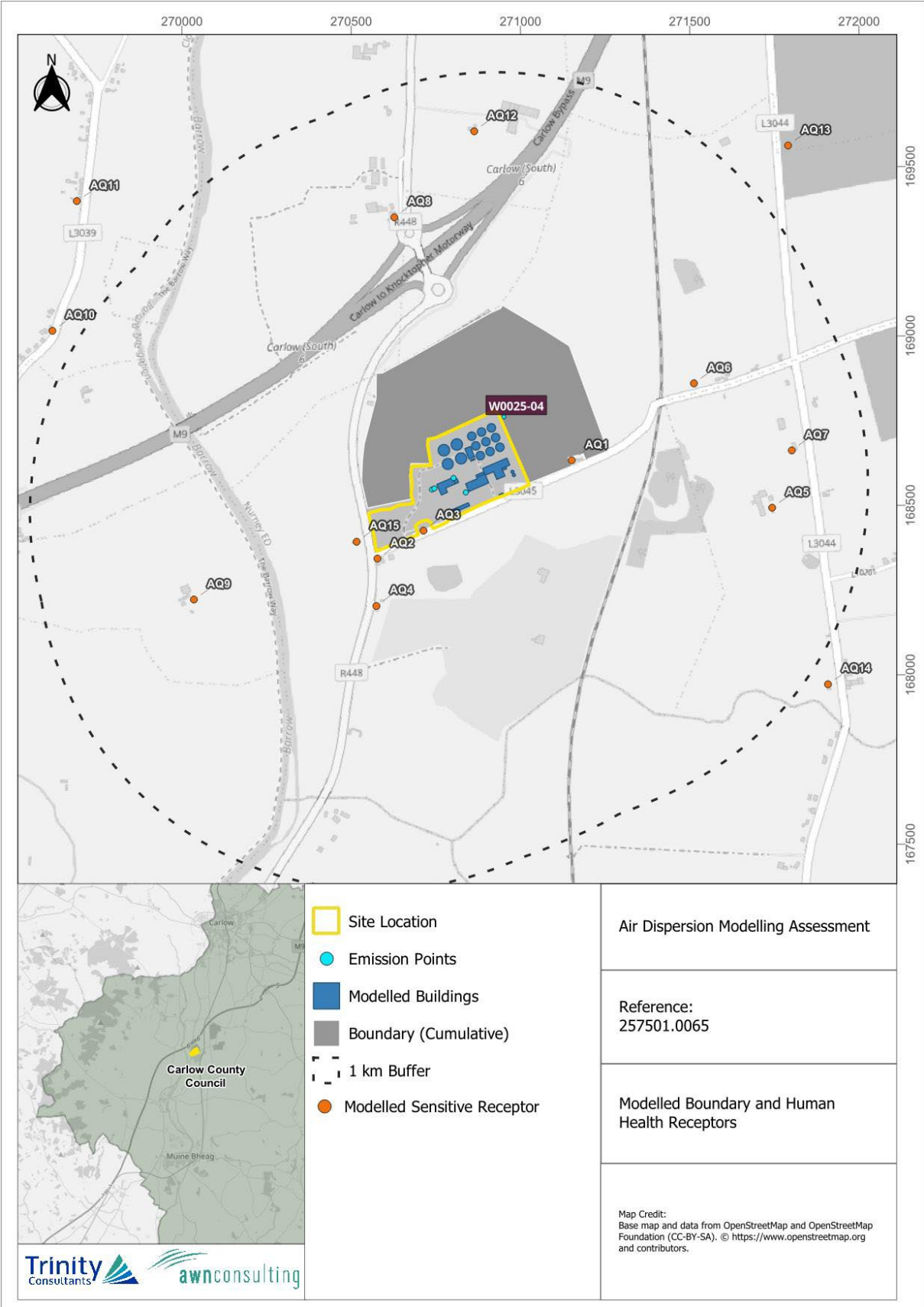


Figure 8-7: Human Health Receptors Included in Operational Phase Air Dispersion Modelling Assessment



8.9.3.2.2 Ecology Receptors

The impact of emissions of NO_x, nitrogen and acid deposition from the proposed development on ambient ground level concentrations was assessed using AERMOD within European sites and NHAs (in line with guidance described in Section 8.5.2.3).

An initial geospatial search was conducted (NPWS, 2026) to identify all European sites within screening distances of 10 km of the proposed development that could potentially be affected by the proposed development, and the nearest national sites (NHA) within 2 km of the proposed development that could potentially be affected by the proposed development, based on the methodology in Air emissions risk assessment for your environmental permit (Environment Agency (UK), 2025). This search zone ensures that all European sites with the potential to be impacted via direct, indirect or cumulative pathways from air emissions are appropriately considered. Beyond these distances, the effects on ecology due to emissions from the proposed development are expected to be not significant.

The final study area also considered the extent of the area within which NO_x and nitrogen deposition levels from the proposed development are greater than 1% of the relevant critical level and lowest critical loads. These areas were determined by concentration contours, the methodology for which is discussed in Section 8.7.1.6 and contours themselves are presented in Section 8.10.3. Designated sites have been included in this assessment when they are within or in close proximity to these 1% threshold concentration contours.

Also reviewed and included in the assessment as required are the Article 17 habitats spatial datasets (NPWS, 2025). The spatial data for Article 17 assessments give the known (as polygon features) or best estimate of distribution (either 10 km or 50 km grids).

Dispersion modelling of relevant pollutant emissions from all emission points at the proposed development 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.

The concentration contours were generated based on a Cartesian receptor grid of 80 x 80 km, with the site at the centre and with concentrations calculated at 500 m intervals. The ecology receptors included in the dispersion model are shown in Table 8-23 and Figure 8-8.

Table 8-23: Ecology Receptors Included in Dispersion Model

Special Area of Conservation (SAC)	Special Protection Area (SPA)	Natural Heritage Area (NHA)
River Barrow and River Nore SAC	No SPAs within 10km	Coan Bogs NHA

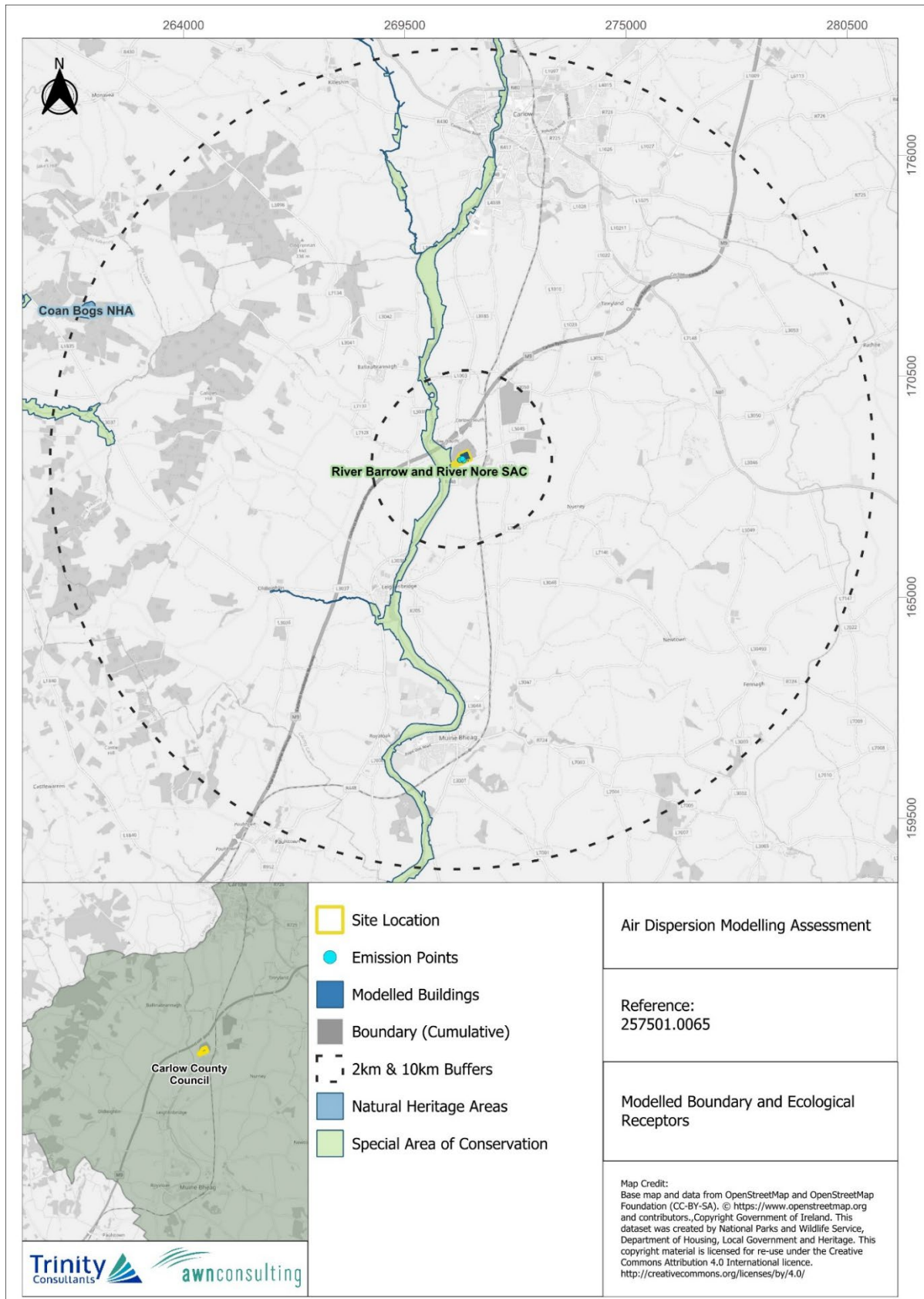


Figure 8-8: Sensitive Ecological Receptors within Operational Phase Air Dispersion Modelling Assessment



8.10 Assessment of Likely Significant Impacts

8.10.1 'Do Nothing' Impacts

Under the “Do Nothing” scenario, no industrial-scale anaerobic digestion (AD) facility is developed and there are therefore no process emissions from the proposed AD facility and no changes in traffic emissions associated with the development which could impact local air quality and no construction of the proposed gas pipeline. The existing use of land for quarry activities and continuation of restoration of same will remain unchanged in the short term. Medium term quarrying activities and restoration of the site will be completed.

Without an AD facility, in the Do-Nothing scenario, ambient air quality at the whole project site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc). The proposed development site has existing planning permission (Ref: 23/60263/ABP3201080-24) for restoration to agricultural land over an eight-year period. This permission allows for infilling of less than 25,000 tonnes per annum and completion of remaining quarrying activities, estimated at approximately 7,500 tonnes, over a 24-month period. The primary emissions to air associated with quarry operations are PM₁₀ and PM_{2.5}, the impact of which was assessed as part of the planning application and is considered not significant.

8.10.2 Construction Phase Impacts

8.10.2.1 *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 Oak Park meteorological data indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature (Section 8.9.1). Dust impacts are likely to occur during drier periods, as rainfall acts as a natural dust suppressant (IAQM, 2024). Days with less than 0.2mm of rainfall can be classified as days with little or no rainfall. A review of historical 30-year average data for Dublin Airport (no 30-year dataset available for Oak Park) indicates that on average 200 days per year have rainfall over 0.2 mm (Met Éireann, 2025). Therefore, it can be determined that over 54% 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 sensitivity of the area. The major dust generating activities are divided into four types within the guidance (IAQM, 2024) to reflect their different potential impacts. These are: demolition, earthworks, construction and trackout (movement of construction vehicles on public roads).

8.10.2.1.1 *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 8-24.



Table 8-24: Dust Emission Magnitude

Activity	Dust Emission Magnitude	Justification
Demolition	N/A	No demolition proposed
Earthworks	Medium	Total site area is between 18,000 m ² and 110,000 m ²
Construction	Medium	Total volume of building to be constructed is between 12,000 m ³ and 75,000 m ³
Trackout	Medium	Approximately 20 - 50 outward vehicle movements per day from construction site activities

8.10.2.1.2 Determining the Risk of Dust Impacts

Once the dust emission magnitude has been determined the next step, according to the guidance (IAQM, 2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, dust-related human health effects and dust-related ecological effects (Section 8.9.2.4). The level of risk associated with each activity is determined using the criteria in Table 8-11. The overall risk of dust impacts from the construction works is shown in Table 8-25 for each category.

There is at most a medium risk of dust soiling impacts, a low risk of dust-related human health impacts and a medium risk of dust-related ecology impacts associated with the proposed works. As a result, best practice dust mitigation measures associated with medium 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 8-25: 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
Ecology	n/a		n/a
Earthworks			
Dust Soiling	High	Medium	Medium
Human Health	Low		Low
Ecology	High		Medium
Construction			
Dust Soiling	High	Medium	Medium
Human Health	Low		Low
Ecology	High		Medium



Receptor	Receptor Sensitivity	Dust Emission Magnitude	Risk of Dust-Related Impacts
Trackout			
Dust Soiling	High	Medium	Medium
Human Health	Low		Low
Ecology	High		Medium

8.10.3 Operational Phase Impacts

8.10.3.1 Air Dispersion Modelling Assessment – Human Health

8.10.3.1.1 NO₂ – Proposed Operations

The results indicate that ambient ground level concentrations of NO₂, detailed in Table 8-26, 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 NO₂ concentration (including background) at the worst-case receptor which are at most:

- 47% of the annual limit value
- 30% of the maximum ambient 1-hour mean limit value (measured as a 99.97th percentile)
- 50% of the maximum ambient 24-hour mean limit value (measured as a 95.1st percentile)

The geographical variations in ground level NO₂ predicted environmental concentrations (PEC) beyond the proposed development boundary for the worst-case year modelled are illustrated as concentration contours in Figure 8-9 (annual mean), Figure 8-10 (1-hr mean) and Figure 8-11 (24-hr mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO₂ are also shown in these figures and are close to the boundary of the proposed development with concentrations decreasing with distance from the facility.

Overall, the effect of nitrogen dioxide (NO₂) due to emissions from the facility's emissions on sensitive human health receptors is considered to be **direct, long-term, negative and slight**, which is overall **not significant** in EIA terms.

Table 8-26: Proposed Operations – Dispersion Model Results for Nitrogen Dioxide (NO₂)

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as % of Limit
		Type	X,Y (UTM Zone 29 N)	PC	Back-ground	PEC	Limit Value	
NO ₂ / 2021	Annual Mean	Boundary	638144, 5848132	3.0	6.24	9.28	20	46%



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	
	1-hr Mean (as 99.97 th ile)	Boundary	638206, 5847901	39.5	12.48	51.96	200	26%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	12.7	12.48	25.15	50	50%
NO ₂ / 2022	Annual Mean	Boundary	638144, 5848132	3.1	6.24	9.31	20	47%
	1-hr Mean (as 99.97 th ile)	Boundary	638046, 5848024	46.7	12.48	59.14	200	30%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	11.2	12.48	23.64	50	47%
NO ₂ / 2023	Annual Mean	Boundary	638144, 5848132	3.2	6.24	9.46	20	47%
	1-hr Mean (as 99.97 th ile)	Boundary	638184, 5847890	40.9	12.48	53.42	200	27%
	24-hr Mean (as 95.1 st ile)	Boundary	638149, 5848134	12.4	12.48	24.90	50	50%
NO ₂ / 2024	Annual Mean	Boundary	638144, 5848132	3.0	6.24	9.24	20	46%
	1-hr Mean (as 99.97 th ile)	Boundary	638107, 5848038	40.1	12.48	52.53	200	26%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	11.4	12.48	23.84	50	48%
NO ₂ / 2025	Annual Mean	Boundary	638107, 5848038	3.0	6.24	9.24	20	46%



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	
	1-hr Mean (as 99.97 th ile)	Boundary	638107, 5848038	38.2	12.48	50.73	200	25%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	12.2	12.48	24.69	50	49%

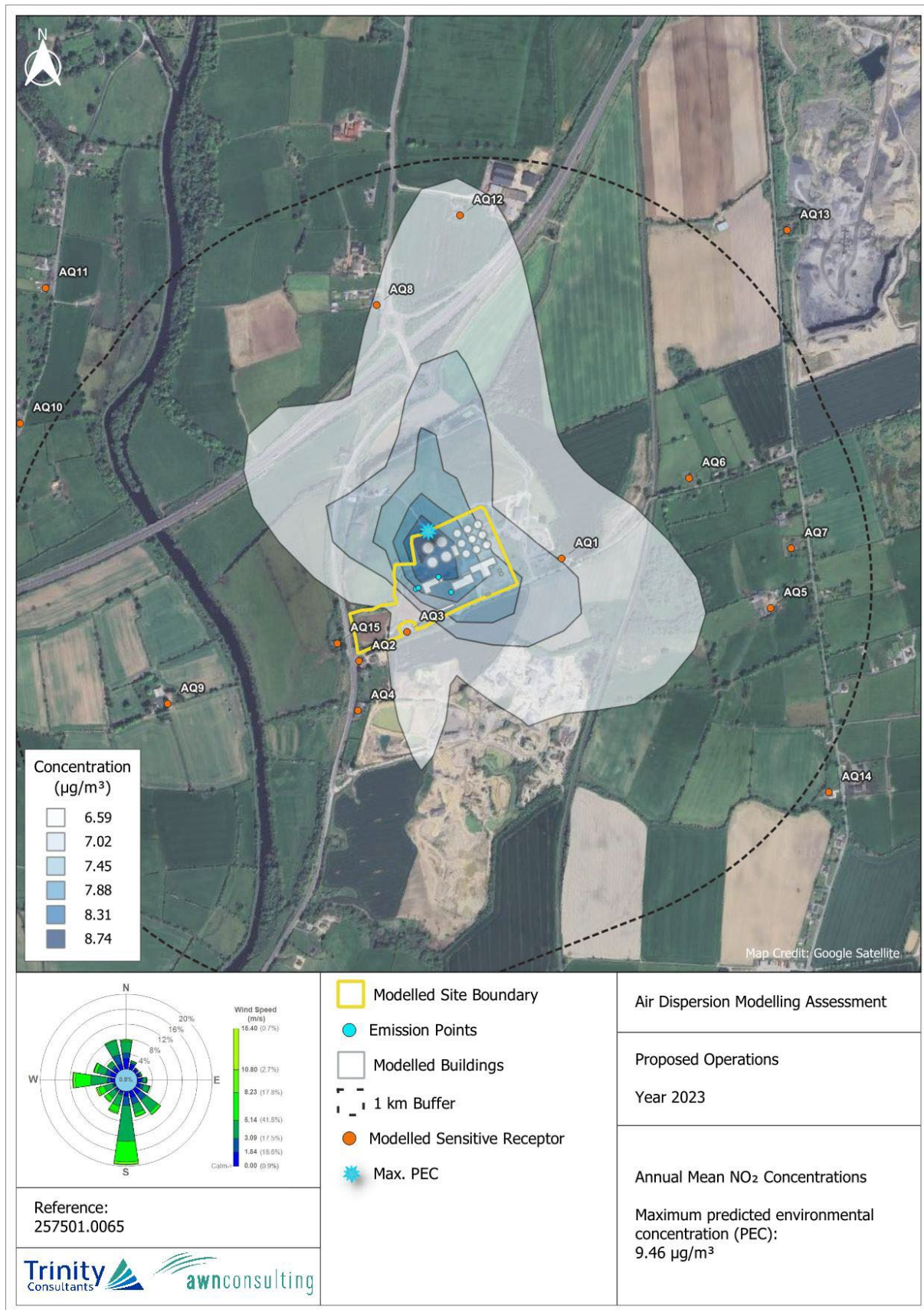


Figure 8-9: Proposed Operations Scenario - Annual Mean NO_2 Concentrations

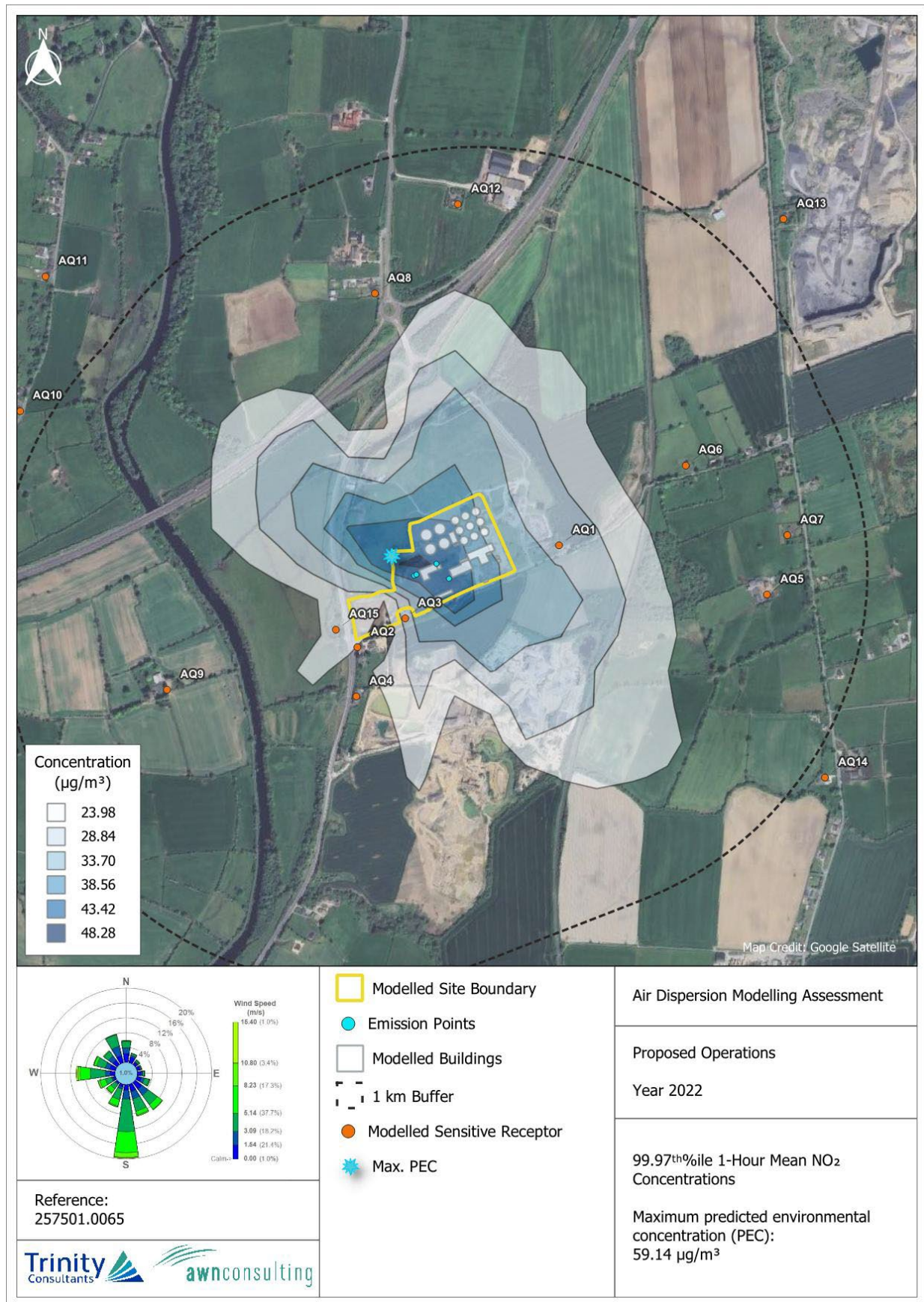


Figure 8-10: Proposed Operations Scenario - Maximum 1-Hour NO_2 Concentrations (as 99.97thile)

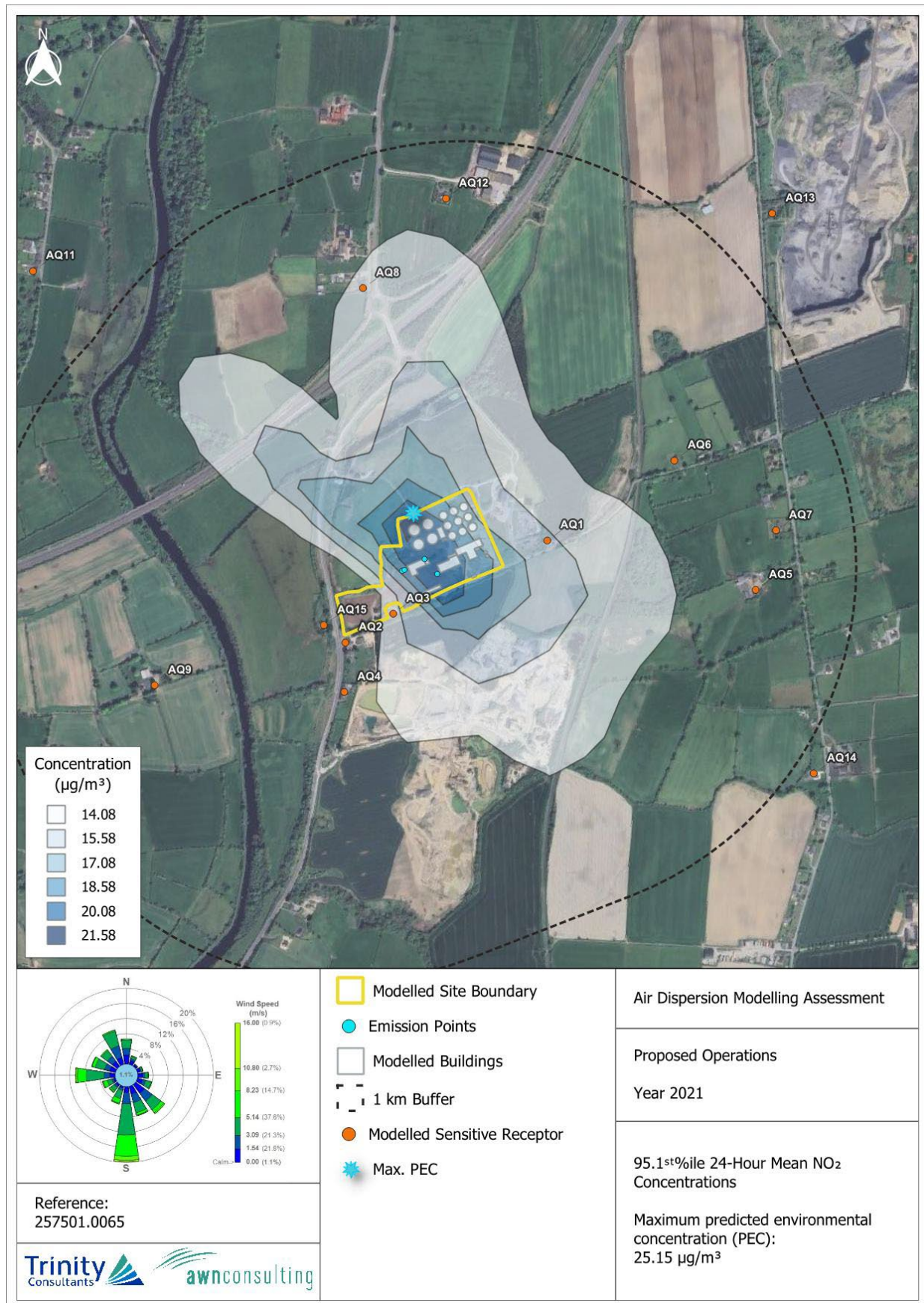


Figure 8-11: Proposed Operations Scenario - Maximum 24-Hour NO₂ Concentrations (as 95.1st%ile)



8.10.3.1.2 Particulate Matter (PM₁₀) – Proposed Operations

The results indicate that ambient ground level concentrations of PM₁₀, detailed in Table 8-27, 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 PM₁₀ concentration (including background) at the worst-case receptor which are at most:

- 46% of the annual limit value
- 40% of the maximum ambient 24-hour limit value (measured as a 95.1st percentile)

Calculating the maximum 24-hour mean PM₁₀ (95.1stile) PEC is not a simple addition of background concentration to process contribution but is instead calculated in line with guidance from (UK DEFRA, 2022) (EPA, 2020), as explained in Section 8.9.2.2, which states that for PM₁₀ an estimate of the maximum PEC can be obtained from the methods shown below:

PM₁₀ - The 95.1stile of total 24-hour mean PM₁₀ is equal to the maximum of either A or B below:

- a) Annual mean process contribution PM₁₀ + 95.1stile of 24-hour mean background PM₁₀
- b) 95.1stile 24-hour mean process contribution PM₁₀ + annual mean background PM₁₀

The results of this calculation process are highlighted (bold, underlined) and shown in Table 8-27 as “PEC A” and “PEC B”, and determined that the maximum 24-hour mean PM₁₀ (95.1stile) PEC is based on method A (“PEC A”).

The geographical variations in ground level PM₁₀ process contribution (PC) concentrations beyond the proposed development boundary for the worst-case years modelled are illustrated as concentration contours in Figure 8-12 (annual mean) and Figure 8-13 (24-hr mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for PM₁₀ are also shown in these figures and are close to the boundary of the site with concentrations decreasing with distance from the facility.

Overall, the effect of particulate matter (PM₁₀) due to emissions from the facility’s emissions on sensitive human health receptors is considered to be **direct, long-term, negative** and **slight**, which is overall **not significant** in EIA terms.



Table 8-27: Proposed Operations – Dispersion Model Results for Particulate Matter (PM₁₀)

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)					PEC as % of Limit
		Type	X,Y (UTM Zone 29 N)	PC	Back-ground	PEC A	PEC B	Limit Value	
PM ₁₀ / 2021	Annual Mean	Boundary	638144, 5848132	0.49	8.71	9.20	9.20	20	46%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.85	17.42	17.91	10.56	45	40%
PM ₁₀ / 2022	Annual Mean	Boundary	638144, 5848132	0.50	8.71	9.21	9.21	20	46%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.67	17.42	17.92	10.38	45	40%
PM ₁₀ / 2023	Annual Mean	Boundary	638144, 5848132	0.53	8.71	9.24	9.24	20	46%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.80	17.42	17.95	10.51	45	40%
PM ₁₀ / 2024	Annual Mean	Boundary	638144, 5848132	0.48	8.71	9.19	9.19	20	46%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.68	17.42	17.90	10.39	45	40%
PM ₁₀ / 2025	Annual Mean	Boundary	638141, 5848133	0.48	8.71	9.19	9.19	20	46%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	1.86	17.42	17.90	10.57	45	40%

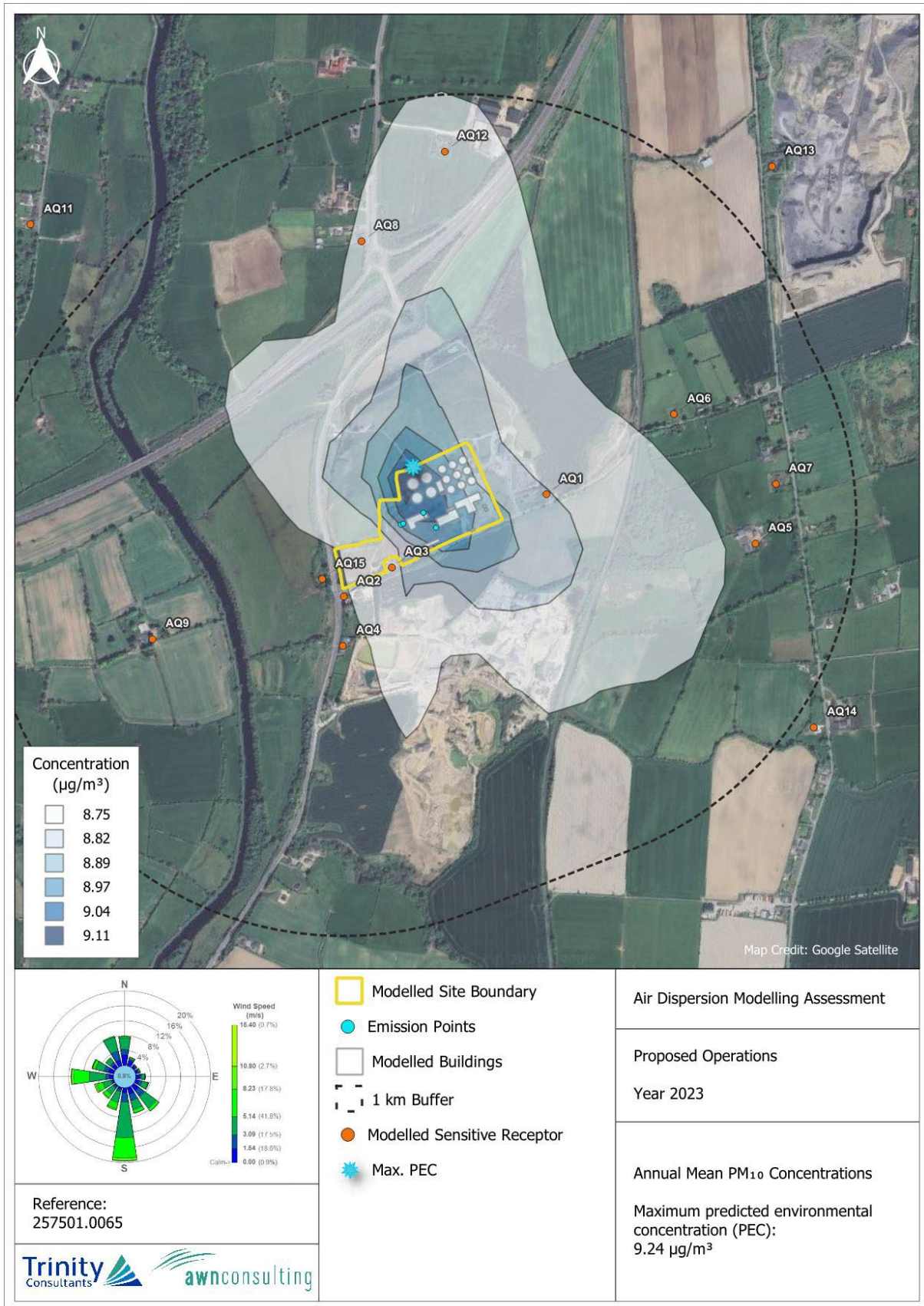


Figure 8-12: Proposed Operations Scenario - Maximum Annual Mean PM_{10} Concentrations

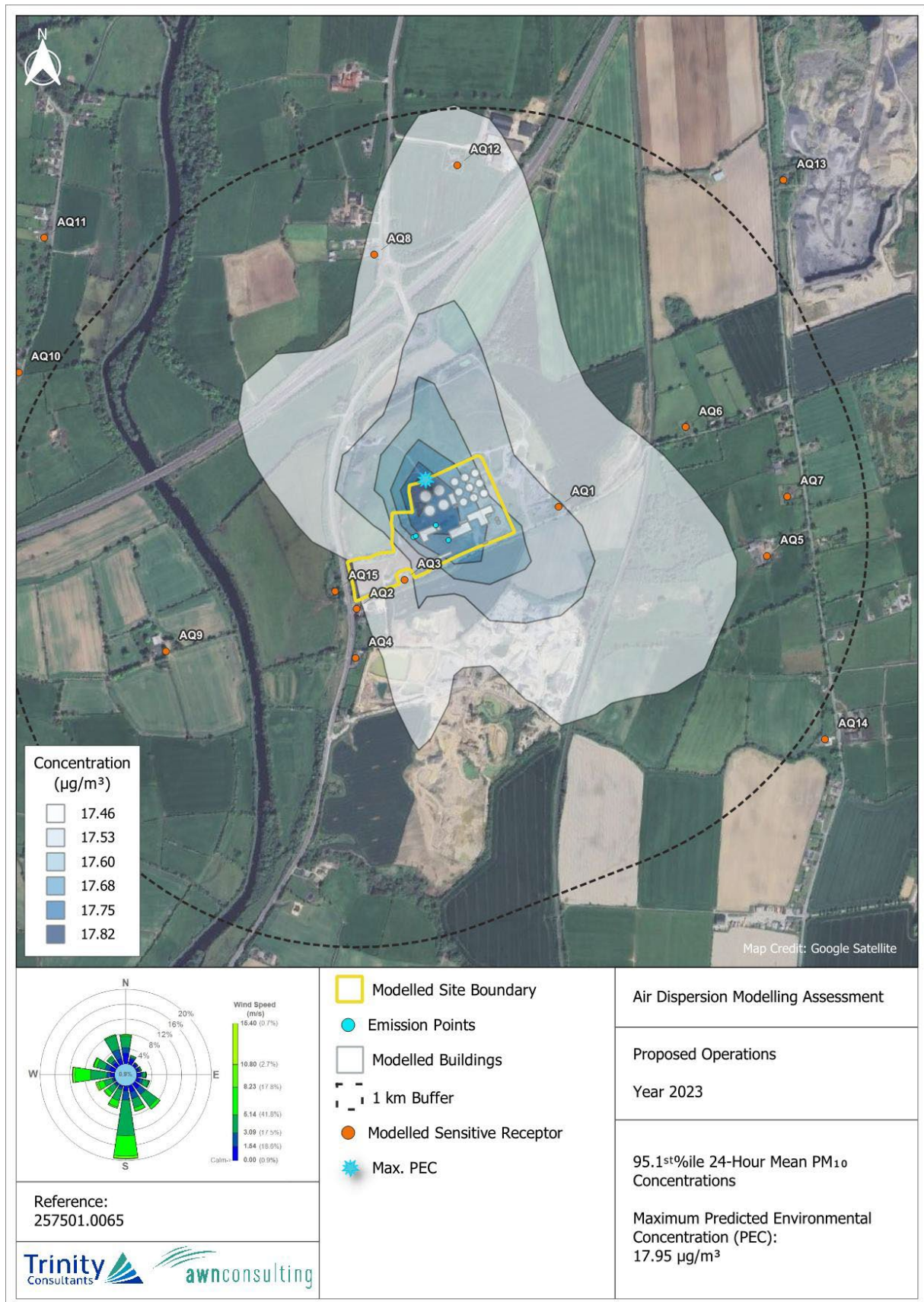


Figure 8-13: Proposed Operations Scenario - Maximum 24-Hour Mean PM_{10} Concentrations (as 95.1st%ile)



8.10.3.1.3 Particulate Matter (PM_{2.5}) – Proposed Operations

The results indicate that ambient ground level concentrations of PM_{2.5}, detailed in Table 8-28, are in compliance with the relevant air quality standards for all modelled years at the worst-case receptor (considers boundary, gridded and sensitive receptors).

The modelled concentrations are derived from a worst-case assumption that all PM₁₀ emissions from the proposed development are of a particle size of 2.5 microns or less (PM_{2.5}). This assumption is necessitated due to the lack of availability of PM_{2.5} emission concentration data for emission sources and therefore PM_{2.5} emissions could not be directly modelled. In reality, particles greater than 2.5 microns will also be present and thus the mass of PM_{2.5} released has been overestimated.

For the worst-case year, emissions from the site lead to an ambient PM_{2.5} concentration (including background) at the worst-case receptor which are at most:

- 62% of the annual limit value
- 47% of the maximum ambient 24-hour limit value (measured as a 95.1st percentile)

Calculating the maximum 24-hour mean PM_{2.5} (95.1st%ile) PEC is not a simple addition of background concentration to process contribution but is instead calculated in line with guidance from the UK DEFRA (UK DEFRA, 2022) and the EPA (EPA, 2020), as explained in Section 8.9.2.2, which states that for PM_{2.5} an estimate of the maximum PEC can be obtained from the methods shown below:

PM_{2.5} - The 95.1st%ile of total 24-hour mean PM_{2.5} is equal to the maximum of either A or B below:

- a) Annual mean process contribution PM_{2.5} + 95.1st%ile of 24-hour mean background PM_{2.5}
- b) 95.1st%ile 24-hour mean process contribution PM_{2.5} + annual mean background PM_{2.5}

The results of this calculation process are highlighted (bold, underlined) and shown in Table 8-28 as “PEC A” and “PEC B”, and determined that the maximum 24-hour mean PM_{2.5} (95.1st%ile) PEC is based on method A (“PEC A”).

As the annual mean PM_{2.5} concentrations have been conservatively assumed equal to the modelled PM₁₀ concentrations, the direction and extent of the emission plume is identical to that shown in Figure 8-12 (annual mean) and Figure 8-13 (24-hr mean, as 95.1st%ile).

Overall, the effect of particulate matter (PM_{2.5}) due to emissions from the proposed development’s emissions on sensitive human health receptors is considered to be **direct, long-term, negative** and **slight**, which is overall **not significant** in EIA terms.



Table 8-28: Proposed Operations – Dispersion Model Results for Particulate Matter (PM_{2.5})

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 A	PEC B	Limit Value	
PM _{2.5} / 2021	Annual Mean	Boundary	638144, 5848132	0.37	5.71	6.081	6.081	10	61%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.39	11.42	11.79	7.10	25	47%
PM _{2.5} / 2022	Annual Mean	Boundary	638144, 5848132	0.37	5.71	6.083	6.083	10	61%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.25	11.42	11.79	6.96	25	47%
PM _{2.5} / 2023	Annual Mean	Boundary	638144, 5848132	0.40	5.71	6.107	6.107	10	61%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.35	11.42	11.82	7.06	25	47%
PM _{2.5} / 2024	Annual Mean	Boundary	638144, 5848132	0.36	5.71	6.073	6.073	10	61%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	1.26	11.42	11.78	6.97	25	47%
PM _{2.5} / 2025	Annual Mean	Boundary	638141, 5848133	0.36	5.71	6.071	6.071	10	61%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	1.39	11.42	11.78	7.10	25	47%



8.10.3.1.4 Ammonia (NH₃) – Proposed Operations

The results indicate that ambient ground level concentrations of NH₃, detailed in Table 8-29, 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 NH₃ concentration (including background) at the worst-case receptor which are at most:

- 1.8 % of the annual limit value
- 0.4 % of the maximum ambient 1-hour limit value

The geographical variations in ground level NH₃ predicted environmental concentrations (PEC) beyond the facility boundary for the worst-case year modelled are illustrated as concentration contours in Figure 8-14 (annual mean) and Figure 8-14: Proposed Operations Scenario – Annual Mean NH₃ Concentrations

(1-hr mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NH₃ are also shown in these figures and are close to the boundary of the site with concentrations decreasing with distance from the facility.

Overall, the effect of ammonia (NH₃) due to emissions from the facility's emissions on sensitive human health receptors is considered to be **direct, long-term, negative** and **slight**, which is overall not significant in EIA terms.



Table 8-29: Proposed Operations – Dispersion Model Results for Ammonia (NH₃)

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as % of Limit
		Type	X,Y (UTM Zone 29 N)	PC	Back-ground	PEC	Limit Value	
NH ₃ / 2020	Annual Mean	Boundary	638094, 5848100	0.05	3.2	3.25	180	1.8%
	Maximum 1-Hour	Boundary	640777, 5847751	1.53	6.4	7.93	2500	0.3%
NH ₃ / 2021	Annual Mean	Boundary	638277, 5847750	0.03	3.2	3.23	180	1.8%
	Maximum 1-Hour	Boundary	637827, 5848050	1.31	6.4	7.71	2500	0.3%
NH ₃ / 2022	Annual Mean	Boundary	638094, 5848100	0.04	3.2	3.24	180	1.8%
	Maximum 1-Hour	Boundary	638046, 5847949	2.38	6.4	8.78	2500	0.4%
NH ₃ / 2023	Annual Mean	Boundary	638094, 5848100	0.04	3.2	3.24	180	1.8%
	Maximum 1-Hour	Boundary	638177, 5847751	2.07	6.4	8.47	2500	0.3%
NH ₃ / 2024	Annual Mean	Boundary	638094, 5848100	0.06	3.2	3.26	180	1.8%
	Maximum 1-Hour	Boundary	638127, 5847700	1.81	6.4	8.21	2500	0.3%

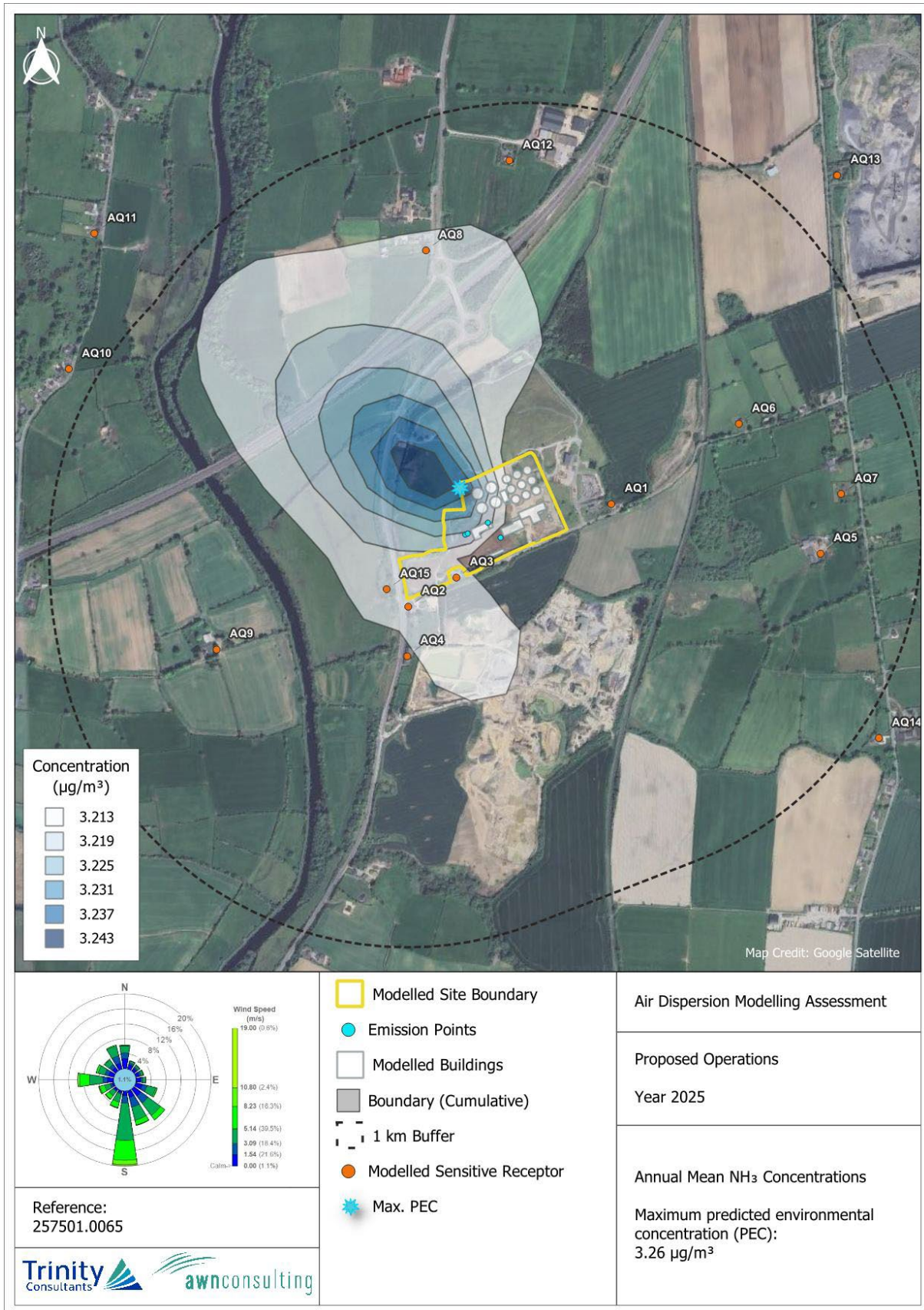


Figure 8-14: Proposed Operations Scenario – Annual Mean NH_3 Concentrations

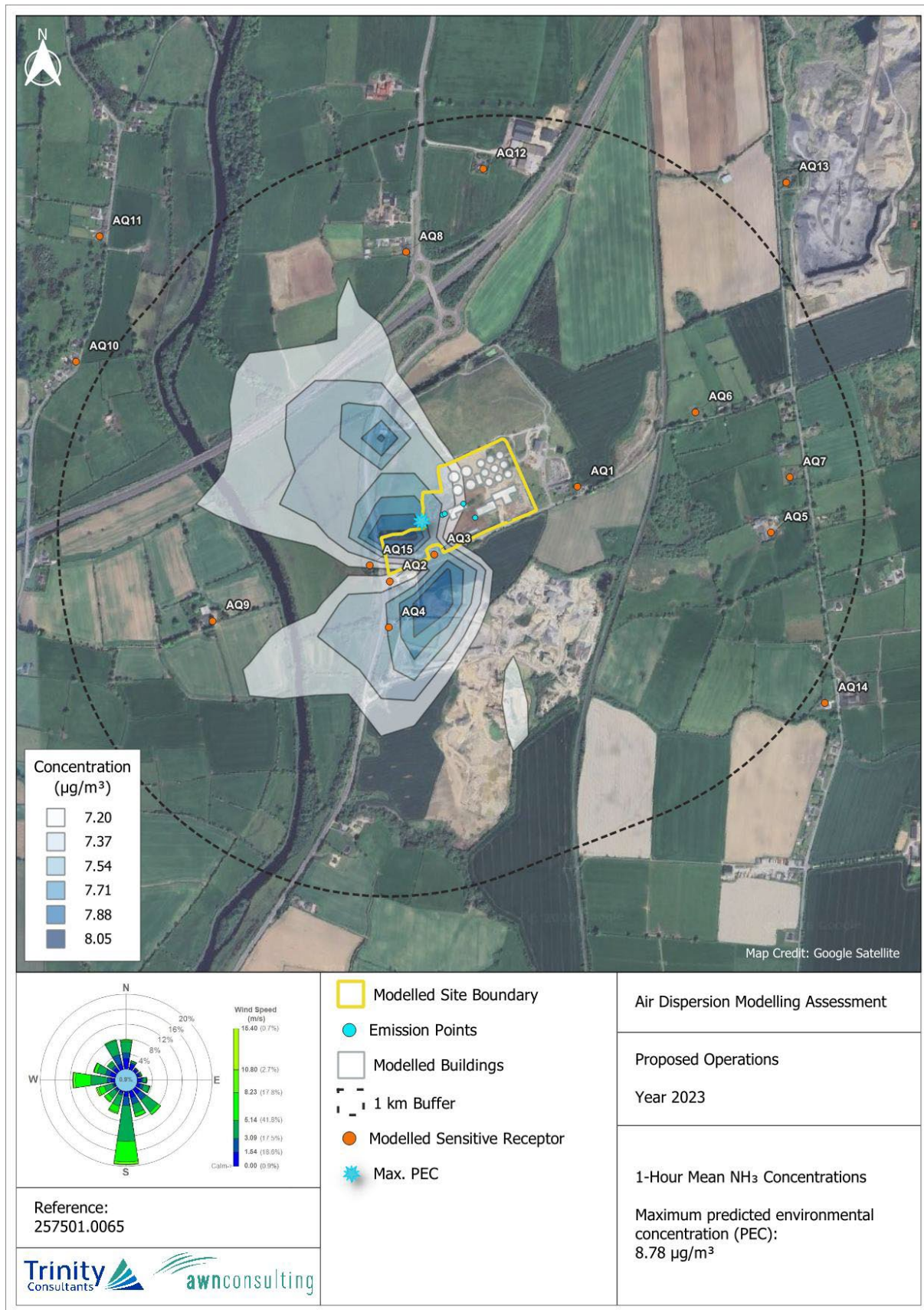


Figure 8-15: Proposed Operations Scenario - Maximum 1-Hour NH_3 Concentrations



8.10.3.1.5 Odour– Proposed Operations

The predicted odour concentration is the maximum concentration predicted at the nearest odour sensitive residential receptor.

The odour modelling results with the proposed development in place are detailed in Table 8-30. The results indicate that the predicted ground level concentrations are below the relevant odour guideline value of 1.5 OUE/m³. The 98thile of mean hourly odour concentrations from the facility range from 0.14 – 0.22 OUE/m³ at the worst-case sensitive receptor. For the worst-case year, emissions from the facility lead to predicted ambient hourly mean (measured as a 98th percentile) odour concentrations which are at most 14% of the of the relevant odour guideline value at the worst-case receptor (location shown in Figure 8-16).

Therefore, the impact of the proposed development in terms of odour can be considered **direct, negative, long-term** and **slight**, which is overall **not significant** in EIA terms.

The geographical variations in ambient ground level odour concentrations beyond the facility for the worst-case year modelled are illustrated as concentration contours in Figure 8-16, to demonstrate the direction and extent of the emission plume.

Table 8-30: Proposed Operations – Dispersion Model Results for Odour

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (OUE/m ³)			
		Type	X,Y (UTM Zone 29 N)	PC	PEC	Guideline Value	PEC as % of Guideline Value
Odour / 2021	Maximum 1-Hour (as a 98 th ile)	Discrete	637998, 5848772	0.148	0.148	1.5	10%
Odour / 2022	Maximum 1-Hour (as a 98 th ile)	Discrete	637998, 5848772	0.181	0.181	1.5	12%
Odour / 2023	Maximum 1-Hour (as a 98 th ile)	Discrete	637887, 5847815	0.155	0.155	1.5	10%
Odour / 2024	Maximum 1-Hour (as a 98 th ile)	Discrete	637887, 5847815	0.145	0.145	1.5	10%
Odour / 2025	Maximum 1-Hour (as a 98 th ile)	Discrete	637887, 5847815	0.217	0.217	1.5	14%
Note: PEC is the Predicted Emission Concentration which includes the predicted contribution from the proposed development as well as the background concentration. As there is no relevant background level for odour EPA, 2019), the PEC is the same as the Process Contribution.							

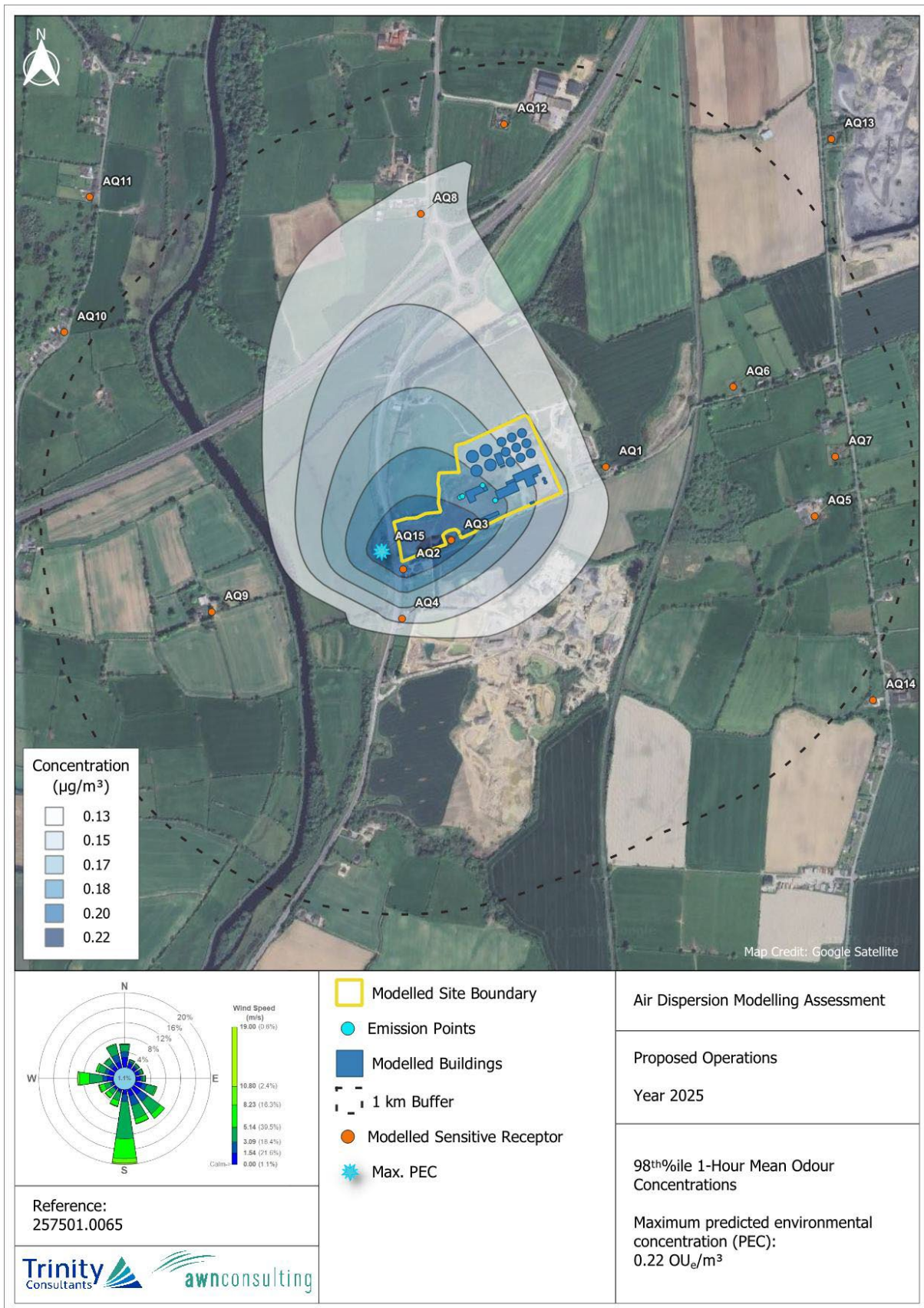


Figure 8-16: Proposed Operations Scenario - 1-Hour Mean Odour Concentrations (as 98th%ile)



8.10.3.2 Air Dispersion Modelling Assessment – Ecology

8.10.3.2.1 NO_x – Proposed Operations

The NO_x modelling results for ecological receptors under the Proposed Operations scenario are detailed in Table 8-31.

As per Section 8.7.1.7, process contributions (PCs) of NO_x at ecological receptors were compared to the relevant critical level (identified in Section 8.5.2.1). As per the IN2 guidance (EPA, 2024), 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.

PCs are greater than 1% of the relevant critical level within the most impacted European site (River Barrow and River Nore SAC, in terms of PEC). At the worst-case location within this site (shown in Figure 8-17), emissions from the proposed development lead to an ambient NO_x concentration (including background) which is at most 18% of the annual limit value over the five years of meteorological data modelled. The effect of NO_x on ecological receptors due to the proposed development is therefore predicted to be not significant.

Table 8-31 shows the extent of the area, as a concentration contour, within which annual mean NO_x concentrations from the proposed development are greater than 1% of the critical level for NO_x of 30 µg/m³.

Table 8-31: Proposed Operations – NO_x Designated Habitat Dispersion Model Results

Ecological Receptor	NO _x Process Contributions (µg/ m³)					Critical Level (µg/m³)	Max PC % of Critical Level	Considered for further assessment?	Back-ground (µg/ m³)	PEC (µg/ m³)	PEC % of critical level
	2020	2021	2022	2023	2024						
Natura 2000											
River Barrow and River Nore SAC	1.17	1.91	1.08	1.02	1.47	30	6.37%	Yes	3.500	5.412	18%
National Sites											
Coan Bogs NHA	0.003	0.003	0.002	0.003	0.003	30	0.01%	No	2.400	2.403	8%

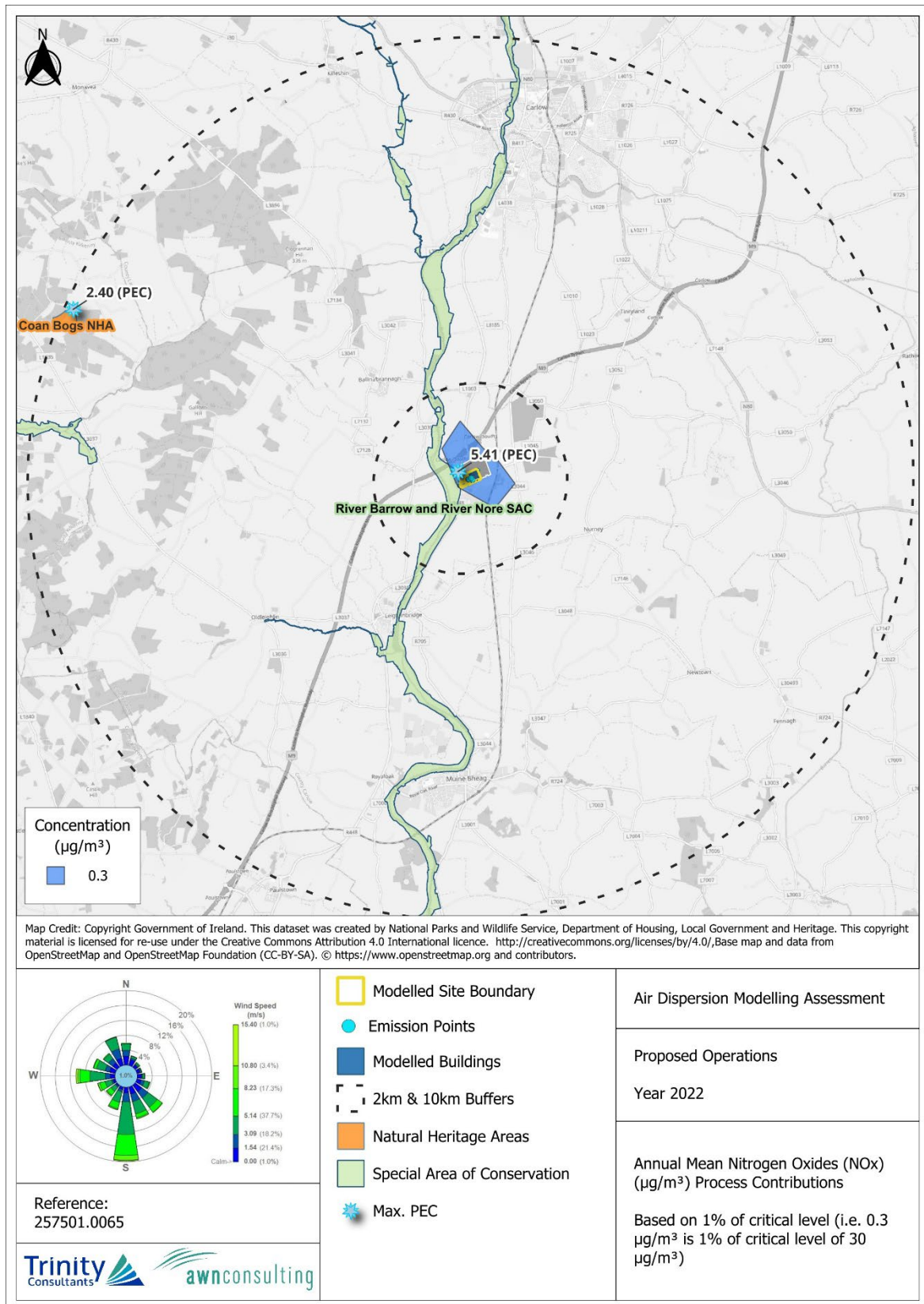


Figure 8-17: Proposed Operations Scenario - NO_x Process Contributions as 1% of Critical Level



8.10.3.2.2 NH₃ – Proposed Operations

The NH₃ modelling results for ecological receptors under the Proposed Operations scenario are detailed in Table 8-32.

As per Section 8.7.1.7, process contributions (PCs) of NH₃ at ecological receptors within the model study area identified were compared to the relevant critical level (identified in Section 8.5.2.1). As per the IN2 guidance (EPA, 2024), 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.

PCs are greater than 1% of the relevant critical level within the most impacted (in terms of PEC) European site (River Barrow and River Nore SAC). At the worst-case location, emissions from the proposed development lead to a maximum ambient NH₃ concentration (including background) which is at most 324% of the annual limit value site over the five years of meteorological data modelled. This exceedance is due to the NH₃ background concentration (the biggest contributor to which is the agricultural sector) exceeding the critical level, rather than the process contribution from the proposed development which is 4.02% of the critical level.

However, at this worst-case model location within the River Barrow and River Nore SAC, there are no features sensitive to ammonia. The closest feature sensitive to ammonia (at a critical level of 1 µg/m³, as established in Section 8.5.2.1) is the habitat *H91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*, as shown in Figure 8-18.

Figure 8-18 shows the extent of the area, as a concentration contour, within which NH₃ concentrations from the proposed development are greater than 1% of the lowest critical load of 1 µg/m³. None of the sensitive features listed above are within the 1% contour, indicating that NH₃ from the proposed development is unlikely to have a significant effect on these features. At this sensitive feature, PCs are less than 1% of the relevant critical level, therefore no further assessment is required as per IN2 guidance (EPA, 2024). The effect of NH₃ on ecological receptors due to the proposed development is therefore predicted to be not significant.



Table 8-32: Proposed Operations – NH₃ Designated Habitat Dispersion Model Results

Ecological Receptor	NH ₃ Process Contributions (µg/m³)					Critical Level (µg/m³)	Max PC % of Critical Level	Considered for further assessment?	Back-ground (µg/m³)	PEC (µg/m³)	PEC % of critical level
	2021	2022	2023	2024	2025						
Natura 2000											
River Barrow and River Nore SAC	0.035	0.035	0.028	0.027	0.040	1	4.02%	Yes	3.200	3.240	324%
National Sites											
Coan Bogs NHA	0.0001	0.0001	0.0001	0.0001	0.0001	1	0.01%	No	2.500	2.500	250%
Sensitive Features											
Petrifying Springs (H7220)	0.0017	0.0017	0.0015	0.0014	0.0015	1	0.17%	Yes	3.300	3.302	330%
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)	0.0093	0.0093	0.0071	0.0069	0.0094	1	0.94%	No	3.100	3.109	311%

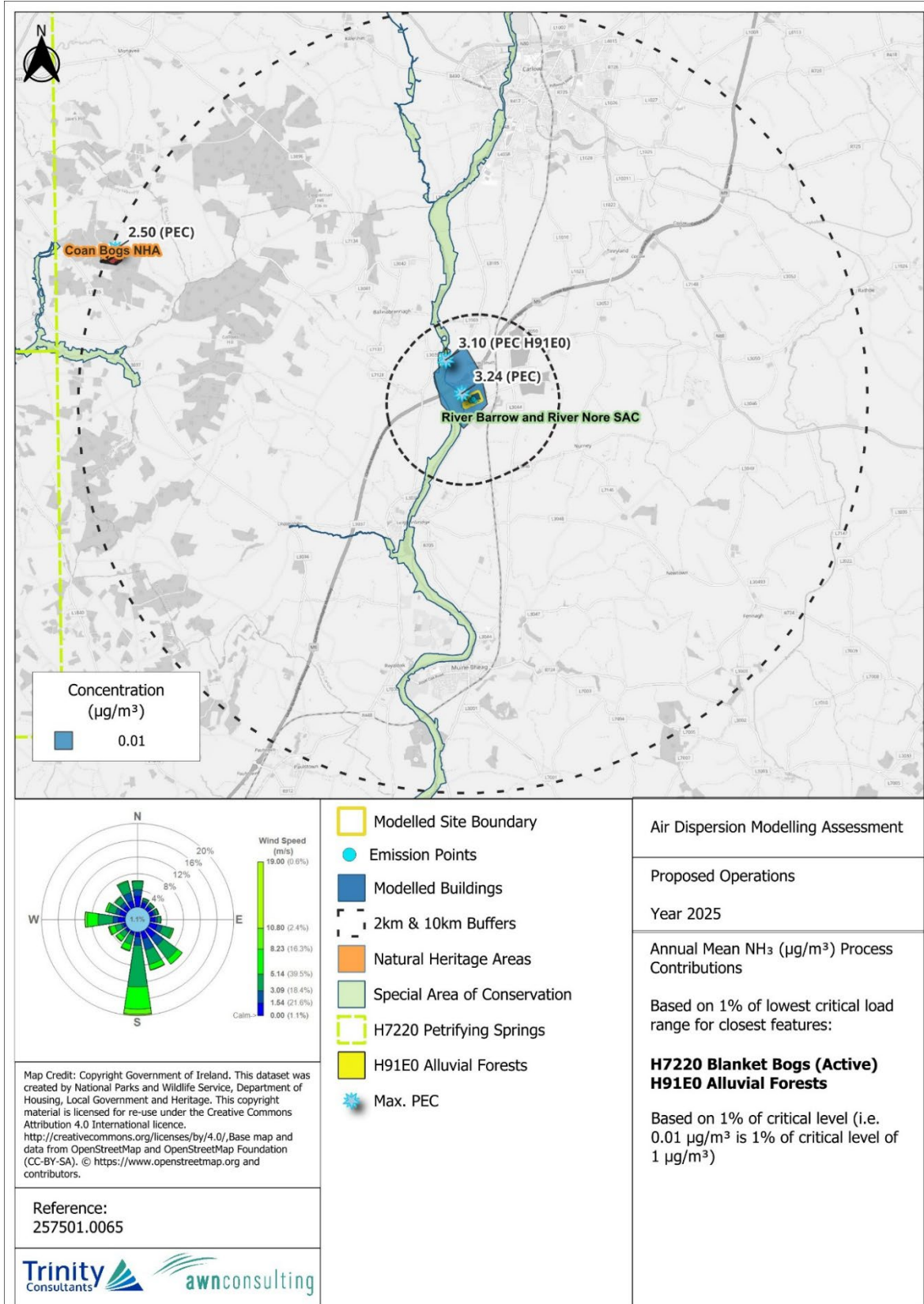


Figure 8-18: Proposed Operations Scenario – NH_3 Process Contributions as 1% of Critical Level



8.10.3.2.3 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 NO₂ and NH₃ process contribution concentrations (PC) are converted into the dry deposition fluxes and then nitrogen deposition fluxes (as described in Section 8.7.1.6) and shown in Table 8-33 and Table 8-34.

As per Section 8.5.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors were compared to the relevant critical load (identified in Section 8.5.2.2). As per the IN2 guidance (EPA, 2024), where a PC is greater than 1% of the lowest critical load, this site has been included in further assessment where the PEC is determined by combining the background concentration with the PC.

PCs are greater than 1% of the worst-case critical load within the River Barrow and River Nore SAC, however the maximum PEC nitrogen deposition level of 7.376 kg/ha/yr does not exceed the critical load assessment criteria of 7.5 kg N/ha/yr for the most sensitive features (*H1130 Estuaries*, *H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)*, *H4030 European dry heaths*, *H7110 Active Raised Bog* and *H7220 Petrifying springs with tufa formation (Cratoneurion)*).

Figure 8-19 shows the extent of the area, as a concentration contour, within which nitrogen deposition levels from the proposed development are greater than 1% of the lowest critical loads of 5 kg/ha/yr (for Coan Bog NHA) and 7.5 kg/ha/yr (River Barrow and River Nore SAC). None of the sensitive features listed above are within the 1% contours, indicating that nitrogen deposition from the proposed development is will not have a significant effect on these features.

Table 8-33: Proposed Operations – Nitrogen Deposition (As NO₂) 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)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.89	0.96	0.86	0.80	1.16	0.0017	0.167
National Sites							
Coan Bogs NHA	0.002	0.002	0.002	0.002	0.003	0.000004	0.0004
Sensitive Features							
Petrifying Springs (H7220)	0.03	0.03	0.03	0.03	0.03	0.00005	0.005
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)	0.14	0.17	0.11	0.11	0.15	0.00025	0.024



NH ₃							
Ecological Receptor	NH ₃ Process Contributions (µg/m³)					NH ₃ Dry Deposition (µg/m²/s)	NH ₃ Nitrogen Deposition (kg/ha/yr)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.0359	0.0359	0.0287	0.0272	0.0402	0.00080	0.2089
National Sites							
Coan Bogs NHA	0.0001	0.0001	0.0001	0.0001	0.0001	0.000003	0.001
Habitats							
Petrifying Springs (H7220)	0.0017	0.0017	0.0015	0.0014	0.0015	0.00003	0.0090
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (91E0)	0.0093	0.0093	0.0071	0.0069	0.0094	0.00019	0.0488

Table 8-34: Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors (continued)

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						
River Barrow and River Nore SAC	0.376	7.5	5.01%	Yes	7.000	7.376
National Sites						
Coan Bogs NHA	0.001	5	0.02%	No	10.400	10.401
a. Concentration contours will always be less than the maximum concentration predicted at an individual receptor, due to the interpolation process of concentrations over a larger area. It is therefore expected that maximum concentrations reported at individual receptors may occur outside contour areas, which would indicate that the area of this maximum concentration is highly localised.						

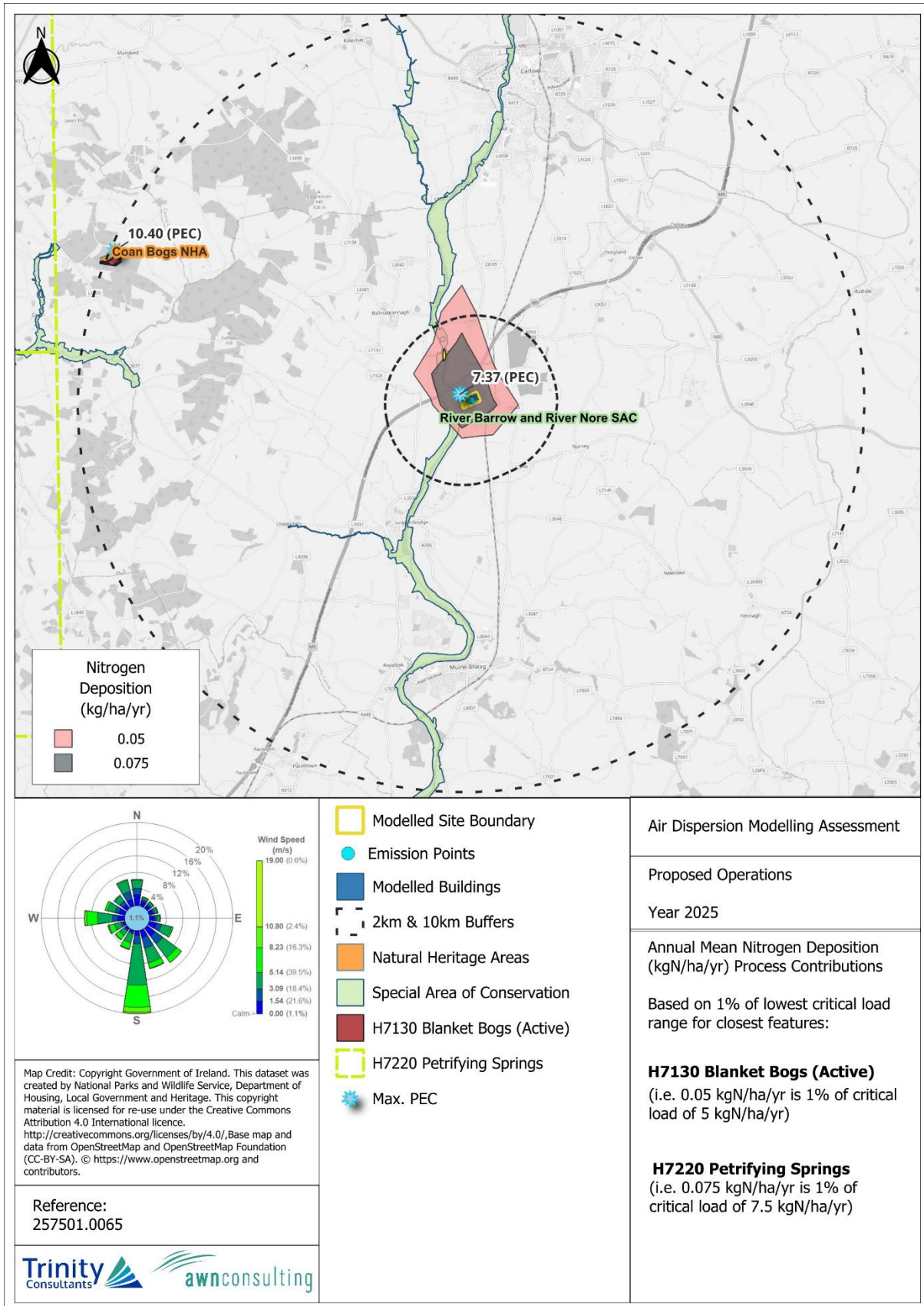


Figure 8-19: Proposed Operations Scenario – Nitrogen Deposition Process Contributions as 1% of Critical Load



8.10.3.2.4 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 NO₂ and NH₃ process contribution concentrations (PC) are converted into the dry deposition fluxes and then acid deposition fluxes (as described in Section 8.7.1.6) and shown in Table 8-35 and Table 8-36.

As per Section 8.5.2.3, process contributions (PCs) of acid deposition at ecological receptors were compared to the relevant critical load (identified in Section 8.5.2.2). As per the IN2 guidance (EPA, 2024), where a PC is greater than 1% of the lowest critical load, this site has been included in further assessment where the PEC is determined by combining the background concentration with the PC.

PCs are greater than 1% of the worst-case critical load within the most impacted European site (River Barrow and River Nore SAC, in terms of PEC). At the worst-case location, the maximum total acid deposition (as N) flux is 0.477 keq/ha/yr. This is below the maximum critical load of 0.714 keq/ha/yr for the most sensitive features *H4030 European dry heaths, H6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, H91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles, H3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion Show more and S1421 Trichomanes speciosum (associated habitat is H91A0).*

Figure 8-20 shows the extent of the area, as a concentration contour, within which acid deposition (as N) levels from the proposed development are greater than 1% of the lowest critical load of 0.0714 kgN/ha/yr. None of the sensitive features listed above are within the River Barrow and River Nore SAC where it overlaps with the 1% contour (only H7130 Blanket Bogs (Active) in the Coan Bog NHA are close enough to be visible on the map), indicating that acid deposition (as N) from the proposed development will not have a significant effect on these features.



Table 8-35: Proposed Operations – Acid Deposition (NO₂) (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)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.893	0.961	0.859	0.802	1.162	0.002	0.012
National Sites							
Coan Bogs NHA	0.002	0.002	0.002	0.002	0.003	0.000004	0.00003
NH ₃							
Ecological Receptor	NH ₃ Process Contributions (µg/ m³)					NH ₃ Dry Deposition (µg/ m²/s)	NH ₃ Acid Deposition (keq/ha/yr)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.036	0.036	0.029	0.027	0.040	0.001	0.015
National Sites							
Coan Bogs NHA	0.000 1	0.000 1	0.000 1	0.000 1	0.0001	0.000003	0.00005

Table 8-36: 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							
River Barrow and River Nore SAC	0.0268	0.143	18.7%	Yes	0.450	0.477	0.714
National Sites							
Coan Bogs NHA	0.0001	0.143	0.05%	No	0.700	0.700	0.714

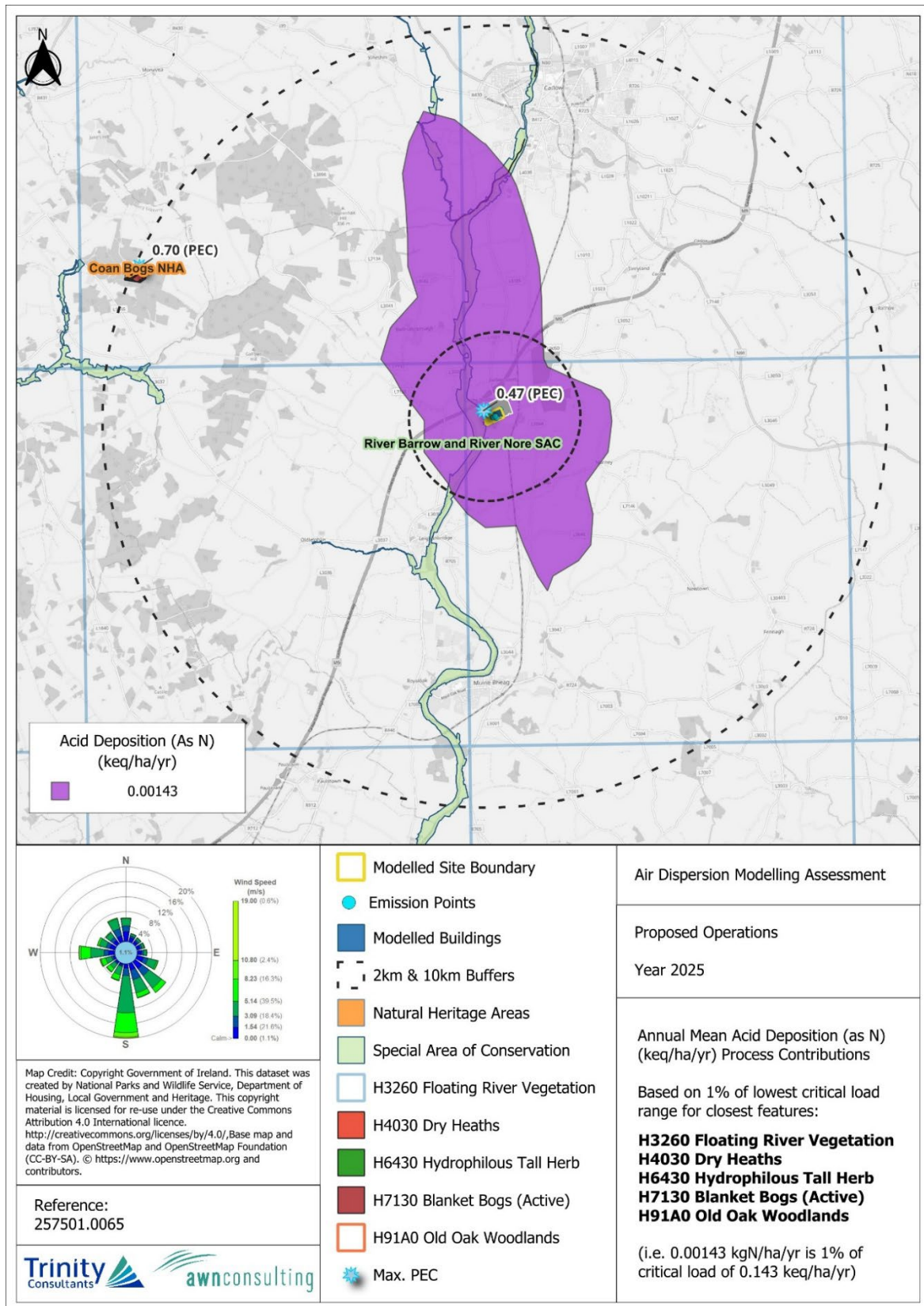


Figure 8-20: Proposed Operations Scenario –Acid Deposition (as N) Process Contributions as 1% of Critical Load



8.10.4 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.

8.10.5 Cumulative Impacts

8.10.5.1 *Construction Phase*

Cumulative construction dust impacts may occur if large-scale developments within 500 m of the site are under construction simultaneously, as per the IAQM guidance (IAQM, 2024).

A review of the planned and permitted projects within the vicinity of the site was undertaken to identify developments (Section 1.6 of Chapter 1 Introduction) with the potential for cumulative construction phase impacts.

Similarly, cumulative dust impacts may occur where developments within 500 m of the proposed development are under construction or decommissioning (i.e. dust generating phases) simultaneously with the decommissioning phases of the proposed project. The following developments were identified with the potential to generate cumulative dust impacts with the proposed development. A number of small-scale (e.g. single dwellings, dwelling extensions, septic tanks, etc) were identified within 500 m however these are not likely to generate significant dust emissions during their construction, as per the IAQM guidance (IAQM, 2024).

Table 8-37: Dust Emission Magnitude

Reference No.	Description
EPA extractive industries register no. QS0472	Kilcarrig Quarries Ltd. operational quarry

The dust mitigation measures outlined in Section 8.11.1 will be applied during the construction phase, and other permitted developments will also apply similar measures as part of their respective impact assessments planning conditions, which will avoid significant cumulative impacts on air quality. The quarry in particular is required to manage its daily extraction activities with dust mitigation measures in place.

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.

8.10.5.2 *Operational Phase*

A cumulative air dispersion modelling assessment of operational phase emissions from the proposed development and other nearby industrial sites with relevant air emissions and an IE licence (as described in Section 8.7.1.8) was undertaken, the results of which are detailed in the following sections.



The potential for cumulative PM₁₀ and PM_{2.5} impact with the Kilcarrig Quarries Ltd. operational quarry 300 m south of the proposed development (EPA extractive industries register no. QS0472) was considered, however the information required for incorporation into a cumulative assessment is not publicly available and therefore a detailed cumulative assessment has been scoped out. The emissions from the quarry are considered to be accounted for in the background concentrations (presented in Sections 8.9.2.2 and 8.9.2.3), which have been incorporated into the operational phase assessment of PM₁₀ and PM_{2.5} emissions from the proposed development (presented in Sections 8.10.3.1.2 and 8.10.3.1.3).

8.10.5.2.1 Air Dispersion Modelling Assessment – Human Health

8.10.5.2.1.1 NO₂ – Cumulative Assessment

The results indicate that ambient ground level concentrations of NO₂, detailed in Table 8-38, 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 NO₂ concentration (including background) at the worst-case receptor which are at most:

- 48% of the annual limit value
- 27% of the maximum ambient 1-hour limit value (measured as a 99.97th percentile)
- 50% of the maximum ambient 24-hour limit value (measured as a 95.1st percentile)

The geographical variations in ground level NO₂ predicted environmental concentrations (PEC) beyond the facility boundary for the worst-case year modelled are illustrated as concentration contours in Figure 8-21 (annual mean), Figure 8-22 (1-hr mean, as 99.97thile) and Figure 8-23 (24-hr mean, as 95.1stile), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO₂ are also shown in these figures and are close to the boundary of the proposed development with concentrations decreasing with distance from the facility.

Overall, the effect of nitrogen dioxide (NO₂) due to emissions from the facility's emissions on sensitive human health receptors is considered to be **direct, long-term, negative and slight**, which is overall **not significant** in EIA terms.



Table 8-38: Cumulative Assessment– Dispersion Model Results for Nitrogen Dioxide (NO₂)

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as % of Limit
		Type	X,Y (UTM Zone 29 N)	PC	Back-ground	PEC	Limit Value	
NO ₂ / 2021	Annual Mean	Boundary	638144, 5848132	3.3	6.24	9.51	20	48%
	1-hr Mean (as 99.97 th ile)	Boundary	638311, 5848184	42.7	12.48	55.17	200	28%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	12.7	12.48	25.16	50	50%
NO ₂ / 2022	Annual Mean	Boundary	638144, 5848132	3.2	6.24	9.44	20	47%
	1-hr Mean (as 99.97 th ile)	Boundary	638046, 5848024	46.7	12.48	59.15	200	30%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	11.3	12.48	23.82	50	48%
NO ₂ / 2023	Annual Mean	Boundary	638144, 5848132	3.4	6.24	9.66	20	48%
	1-hr Mean (as 99.97 th ile)	Boundary	638184, 5847890	40.9	12.48	53.43	200	27%
	24-hr Mean (as 95.1 st ile)	Boundary	638149, 5848134	12.5	12.48	24.99	50	50%
NO ₂ / 2024	Annual Mean	Boundary	638144, 5848132	3.2	6.24	9.43	20	47%
	1-hr Mean (as 99.97 th ile)	Boundary	638107, 5848038	40.1	12.48	52.53	200	26%
	24-hr Mean (as 95.1 st ile)	Boundary	638144, 5848132	11.4	12.48	23.86	50	48%
NO ₂ / 2025	Annual Mean	Boundary	638107, 5848038	3.3	6.24	9.51	20	48%
	1-hr Mean (as 99.97 th ile)	Boundary	638311, 5848184	40.2	12.48	52.71	200	26%
	24-hr Mean (as 95.1 st ile)	Boundary	638141, 5848133	12.2	12.48	24.69	50	49%

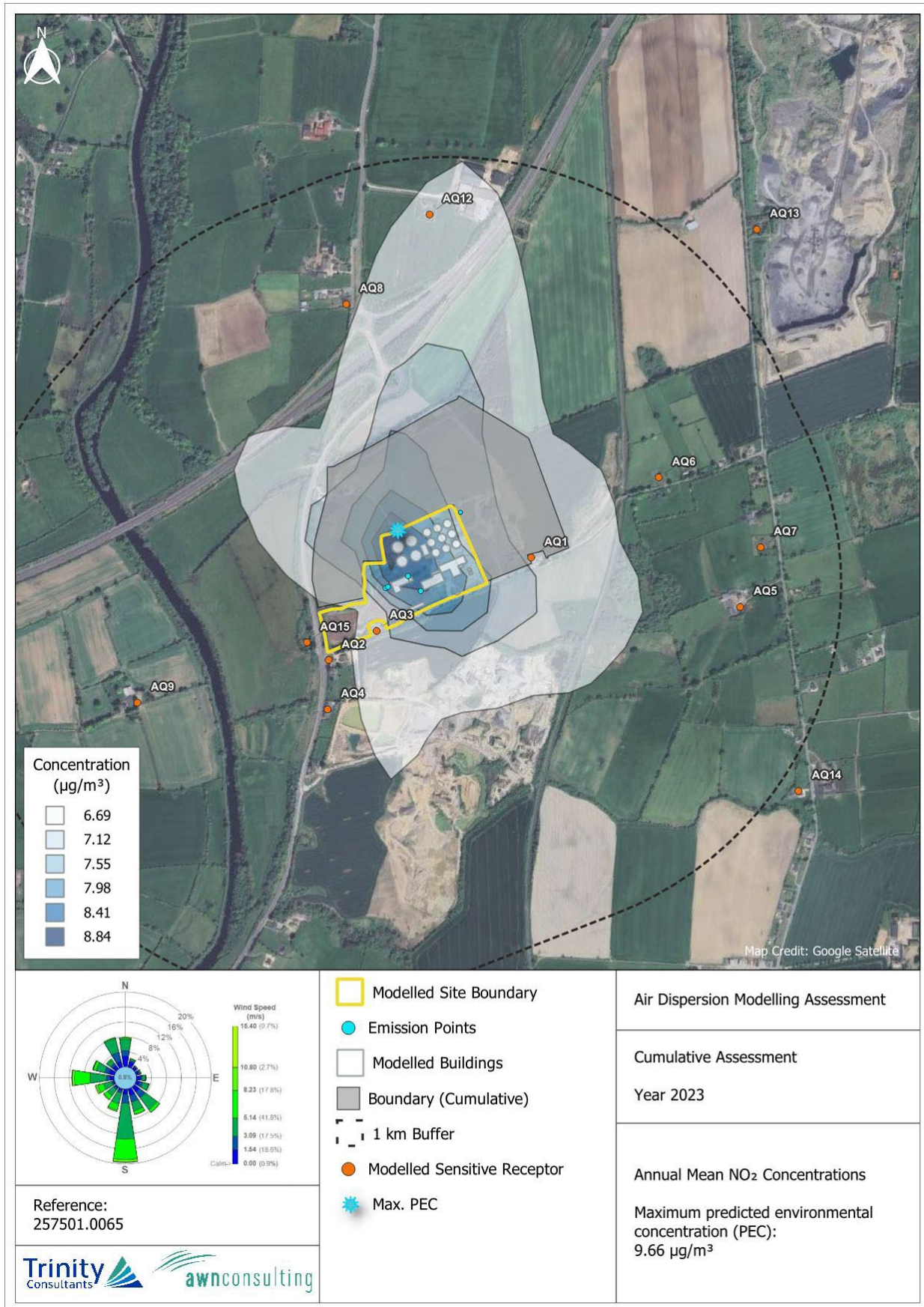


Figure 8-21: Cumulative Assessment - Annual Mean NO₂ Concentrations

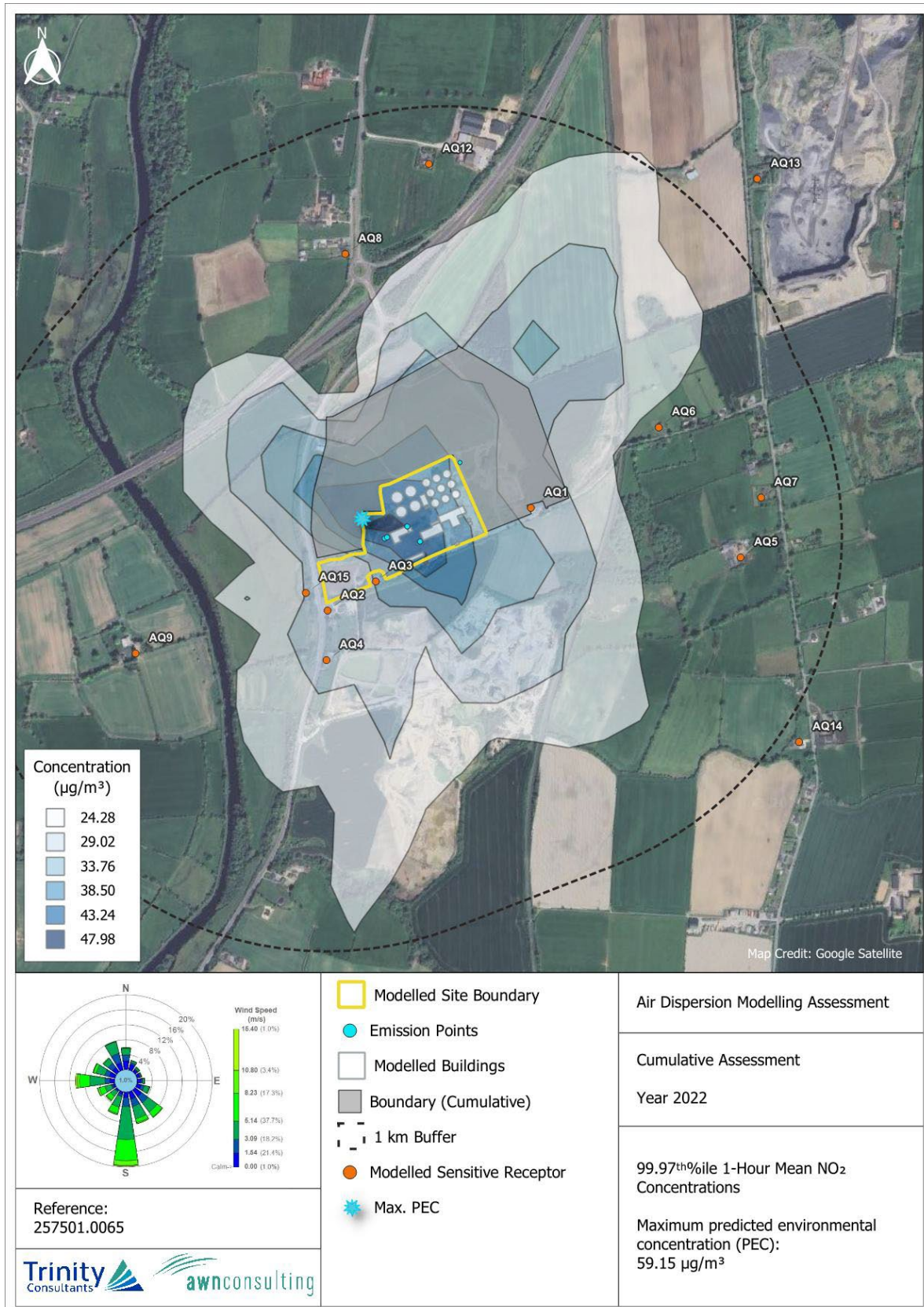


Figure 8-22: Cumulative Assessment - Maximum 1-Hour NO₂ Concentrations (as 99.97th%ile)

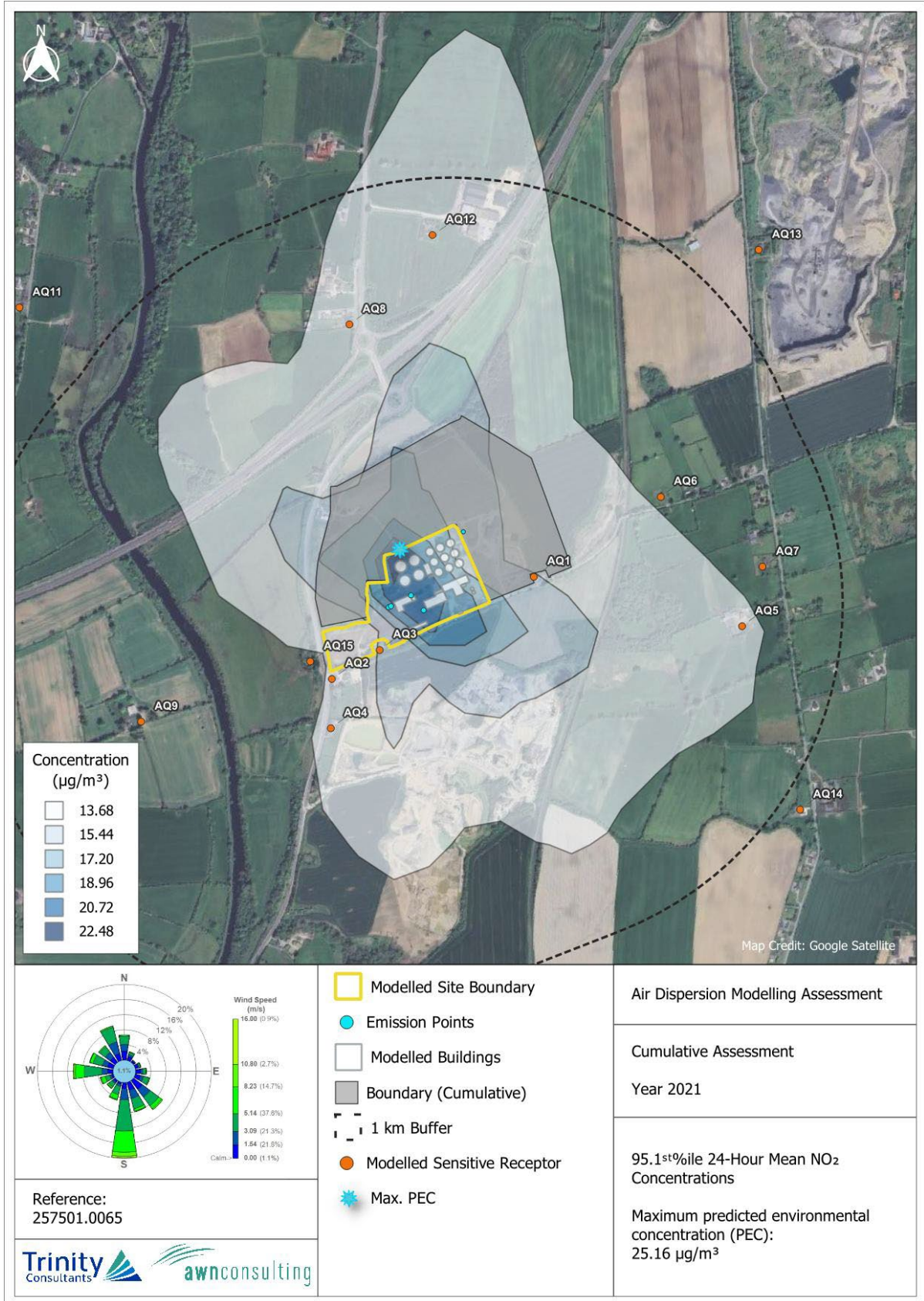


Figure 8-23: Cumulative Assessment - Maximum 24-Hour NO_2 Concentrations (as 95.1st%ile)



8.10.5.3 Air Dispersion Modelling Assessment – Ecology

8.10.5.3.1 NO_x – Proposed Operations

The NO_x modelling results for ecological receptors under the Proposed Operations scenario are detailed in Table 8-31.

Within the most impacted European site (in terms of PEC) (River Barrow and River Nore SAC), at the worst-case location, cumulative emissions lead to a maximum ambient NO_x concentration (including background) which is at most 18% of the annual limit value site over the five years of meteorological data modelled. The effect of NO_x on ecological receptors due to the proposed development is therefore predicted to be not significant.

Table 8-39: Proposed Operations – NO_x Designated Habitat Dispersion Model Results

Ecological Receptor	NO _x 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
	2021	2022	2023	2024	2025						
Natura 2000											
River Barrow and River Nore SAC	1.230	1.942	1.133	1.065	1.534	30	6.47%	Yes	3.50	5.44	18%
National Sites											
Coan Bogs NHA	0.003	0.003	0.003	0.003	0.004	30	0.0001	No	2.40	2.40	8%

8.10.5.3.2 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 NO₂ process contribution concentrations (PC) are converted into the dry deposition fluxes and then nitrogen deposition fluxes (as described in Section 8.7.1.6) and shown in Table 8-33 and Table 8-34.

As per Section 8.5.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors were compared to the relevant critical load (identified in Section 8.5.2.2).

Within the most impacted European site (River Barrow and River Nore SAC, in terms of PC), at the worst-case location, the maximum nitrogen deposition level is 7.384 kg/ha/yr. This is below the critical load assessment criteria of 7.5 kg N/ha/yr for the most sensitive features (*H1130 Estuaries*, *H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritima)*, *H4030 European dry heaths*, *H7110 Active Raised Bog* and *H7220 Petrifying springs with tufa formation (Cratoneurion)*).

Note that as there is no appropriate threshold for cumulative effects (i.e. equivalent to the 1% threshold applied for the proposed operations scenario), a concentration contour cannot be produced to illustrate the extent of the likely affected area (Zol).



Table 8-40: Cumulative Assessment – 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)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.947	0.984	0.901	0.839	1.217	0.002	0.175
National Sites							
Coan Bogs NHA	0.003	0.002	0.002	0.003	0.003	0.00001	0.0005
Habitats							
Petrifying Springs (H7220)	0.039	0.030	0.034	0.034	0.037	0.0001	0.006
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)	0.164	0.188	0.130	0.128	0.170	0.0003	0.027
NH ₃							
Ecological Receptor	NH ₃ Process Contributions (µg/m³)					NH ₃ Dry Deposition (µg/m²/s)	NH ₃ Nitrogen Deposition (kg/ha/yr)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.0359	0.0359	0.0287	0.0272	0.0402	0.00080	0.2089
National Sites							
Coan Bogs NHA	0.0001	0.0001	0.0001	0.0001	0.0001	0.000003	0.001
Habitats							
Petrifying Springs (H7220)	0.0017	0.0017	0.0015	0.0014	0.0015	0.00003	0.0090
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)	0.0093	0.0093	0.0071	0.0069	0.0094	0.00019	0.0488



Table 8-41: Proposed Operations – Nitrogen Deposition Dispersion Model Results at Ecological Receptors (continued)

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						
River Barrow and River Nore SAC	0.384	7.5	5.1%	n/a	7.000	7.384
National Sites						
Coan Bogs NHA	0.001	5.0	0.02%	n/a	10.400	10.401
Habitat						
Petrifying Springs (H7220)	0.015	7.5	0.24%	n/a	10.200	10.215
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (91E0)	0.076	n/a	n/a	n/a	6.900	6.976

8.10.5.3.3 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 NO₂ process contribution concentrations (PC) are converted into the dry deposition fluxes and then acid deposition fluxes (as described in Section 8.7.1.6) and shown in Table 8-42 and Table 8-43.

As per Section 8.5.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors were compared to the relevant critical load (identified in Section 8.5.2.2).

Within the most impacted European site (River Barrow and River Nore SAC, in terms of PC). At the worst-case location, the maximum total acid deposition (as N) flux is 0.527 keq/ha/yr. This is below the maximum critical load of 0.714 keq/ha/yr for the most sensitive features *H4030 European dry heaths*, *H6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, *H91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles*, *H3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion* Show more and *S1421 Trichomanes speciosum* (associated habitat is H91A0).

Note that as there is no appropriate threshold for cumulative effects (i.e. equivalent to the 1% threshold applied for the proposed operations scenario), a concentration contour cannot be produced to illustrate the extent of the likely affected area (Zol).



Table 8-42: 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)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.947	0.984	0.901	0.839	1.217	0.002	0.01249
National Sites							
Coan Bogs NHA	0.003	0.002	0.002	0.003	0.003	0.00001	0.00003
NH ₃							
Ecological Receptor	NH ₃ Process Contributions (µg/ m³)					NH ₃ Dry Deposition (µg/ m²/s)	NH ₃ Acid Deposition (keq/ha/yr)
	2021	2022	2023	2024	2025		
Natura 2000							
River Barrow and River Nore SAC	0.036	0.036	0.029	0.027	0.040	0.001	0.015
National Sites							
Coan Bogs NHA	0.0001	0.0001	0.0001	0.0001	0.0001	0.000003	0.00005

Table 8-43: 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							
River Barrow and River Nore SAC	0.0273	0.143	19.1%	n/a	0.500	0.527	0.714
National Sites							
Coan Bogs NHA	0.0001	0.143	0.1%	n/a	0.700	0.700	0.714



8.10.6 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 8-44: 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 8.9.3.1.	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 8-45: 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 emissions from proposed development on air quality	Negative	Not significant	Dispersion model study area as per Section 8.9.3.2.	Likely	Long-term	Direct

8.11 Mitigation Measures

8.11.1 Construction Phase Mitigation

The proposed development has been assessed as having a medium risk of dust soiling impacts and a low risk of dust related human health impacts and a medium risk of dust related ecology impacts during the construction phase as a result of construction and trackout activities (see Section 8.10.2.1). 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 (Appendix 3.1 of Volume 3 of this EIAR). The measures are divided into different categories for different activities.



Table 8-46: Construction Dust Management Measures

Mitigation Type	Location	Description of Mitigation or Monitoring Measures
Communications	Construction Compound/Site Boundary and throughout (as required)	- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. - Display the head or regional office contact information
Construction Works Area Management	Construction Compound/Site Boundary and throughout (as required)	- Storage areas/containers with loose dust-generating material 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.
Site Management	Construction Compound/Site Boundary and throughout (as required)	- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. - Make the complaints log available to the local authority when asked. - Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Operating Vehicles / Machinery	Construction Compound/Site Boundary and throughout (as required)	- All vehicles' engines will be switched off when stationary – no idling vehicles. - Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. - Impose and signpost a maximum-speed-limit of 25 kmph on surfaced and 15 kmph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and carsharing).
Construction Activities	Areas where construction is required	- Avoid scabbling (roughening of concrete surfaces) if possible. - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.



Mitigation Type	Location	Description of Mitigation or Monitoring Measures
		- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. - For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
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)	- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. - Avoid dry sweeping of large areas. - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. - Record all inspections of haul routes and any subsequent action in a site log book. - Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. - Access gates to be located at least 10 m from receptors where possible.
Monitoring	Construction Compound/Site Boundary and throughout (as required)	- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This will include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary. - Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked. - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

8.11.2 Operational Phase Mitigation

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



8.11.3 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.

A Closure, Restoration and Aftercare Management Plan (CRAMP) will be implemented, in line with EPA Industrial Emissions Licence requirements. Monitoring will remain in place for the duration of the decommissioning phase as required by the EPA. The site cannot be surrendered and formally closed until the EPA is satisfied that all closure, restoration and aftercare requirements have been met, in accordance with an Industrial Emissions Licence.

8.12 Residual Impacts

8.12.1 Construction Phase

To minimise dust emissions during construction, a series of mitigation measures have been prepared as outlined in Section 8.11.1. 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 8-1). 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**.

8.12.2 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 8-1. Therefore, emissions from the proposed development will have a **direct, long-term, negative** and **not significant** impact on air quality.

8.12.3 Cumulative

The primary potential cumulative residual effect relates to construction dust emissions. According to the 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 8.11.1 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.



8.12.4 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 8-47: 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 8.9.3.1.	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 8-48: Summary of Operational Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of operational phase emissions from proposed development on air quality	Negative	Not significant	Dispersion model study area as per Section 8.9.3.2	Likely	Long-term	Direct

8.13 Interactions and Interrelationships

8.13.1 Air Quality and Population & Human Health

8.13.1.1 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.



8.13.1.2 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**.

8.13.1.3 Decommissioning Phase

An adverse air quality impact during the decommissioning phase can cause health and dust nuisance issues. 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. Therefore, the predicted impact is **direct, short-term, negative** and **not significant** with respect to Population and Human Health during the decommissioning phase.

8.13.2 Air Quality and Climate

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

8.13.3 Air Quality and Land & Soils

8.13.3.1 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 & Soils during the construction phase.

8.13.3.2 Operational Phase

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

8.13.3.3 Decommissioning Phase

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. Therefore, the predicted impact is **direct, short-term, negative** and **not significant** with respect to Land & Soils during the decommissioning phase.



8.13.3.4 Decommissioning Phase

8.13.4 Air Quality and Biodiversity

8.13.4.1 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. The River Nore and River Barrow SAC is within 20m of the Proposed Development site area. Dust mitigation measures will be implemented on site as set out in Section 8.11.1. 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.

8.13.4.2 Operational Phase

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

8.13.4.3 Decommissioning Phase

Dust impacts on ecology 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. Therefore, the predicted impact is **direct, short-term, negative** and **not significant** with respect to Biodiversity during the decommissioning phase.

8.13.5 Air Quality and Material Assets – Traffic & Transport

8.13.5.1 Construction Phase

There are interactions between Air Quality and Traffic and Transportation. 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.

8.13.5.2 Operational Phase

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



8.13.5.3 Decommissioning Phase

There are interactions between Air Quality and Traffic and Transportation. 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 decommissioning phase.



8.14 References

- ADEC. 2008.** *ADEC Guidance re AERMET Geometric Means.* 2008.
- APIS. 2026.** GIS map tool. [Online] 2026. <https://www.apis.ac.uk/app>.
- BRE. 2003.** *Controlling Particles, Vapours & Noise Pollution from Construction Sites.* 2003.
- DEFRA (UK). 2022.** *Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(22).* 2022.
- Department of Housing, Planning and Local Government. 2018.** *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.* 2018.
- Dublin City Council. 2018.** *Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition.* 2018.
- Environment Agency (UK). 2014.** *AGTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air.* 2014.
- . **2025.** *Air emissions risk assessment for your environmental permit .* 2025.
- EPA. 2003.** *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements).* 2003.
- . **2020.** *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).* 2020.
- . **2020.** *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).* 2020.
- . **2025.** *Air Quality Monitoring Report 2024 (& previous reports).* 2025.
- . **2024.** *Assessing the Impact of Ammonia Emissions to Air and Nitrogen Deposition from EPA licensable activities on European Sites (DRAFT) Licence Application Instruction Note IN2.* 2024.
- . **2006.** *Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals).* 2006.
- . **2022.** *Guidelines on the information to be contained in Environmental Impact Assessment Reports.* 2022.
- . **2019.** *Odour Emissions Guidance Note (Air Guidance Note AG9).* 2019.
- . **2021.** *Research 390: Nitrogen-Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats .* 2021.
- European Commission. 2017.** *Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU).* 2017.
- German VDI. 2002.** *Technical Guidelines on Air Quality Control – TA Luft.* 2002.
- Government of Ireland. 2023.** *Clean Air Strategy for Ireland .* 2023.
- Hanrahan, P. 1999a.** The Plume Volume Molar Ratio Method for Determining NO₂/NO_x Ratios in Modelling – Part 1: Methodology. s.l. : J. Air & Waste Management Assoc., 1999a. Vol. 49.
- . **1999b.** The Plume Volume Molar Ratio Method for Determining NO₂/NO_x Ratios in Modelling – Part 2: Evaluation Studies. s.l. : J. Air & Waste Management Assoc., 1999b. Vol. 49.



- IAQM. 2020.** *A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites V1.1.* 2020.
- . **2024.** *Guidance on the Assessment of dust from demolition and construction.* 2024.
- Met Éireann. 2026.** Historical Data. [Online] 2026. <https://www.met.ie/climate/available-data/historical-data>.
- . **2025.** Ireland's 30-Year Climate Averages. [Online] 2025. <https://www.met.ie/climate/30-year-averages>.
- NPWS. 2026.** NPWS Designations Viewer. [Online] 2026.
<https://experience.arcgis.com/experience/edf34d92e28040fd87d3d14f55d8d95f> .
- . **2025.** Article 17 GIS and Metadata. [Online] 2025. <https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17>.
- OPDM. 2002.** *Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance.* 2002.
- Paine, R & Lew, F. 1997a.** *Consequence Analysis for Adoption of PRIME: an Advanced Building Downwash Model.* s.l. : EPRI, 1997a.
- . **1997b.** *Results of the Independent Evaluation of ISCST3 and ISC-PRIME.* s.l. : EPRI, 1997b.
- Schulman, L.L, Strimaitis, D.G. and Scire, J.S. 2000.** Development and evaluation of the PRIME plume rise and building downwash model. s.l. : Journal of the Air & Waste Management Association, 2000. Vol. 50.
- The Sottish Office. 1996.** *Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings.* 1996.
- TII. 2025.** *PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects (Transport Infrastructure Ireland.* 2025.
- UK Environment Agency. 2011.** *H4 – Odour Management.* 2011.
- . **2003.** *IPPC Draft Horizontal Guidance for Odour Part 2 – Assessment and Control.* 2003.
- . **2002.** *PPC Draft Horizontal Guidance for Odour Part 1- Regulation and Permitting.* 2002.
- UNECE. 2003.** *Critical Loads for Nitrogen Expert Workshop 2002.* 2003.
- USEPA. 2017.** *AERMAP Users Guide.* 2017.
- . **2025.** *AERMOD Description of Model Formulation and Evaluation.* 2025.
- . **2008.** *AERSURFACE User's Guide.* 2008.
- . **1999.** *Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3 vs. CTDM PLUS.* 1999.
- . **1997.** *Fugitive Dust Technical Information Document for the Best Available Control Measures.* 1997.
- . **1985.** *Good Engineering Practice Stack Height (Technical Support Document For The Stack Height Regulations) (Revised).* 1985.
- . **2005.** *Guidelines on Air Quality Models, Appendix W to Part 51, 40 CFR Ch.1.* 2005.



- . **1998.** *Human Health Risk Assessment Protocol, Chapter 3: Air Dispersion and Deposition Modelling.* s.l. : Region 6 Centre for Combustion Science and Engineering, 1998.
- . **2000.** *Seventh Conference on Air Quality Modelling (June 2000) Vol I & II.* 2000.
- . **1995.** *User's Guide for the Industrial Source Complex (ISC3) Dispersion Model Vol I & II.* 1995.
- . **2018.** *User's Guide to the AERMOD Meteorological Preprocessor (AERMET).* 2018.
- WHO. 2021.** *Air Quality Guidelines.* 2021.



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