

6.0 AIR QUALITY AND ODOUR

6.1 Introduction

This chapter assesses the potential local air quality impact of the proposed development at the Cara Partners site at Little Island Industrial Estate, Co. Cork. The assessment of impacts has been undertaken in the context of current relevant standards and guidance, and identifies any requirements or possibilities for mitigation. A full description of the development can be found in Chapter 2 - Description of Proposed Development.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

This chapter was prepared by Dr. Jovanna Arndt, a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. 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 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.

6.2 Characteristics of the Proposed Development

6.2.1 General Characteristics of the Proposed Development

The proposed development comprises various elements to be developed on a phased basis over a period of ten years. A proposed site layout drawing is presented in Drg. Ref. 5340-PLA-XXX-DR-DJF-AR-0010.

1. **Unit 1 Production Building** – Construction of a replacement, multi-storey Unit 1 Production building approx. 34m L x 23m W x 26m H (approx. 3,000m²).
2. **In Process Tank Farm Bund** – Modifications to the existing 'In Process Tank Farm' bund and ancillary plant and services related to same including pipe racks.
3. **Laboratory Gas Bottle Store** – Construction of a new Laboratory Gas Bottle Store approx. 4m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
4. **Regenerative Thermal Oxidiser** – Provision of a new Regenerative Thermal Oxidiser, associated exhaust stack (approx. 10mAGL) and ancillary plant and services related to same including pipe racks.
5. **Process Cooling** – Provision of 1no. process cooling tower (approx. 5mAGL) to be installed to provide additional cooling for manufacturing processes and ancillary plant and services related to same including pipe racks.
6. **Combined Heat and Power Plant and Heat Recovery System** – addition of a new natural-gas fired containerised combined heat and power (CHP) plant (approx. 6 MW_{TH} Total Rated Thermal Input) and associated containerised waste heat boiler system with exhaust stack approx. 13mAGL and ancillary plant, kiosks and services related to same including pipe racks.
7. **Ethanol Storage Tank** – addition of a new ethanol storage tank (2.4m diameter x 7m H) in existing solvent tank farm bund and ancillary plant and services related to same including pipe racks.
8. **Car Park** – extension to existing car park including associated lighting to provide a net increase of additional 67no. permanent car parking spaces.
9. **Wastewater Treatment Plant (WWTP) Control and Blower Building** - Single storey building associated with WWTP expansion, approx. 11m L x 10m W x 4m H (approx. 90m²); and ancillary plant and services related to same including pipe racks.
10. **WWTP Chemical storage tanks and bund** – new concrete base and bund (approx. 45m²) with tanks approx. 3.5m H and ancillary plant and services related to same including pipe racks.
11. **WWTP Inlet works** – new screens, tanks up to approx. 9m H and ancillary plant and services related to same including pipe racks
12. **WWTP Dissolved Air Flotation tank** – new tank approx. 5m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.

13. **Site Works** – All associated site services, site development works and landscaping to facilitate the proposed development.

6.2.2 Specific Characteristics of the Proposed Development

In relation to air quality, impacts will occur during both the construction and operational phases of the development.

During the construction stage, the main source of air quality impacts will be due to fugitive dust emissions from site activities. Dust emissions will primarily occur because of site preparation works, minor demolition works, earthworks, construction of proposed buildings and the movement of trucks on site and exiting the site. Construction phase impacts will have a short-term impact on air quality.

During the operational phase process emissions of nitrogen dioxide (NO₂), particulate matter (as PM₁₀ and PM_{2.5}) and total volatile organic compounds (TVOC) from the proposed development have the potential to affect local air quality.

6.2.2.1 Scoped Out Impacts

A number of impacts have been scoped out of this assessment, summarised as follows:

- Engine emissions nitrogen dioxide (NO₂) and particulate matter (as PM₁₀ and PM_{2.5}) from site vehicles and machinery – see section 0 for details.
- Engine emissions nitrogen dioxide (NO₂) and particulate matter (as PM₁₀ and PM_{2.5}) from vehicles accessing the site during the operational phase – see section 6.3.4.1 for details.
- A small odour control unit will be installed for the WWTP – due to its nature as abatement technology, there are no significant odour emissions predicted from the WWTP and odour control unit and these have therefore been scoped out of assessment.

6.3 Assessment Methodology

The following methodology has been adopted for this assessment:

- A detailed baseline air monitoring study has been undertaken in order to characterise the existing ambient environment in areas along the proposed development. This has been undertaken through a review of available published ambient air monitoring data applicable to the proposed development;
- A review of the most applicable standards and guidelines has been undertaken in order to define the air quality significance criteria for the construction and operational phases of the proposed development;
- Do Nothing conditions have been established by dispersion modelling of the existing operational emissions to air from the facility;

- An impact assessment relating to the likely construction phase air quality impacts has been undertaken at the nearest sensitive locations to the construction work areas associated with the proposed development;
- An impact assessment relating to the likely construction phase air quality impacts has been undertaken to assess the potential air quality impacts associated with traffic alterations associated with the construction of the proposed development at the most sensitive locations;
- An impact assessment relating to the likely operational phase air quality impacts has been undertaken to assess the potential air quality impacts associated with traffic alterations associated with the operation of the proposed development at the most sensitive locations;
- An impact assessment relating to the likely operational phase air quality impacts has been undertaken to assess the potential air quality impacts associated with emissions to air from existing sources at the facility as well as the following proposed emissions:
 - NOx from a new Combined Heat and Power (CHP) engine
 - NOx from a new regenerative thermal oxidiser (RTO)
 - TVOCs from the new RTO (replacing existing Carbon Absorption Units)
 - Removal of all existing lead-based processing onsite
 - Relocating Unit 1 dust emission points (with stricter dust emission limit values)
- A schedule of mitigation measures has been incorporated where required, to reduce, where necessary, the identified potential air quality impacts associated with the proposed development.

6.3.1 Relevant Legislation, Policy and Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on air quality are summarised below. The assessment has made reference to national guidelines where available, in addition to international standards and guidelines relating to the assessment of air quality impacts:

- Guidance on the Assessment of Dust from Demolition and Construction v2.2 (Institute of Air Quality Management [IAQM] (hereafter referred to as the IAQM Guidelines) (IAQM, 2024);
- A Guide To The Assessment Of Air Quality Impacts On Designated Nature Conservation Sites (Version 1.1) (IAQM, 2020);
- Odour Emissions Guidance Note (AG9) (EPA, 2019);
- Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (EPA, 2020); and
- PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects (Transport Infrastructure Ireland [TII], 2025).

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

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

6.3.2 Criteria for Rating of Impacts

6.3.2.1 Human Health

6.3.2.1.1 Ambient Air Quality Standards

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). Directive (EU) 2024/2881 sets out air quality standards for pollutants to be reached by 2026 and by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

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

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

Ambient air quality legislation designed to protect human health and the environment is generally based on assessing ambient air quality at locations where the exposure of the population is significant relevant to the averaging time of the pollutant. However, in the current

assessment, ambient air quality legislation has been applied to all locations within 10 km of the proposed development regardless of whether any sensitive receptors (such as residential locations) are present. This represents a worst-case approach and an examination of the corresponding concentrations at the nearest sensitive receptors relative to the actual quoted maximum concentration indicates that these receptors generally experience ambient concentrations significantly lower than that reported for the worst-case location.

The ambient Air Quality Standards (AQS) applicable for the current assessment to determine the potential impact of nitrogen dioxide (NO₂), particulate matter (as PM₁₀ and PM_{2.5}) and total volatile organic carbon (TVOC) 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 6-1. These pollutants are of relevance to the proposed development. The limit values stipulated by Directive (EU) 2024/2881 Annex I Table 2 are applicable for the opening year of the proposed development as it will be in operation pre-2030.

Table 6-1 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
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

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)
	Annual limit for protection of human health	25 µg/m ³	Annual limit for protection of human health	10 µg/m ³

6.3.2.1.2 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 6-2), the IT4 targets by 2030 and the final targets by 2040 (Table 6-2). 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 6-2 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

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

The applicable air quality limit values for the purposes of this assessment are those set out in Table 6-1. The limit values stipulated under Directive 2008/50/EC and the Air Quality Standards Regulations 2022 are applicable for the proposed development as it will be constructed and operational prior to 2030.

6.3.2.1.3 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 6-1 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 from the EPA in Ireland in the document titled *Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)* (EPA, 2006). The document recommends that the TA-Luft limit of 350 mg/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.

6.3.2.1.4 Volatile Organic Compounds

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

such as the World Health Organisation (WHO) or derive an ambient air quality guideline from occupational exposure limits (OEL).

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

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

Table 6-3 identifies the appropriate short-term and long-term EALs, derived from the most stringent sources above, for the specific compounds which are likely to be used on-site.

Table 6-3 Guideline limit values for TVOCs.

Pollutant	Regulation	Limit Type	Annual Mean	1 hour mean
Methanol	UK HEAL	Guideline Value	2,660 µg/m ³	33,000 µg/m ³
Ethanol	UK HEAL	Guideline Value	19,200 µg/m ³	576,000 µg/m ³
Acetone	UK HEAL	Guideline Value	362,000 µg/m ³	18,100 µg/m ³
Heptane	UK HEAL	Guideline Value	208,500 µg/m ³	6,255 µg/m ³
Butanol	UK HEAL	Guideline Value	30,000 µg/m ³	4,500 µg/m ³
MEK (Methyl Ethyl Ketone)	UK HEAL	Guideline Value	6,000 µg/m ³	89,900 µg/m ³

6.3.2.2 Ecology

6.3.2.2.1 Critical Levels

The Air Quality Standards Regulations 2022 outline an annual critical level of $30 \mu\text{g}/\text{m}^3$ for NO_x and (Table 6-1) for the protection of vegetation and natural ecosystems in general. The CAFE Directive (2008/50/EC) defines 'Critical Levels' as "a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans".

6.3.2.2.2 Critical Loads

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

Critical loads are presented as a range, within which there is the potential for effects on sensitive ecological receptors. Critical load ranges for N deposition and acid deposition were derived from the Air Pollution Information System (APIS) website (APIS, 2025) and are reproduced as shown in Table 6-5 and Table 6-6.

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).

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

6.3.2.2.2.1 Nitrogen Deposition Critical Loads

In order to determine the appropriate nitrogen deposition critical load, and in addition to APIS, the EPA publication *Research 390: Nitrogen-Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats* (EPA, 2021) was consulted. In Table 3.2 of *Research 390*, empirical critical loads ($\text{CL}_{\text{empN ABR}}$) of nutrient nitrogen are outlined with a worst-case range of 5-10 kg N/ha/yr for certain habitat types. These have been reproduced below in Table 6-4. Where the $\text{CL}_{\text{empN ABR}}$ is underlined in Table 3.2 of *Research 390*, the lower limit of the critical load range should be used. Where there is no underlining of the $\text{CL}_{\text{empN ABR}}$, the midpoint can be used to define the critical load for specific habitat types.

APIS and Table 3.2 of *Research 390* 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 of *Research 390*. Where a feature's EUNIS code was specifically listed in Table 3.2 of *Research 390*, 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 of Research 390*, 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 6-4*, and are termed assessment criteria.

Table 6-4 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. <i>Juniperus communis</i> formations, similar results for acidic and calcareous vegetation groups; <i>Juniperus communis</i> 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		

6.3.2.2.2.2 Acid 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 6.3.4.3).

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).

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

Table 6-5 Critical loads for nitrogen deposition.

Ecological Receptor		Feature Code	Feature Name	Critical loads for N for most sensitive feature* (kg/ha/yr)			Nitrogen Critical Load Class	EUNIS code
Site	Site Code			Min.	Max.	Mid-point		
Natura 2000								
Great Island Channel SAC	001058	H1330	Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		H1330	Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>)	n/a	n/a	n/a	No comparable habitat with established critical load estimate available	n/a
Cork Harbour SPA	004030	A005	Podiceps cristatus (North-western Europe - wintering)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		A050	Anas penelope (Western Siberia/North-western/North-eastern Europe)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		A140	Pluvialis apricaria [North-western Europe]	5	15	10	Low and medium altitude hay meadows	E2.2
				5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		A142	Vanellus vanellus (Europe - breeding)	5	15	10	Low and medium altitude hay meadows	E2.2
		A160	Numenius arquata (Europe - breeding)	5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
				5	15	10	Low and medium altitude hay meadows	E2.2
				5	10	7.5	Pioneer, low-mid, mid-upper saltmarshes	A2.54; A2.55; A2.53
		A162	Tringa totanus (Eastern Atlantic - wintering)	5	15	10	Low and medium altitude hay meadows	E2.2

Ecological Receptor		Feature Code	Feature Name	Critical loads for N for most sensitive feature* (kg/ha/yr)			Nitrogen Critical Load Class	EUNIS code
Site	Site Code			Min.	Max.	Mid-point		
		A193	<i>Sterna hirundo</i> (Northern/Eastern Europe - breeding)	5	10	7.5	Coastal stable dune grasslands - calcareous type	B1.4 - calcareous
			<i>Sterna hirundo</i> (Northern/Eastern Europe - breeding)	5	10	7.5	Coastal stable dune grasslands	B1.4
			<i>Sterna hirundo</i> (Northern/Eastern Europe - breeding)	5	10	5	Shifting coastal dunes	B1.3

Table 6-6 Critical loads for acid deposition.

Site	Site Code	Feature Code	Feature Name	Acidity Critical Load Class	Max. Critical Load Range (N) (keq/ha/yr)		Max. Critical Load (S) (keq/ha/yr)	Min. Critical Load Range (N) (keq/ha/yr)		Min. Critical Load (S) (keq/ha/yr)	Is species sensitive due to acidity impacts on broad habitat?
					Max CL minN	Max CL maxN	Max CL maxS	Min CL minN	Min CL maxN	Min CL maxS	
Natura 2000											
Cork Harbour SPA	004030	A017	<i>Phalacrocorax carbo</i> (North-western Europe)	Freshwater	0.714	5.962	5.247	0.143	2.383	2.241	Yes
Great Island Channel SAC	001058	n/a	No information on this site.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

6.3.2.2.3 Ecology Significance Criteria

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

IN2, along with the accompanying flowchart (reproduced in Figure 6-1 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 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 facilities, for the purposes of an Appropriate Assessment (AA). This approach may also be applied to NO_x and SO₂ specifically in the context of 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 proposed development 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?
 - a. To address these criteria, PCs have been compared to the relevant critical levels and critical loads. The results of this screening exercise are presented in Section 9.
 - b. Planning applications and the EPA register of Industrial Emissions (IE) licences were 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 operate sources of NO₂, therefore a cumulative impact assessment was required.

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

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

The IN2 process applies specifically to European sites with international designation, namely Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). However, the same approach has been taken to assess the effect of emissions impacts on nationally designated sites

such as Natural Heritage Areas (NHAs). 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.

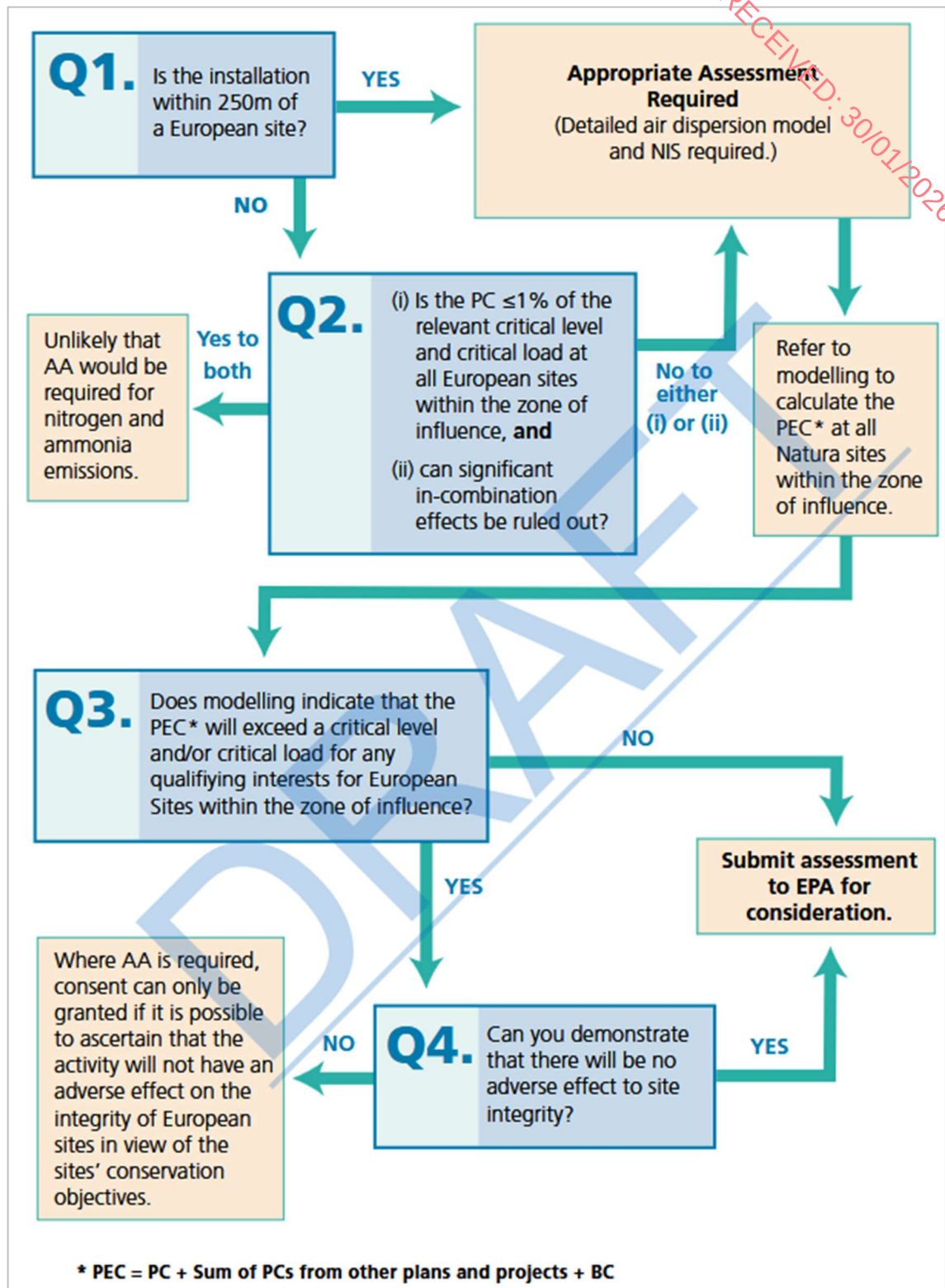


Figure 6-1 IN2 flowchart for assessing the impacts of nitrogen deposition and ammonia emissions to air on European Sites.

6.3.3 Construction Phase

6.3.3.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (IAQM, 2024) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland in their guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2025).

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

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

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

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The criteria for determining the category for the works involved are outlined in Table 6-7, these are based on the IAQM guidance (IAQM, 2024). The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined. The magnitude of each dust generating activity is established in section 6.5.2.1 as part of the impact assessment.

Table 6-7 IAQM criteria to determine dust emissions magnitude.

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	• 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

Dust Emission Magnitude		
Small	Medium	Large
Demolition during wetter months		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

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (IAQM, 2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, human health and ecological effects. The level of risk associated with each activity is determined using the criteria in Table 6-8. The level of risk of each dust generating activity is established in section 6.5.2.1 as part of the impact assessment.

Table 6-8 IAQM criteria to determine risk of dust impacts.

Sensitivity of Area	Dust Emission Magnitude		
	Small	Medium	Large
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

Sensitivity of Area	Dust Emission Magnitude		
	Small	Medium	Large
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

6.3.3.2 Construction Phase Traffic Assessment

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 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 Chapter 12 – Traffic and Transportation of this EIAR, it has been determined by the traffic consultant that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT. The construction stage traffic has been reviewed, and it has been determined that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT; additionally, the development will not result in speed changes or changes in road alignment. Therefore, the traffic does not meet the above scoping criteria. A detailed air quality assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality with respect with human or ecological receptors.

6.3.4 Operational Phase

6.3.4.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the proposed development. The TII scoping criteria detailed in section 6.3.2 were used to determine if any road links are affected by the proposed

development and require inclusion in a detailed air dispersion modelling assessment. The proposed development will not result in the operational phase traffic increasing by more than 1,000 AADT or 200 HDV AADT. In addition, there are no proposed changes to the traffic speeds or road alignment. Therefore, no road links impacted by the proposed development satisfy the screening criteria (section 6.2.2). 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.

6.3.4.2 Air Dispersion Modelling

The proposed development currently holds an Industrial Emissions (IE) licence from the EPA (Licence Reg. No. P0017-02). As part of this IE licence there are limits on the emissions from the main emission sources, which are described in more detail in section 6.2.4.3.1. The proposed development will also include additional sources of emissions to air, as well as changes to existing sources, which are described in more detail in section 6.2.4.3.1.

The modelling assessment has been undertaken at the licenced maximum emission limits for the emission sources described in section 6.2.4.3.1. The modelling assessment was undertaken using the AERMOD dispersion model (Version 24124) which has been developed by the U.S. Environmental Protection Agency (USEPA) (USEPA, 2024) and following guidance issued by the EPA (EPA, 2020).

The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources and has replaced ISCST3 (USEPA, 1995) as the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA, 1998; USEPA, 2000; USEPA, 2005). The model has more advanced algorithms and gives better agreement with monitoring data in extensive validation studies (USEPA, 1998; USEPA, 1999; Paine 1997a; Paine 1997b; Schulman, 2000). An overview of the AERMOD dispersion model is outlined in Appendix 6-A.

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 aims to achieve compliance with the guidance outlined within the EPA document *AG4 Guidance for Air Dispersion Modelling* (EPA, 2020) for the maximum permissible process contribution:

“When modelling a facility, the uncertainty in the model should be considered. If the facility is operated continually at close to the maximum licenced mass emission rate (i.e. maximum

concentration and maximum volume flow) the process contribution (PC) should be less than 75% of the ambient air quality standard and less than this where background levels account for a significant fraction of the ambient air quality standard."

This approach allows for inherent uncertainty in air dispersion modelling to be taken into account in order to avoid a risk of exceeding the air quality standards. The modelling assessment has aimed to achieve a process contribution that is less than 75% of the ambient air quality standard under the Proposed Development scenario modelled (see section 0, Process Emissions for details on modelling scenarios).

Throughout this study a conservative approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The conservative assumptions are outlined below:

- Maximum predicted concentrations were reported in this study, even if no residential receptors were near the location of this maximum;
- Conservative background concentrations were used in the assessment;
- The effects of building downwash, due to on-site buildings, has been included in the model; and
- The main emission points (CHP, boilers and RTO) were assumed to operate continuously for 24 hours a day, 365 days a year in all scenarios.

The United States Environmental Protection Agency (USEPA) approved AERMOD dispersion model has been used to predict the ground level concentrations [GLC] of compounds emitted from the principal emission sources on-site.

The modelling incorporated the following features:

- Modelled receptors included the proposed development boundary, gridded receptors and discrete sensitive receptors. These are described in more detail in section 6.4.3;
- All on-site buildings and significant process structures were mapped into the computer 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 relatively simple terrain. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP (USEPA, 2017).
- Hourly-sequenced meteorological information has been used in the model. Meteorological data over a five-year period (Cork Airport 2020 – 2024) was used in the model (see Figure 6-3 and Appendix 6-B).
- The source and emissions data, including stack dimensions, gas volumes and emission temperatures have been incorporated into the model (see section 6.2.2).

6.3.4.2.1 Methodology for NO_x to NO₂ Conversion

The Ozone-Limited Method (OLM) was used to model NO₂ concentrations. The OLM is a regulatory option in AERMOD (Hanrahan, 1999a; Hanrahan 1999b) which assumes that the amount of NO converted to NO₂ is proportional to the ambient ozone (O₃) concentration. 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. The equation used in the algorithm to derive the ratio of NO₂/NO_x is:

$$\text{NO}_2/\text{NO}_x = (\text{moles O}_3 / \text{moles NO}_x) + 0.10$$

Based on research of NO₂/NO_x ratios from fossil fuel power plants (EPRI, 2020), it has been assumed that 10% of the NO_x in the stack gas from the boilers, CHP and RTO is already in the form of NO₂ before the gas leaves the stack.

A background ozone concentration of 55 µg/m³ was used in the modelling assessment, based on a review of 5-year average background ozone data for Zone B sites (further detail on background concentrations given in Section 6.4.2) (EPA, 2025).

6.3.4.2.2 Terrain

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

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

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

6.3.4.2.3 Geophysical Considerations

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

AERMOD incorporates a meteorological pre-processor AERMET (USEPA, 2018) to enable the calculation of the appropriate parameters. The AERMET meteorological pre-processor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10 km from the meteorological station for Bowen Ratio and albedo and to a distance of 1 km for surface roughness in line with USEPA recommendations (USEPA, 2008; USEPA, 2018) as outlined in Appendix 6-B.

In relation to AERMOD, detailed guidance for calculating the relevant surface parameters has been published (USEPA, 2018). The most pertinent features are:

- The surface characteristics should be those of the meteorological site (Cork Airport) 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 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 6-B.

6.3.4.2.4 Building Downwash

When modelling emissions from an industrial installation, stacks which are relatively short can be subjected to additional turbulence due to the presence of nearby buildings. Buildings are

considered nearby if they are within five times the lesser of the building height or maximum projected building width (but not greater than 800 m).

The USEPA has defined the “Good Engineering Practice” (GEP) stack height as the building height plus 1.5 times the lesser of the building height or maximum projected building width. It is generally considered unlikely that building downwash will occur when stacks are at or greater than GEP (USEPA, 1985).

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

The Plume Rise Model Enhancements (PRIME) (Paine, 1997a; Paine, 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, 1997a).

Given that the proposed 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 6-2).

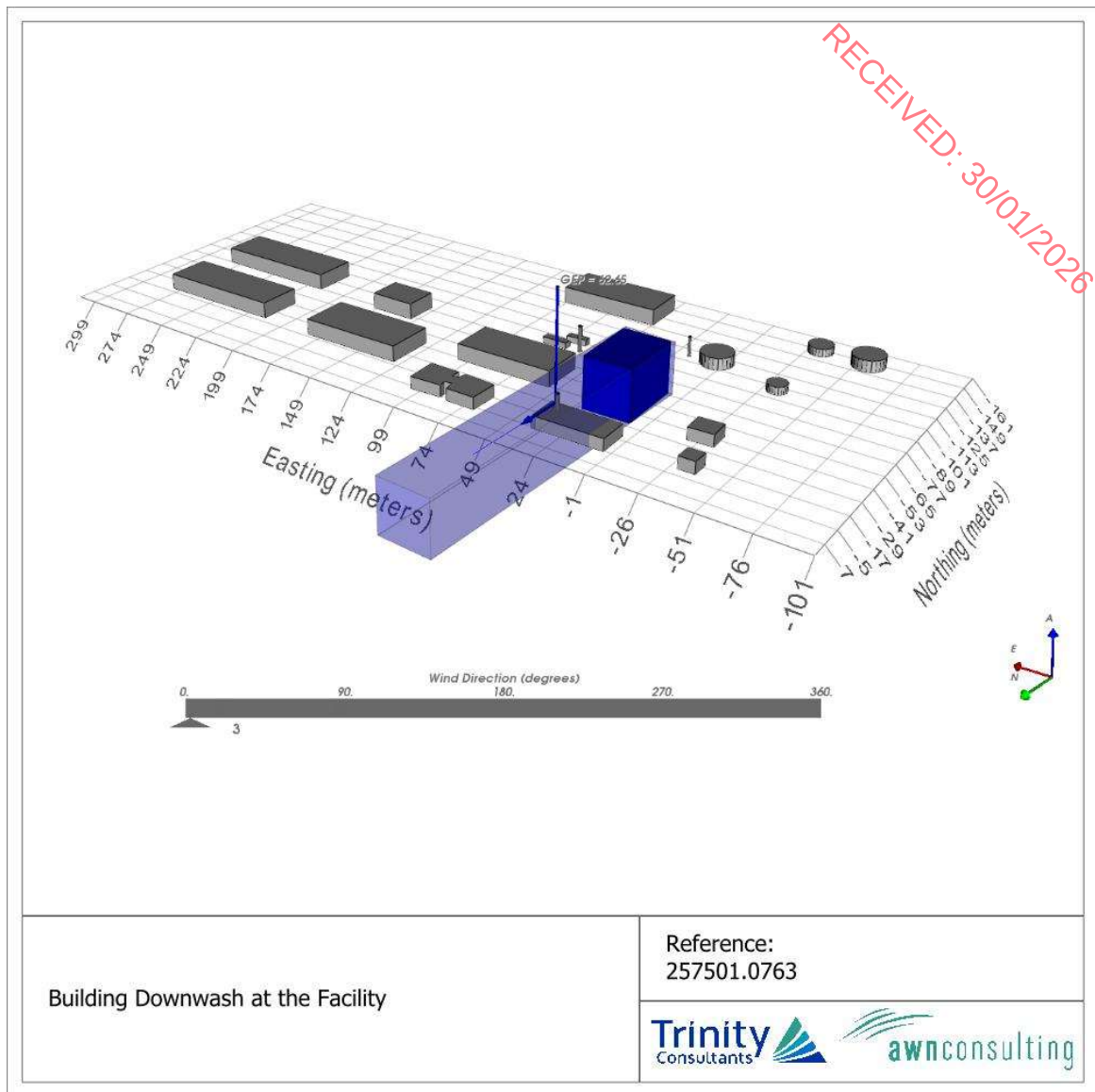


Figure 6-2 Building downwash for selected emission point A1-1.

6.3.4.2.5 Concentration Contours

Modelled predicted ambient ground level concentrations beyond the site boundary are presented as concentration contours in section 8. 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 0). 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.

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.

The primary differences between concentration contours and tabular results are:

- Tabular results provide the exact model predictions at defined receptor points and identify the receptor where the maximum model concentration is predicted. These are the values to be relied upon for compliance assessment and reporting against air quality standards or guidelines.
- 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 6.4.3.2, 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.

Concentration contours have also been produced for the modelled ecology results for the proposed operations scenario. These are presented in section 0. Specifically, the contours show the extent of the area, as a concentration contour, 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.

Again, 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.

6.3.4.3 Nitrogen and Acid Deposition Methodology

In order to consider the effects of nitrogen and acid deposition owing to emissions from the facility on the ecological receptors, the maximum annual mean NO₂ predicted environmental concentrations must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency publication *AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air* (UKEA, 2014):

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

The deposition velocity for NO₂ is outlined in AQTAG06 (UKEA, 2014) and shown below in Table 6-9. The dry deposition flux is then multiplied by conversion factors shown in Table 6-9 (taken from AQTAG06 (UKEA, 2014)) to convert it to a nitrogen (N) deposition flux (kg/ha/yr), and to an acid deposition flux (keq/ha/yr).

Table 6-9 Dry deposition fluxes for NO₂.

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

6.3.4.4 Process Emissions

6.3.4.4.1 Do Nothing

The proposed development is currently licenced to operate emissions to air sources by the EPA under Industrial Emissions (IE) Licence P0017-02.

The Do Nothing (i.e. existing) Operations scenario therefore considers the following existing emission points:

- A1-1 Boiler Stack (EP027)
- A1-2 Boiler Stack (EP108)
- A2-2 Leaf Preparation (EP001)
- A2-3 Unit 1 Conveyor (EP004)
- Carbon Adsorption Unit (EP005)
- Carbon Adsorption Unit (EP006)
- A2-4 Ammonium Sulphate Dryer Building (EP008)
- A2-5 Lead Room (EP011)
- A2-6 Unit 2 Conveyor (EP037)
- A2-7 Lead Room (EP038)
- A2-8 Unit 3 Product Collection Chamber (EP127)

The process emissions used in the modelling assessment, including stack heights for each source, for existing sources are outlined in Table 6-11.

Emission concentrations, stack heights and volume flow rates are derived from the existing IE licence P0017-02. Data for other process parameters have been provided by the applicant based on existing operations.

The carbon fractions listed in were applied to the modelled ambient VOC concentrations in turn for each emitted VOC. It is assumed that where more than one compound is being emitted from any emission point, as a worst-case assumption, the total VOC (as C) consists of only one compound (in turn) with each compound compared to the 1-hour EAL and annual EAL.

Table 6-10 Emissions details for VOCs used in the air modelling (where applicable).

Compound	Carbon Weight (g/mol)	Molecular Weight (g/mol)	Carbon fraction
Methanol	12.01	32.04	0.375
Ethanol	24.02	46.07	0.521
Butanol	48.04	74.12	0.648

Compound	Carbon Weight (g/mol)	Molecular Weight (g/mol)	Carbon fraction
Acetone	36.03	58.08	0.620
N-Heptane	84.07	100.21	0.839
Methyl ethyl ketone	48.04	72.11	0.666

RECEIVED: 30/01/2026

Table 6-11 Summary of existing emission information for the facility.

Current Emission Point Ref.	Revised Emission Point Ref.	Description	ITM Co-ordinates	Height Above Ground Level (m)	Exit Diameter (mm)	Temp (K)	Volume Flow (Nm ³ /hr Note 1)	Exit Velocity (m/sec actual)	NO _x Conc. (mg/Nm ³ Note 1)	NO _x Mass Emission (g/s)	TVOC Conc. (mg/Nm ³ Note 1)	TVOC Mass Emission (g/s)	PM Conc. (mg/Nm ³ Note 1)	PM Mass Emission (g/s)
A1-1	A1-1	Boiler Stack (EP027)	E 574179, N 572157	8.5	540	488.15	4,440	12.31	100	0.123	n/a	n/a	n/a	n/a
A1-2	A1-2	Boiler Stack (EP108)	E 574178, N 572157	13.5	390	423.15	4,440	20.46	250	0.308	n/a	n/a	n/a	n/a
EP 001	A2-2	Leaf Preparation (EP001)	E 574179, N 572157	9.1	220	295.15	3,000	23.69	n/a	n/a	n/a	n/a	10	0.008
EP 004	A2-3	Unit 1 Conveyor (EP004)	E 574178, N 572157	15.6	220	295.15	1,600	12.63	n/a	n/a	n/a	n/a	10	0.004
EP 005	n/a	Carbon Adsorption Unit (EP005)	E 574166, N 572093	3.2	160	288.15	1,000	14.57	n/a	n/a	2000	0.556	n/a	n/a
EP 006	n/a	Carbon Adsorption Unit (EP006)	E 574168, N 572091	3.3	160	288.15	1,000	14.57	n/a	n/a	2000	0.556	n/a	n/a
EP 008	A2-4	Ammonium Sulphate Dryer Building (EP008)	E 574156, N 572107	13.5	693	295.15	1,000	0.80	n/a	n/a	50	0.014	n/a	n/a
EP 011	A2-5	Lead Room (EP011)	E 574155, N 572118	7.2	225	295.15	5,000	37.74	n/a	n/a	n/a	n/a	5	0.007
EP 037	A2-6	Unit 2 Conveyor (EP037)	E 574187, N 572044	9.1	160	295.15	1,300	19.60	n/a	n/a	n/a	n/a	10	0.004
EP 038	A2-7	Lead Room (EP038)	E 574226, N 572033	9.8	205	295.15	3,100	28.19	n/a	n/a	n/a	n/a	5	0.004
EP 127	A2-8	Unit 3 Product Collection Chamber (EP127)	E 574301, N 572107	13.8	192	295.15	2,000	20.73	n/a	n/a	n/a	n/a	1	0.001
Note 1 Combustion emissions referenced to 273.15 K, 101.3 Pa, dry gas and 3% oxygen for the boilers.														

6.3.4.4.2 Proposed Operations

The proposed development is currently licenced to operate emissions to air sources by the EPA under Industrial Emissions Licence P0017-02.

The Proposed Operations scenario therefore considers the following emission points:

- Existing
 - A1-1 Boiler Stack (EP027)
 - A1-2 Boiler Stack (EP108)
 - A2-2 Leaf Preparation (EP001)
 - A2-3 Unit 1 Conveyor (EP004)
 - A2-4 Ammonium Sulphate Dryer Building (EP008)
 - A2-5 Lead Room (EP011)
 - A2-6 Unit 2 Conveyor (EP037)
 - A2-7 Lead Room (EP038)
 - A2-8 Unit 3 Product Collection Chamber (EP127)
- Proposed
 - A2-1 Regenerative Thermal Oxidiser
 - A1-3 CHP

The process emissions used in the modelling assessment, including stack heights for each source, for proposed operations are outlined in Table 6-12.

Emission limit values (ELV) for the 2 no. boilers and 1 no. CHP are derived from the Medium Combustion Plant (MCP) Regulations (S.I. No. 595 of 2017) (MCP Regulations), which transpose the Medium Combustion Plant Directive ((EU) 2015/2193) into Irish law apply to combustion plant with a rated thermal input equal to or greater than 1 MW and less than 50 MW irrespective of the fuel that they use.

ELVs for dust (i.e. particulate matter) from the emissions sources A2-2 to A2-8 are derived from the *Commission Implementing Decision (EU) 2022/2427 of 6 December 2022 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions, for common waste gas management and treatment systems in the chemical sector.*

ELVs for TVOC from the proposed regenerative thermal oxidiser are derived from the *Commission Implementing Decision (EU) 2022/2427 of 6 December 2022 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions, for common waste gas management and treatment systems in the chemical sector.* These are the maximum VOC emission concentrations expected.

Data for other process parameters have been provided by the applicant based on existing operations.

Table 6-12 Summary of proposed emission information for the facility.

Emission Point Ref.	Old Emission Point Ref.	Description	ITM Coordinates	Height Above Ground Level (m)	Exit Diameter (mm)	Temp (K)	Volume Flow (Nm ³ /hr Note 1)	Exit Velocity (m/sec actual)	NO _x Conc. (mg/Nm ³ Note 1)	NO _x Mass Emission (g/s)	TVOC Conc. (mg/Nm ³ Note 1)	TVOC Mass Emission (g/s)	PM Conc. (mg/Nm ³ Note 1)	PM Mass Emission (g/s)
A1-1	A1-1	Boiler Stack (EP027)	E 574179, N 572157	8.5	540	488.15	4,440	12.31	100	0.123	n/a	n/a	n/a	n/a
A1-2	A1-2	Boiler Stack (EP108)	E 574178, N 572157	13.5	390	423.15	4,440	20.46	250	0.308	n/a	n/a	n/a	n/a
A2-1	n/a	Regenerative Thermal Oxidiser	E 574159, N 572070	9.775	350	523.15	5,500	30.41	150	0.222	20	0.031	n/a	n/a
A1-3	n/a	CHP	E 574159, N 572070	13.0	480	402.15	12,500	15.68	95	0.330	n/a	n/a	n/a	n/a
A2-2	EP 001	Leaf Preparation (EP001)	E 574179, N 572157	9.1	220	295.15	3,000	23.69	n/a	n/a	n/a	n/a	5	0.004
A2-3	EP 004	Unit 1 Conveyor (EP004)	E 574164, N 572106	22	220	295.15	1,600	12.63	n/a	n/a	n/a	n/a	5	0.002
A2-4	EP 008	Ammonium Sulphate Dryer Building (EP008)	E 574175, N 572127	22	693	295.15	1,000	0.78	n/a	n/a	20	0.006	n/a	n/a
A2-5	EP 011	Lead Room (EP011)	E 574154, N 572128	22	225	295.15	5,000	37.74	n/a	n/a	n/a	n/a	5	0.007
A2-6	EP 037	Unit 2 Conveyor (EP037)	E 574187, N 572044	9.1	160	295.15	1,300	19.60	n/a	n/a	n/a	n/a	5	0.002
A2-7	EP 038	Lead Room (EP038)	E 574226, N 572033	9.8	205	295.15	3,100	28.19	n/a	n/a	n/a	n/a	5	0.004
A2-8	EP 127	Unit 3 Product Collection Chamber (EP127)	E 574301, N 572107	13.8	192	295.15	2,000	20.73	n/a	n/a	n/a	n/a	1	0.001
Note 1 Combustion emissions referenced to 273.15 K, 101.3 Pa, dry gas, 3% oxygen for boilers and 15% for the CHP														

6.3.4.4.3 Cumulative Assessment

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

- Facility emissions as outlined in the Proposed Operation scenario above.
- Nearby IE licenced main emission points (see Figure 6-5).
- The process emissions used in the cumulative assessment are outlined in Table 6-13.

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

Table 6-13 Summary of process emissions information for cumulative assessment.

Installation	Emission source	Types of Operations	Height Above Ground Level (m)	Exit Diameter (m)	Temp (K)	Exit Velocity (m/sec actual)	NO ₂ Mass Emission (g/s)
IE Reg. No. P1018-01	A2-1	Continuous	28	0.7	423.15	16.36	2.032
	A2-4	Continuous	25	1.7	293.00	15.91	-
IE Reg. No. P0136-04	V1	Continuous	18	0.7	473.15	27.4	1.111
	V28	Continuous	18	0.7	373.15	13.7	0.278
IE Reg. No. P0016-02	F1.5	Continuous	15.00	0.7	373.15	8.22	-
	F1.6	Continuous	15.00	0.7	373.15	13.7	-
	F1.1	Continuous	15.00	1.05	296.15	9.1	-
IE Reg. No. P0091-03	A1-2	Continuous	8.65	0.3	448.15	23.2	0.200
IE Reg. No. P0052-02	A1-2	Continuous	35.20	0.85	503.15	10.64	0.656
	A1-3	Continuous	35.40	0.85	503.15	16.23	1.500
IE Reg. No. P1117-01	A1-1	Continuous	14.25	0.4	388.15	6.3	0.056
	A2-2	Continuous	14.80	0.22	313.15	25.1	-

6.4 Receiving Environment

6.4.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM₁₀, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than PM_{2.5}) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles (PM_{2.5} - PM₁₀) will actually increase at higher wind speeds. Thus, measured levels of PM₁₀ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Cork Airport meteorological station, which is located approximately 9.2 km west of the proposed development. Cork Airport meteorological data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 6-3). For data collated during five representative years (2020 – 2024), the predominant wind direction is westerly to south-westerly with generally moderate wind speeds (Met Éireann, 2025).

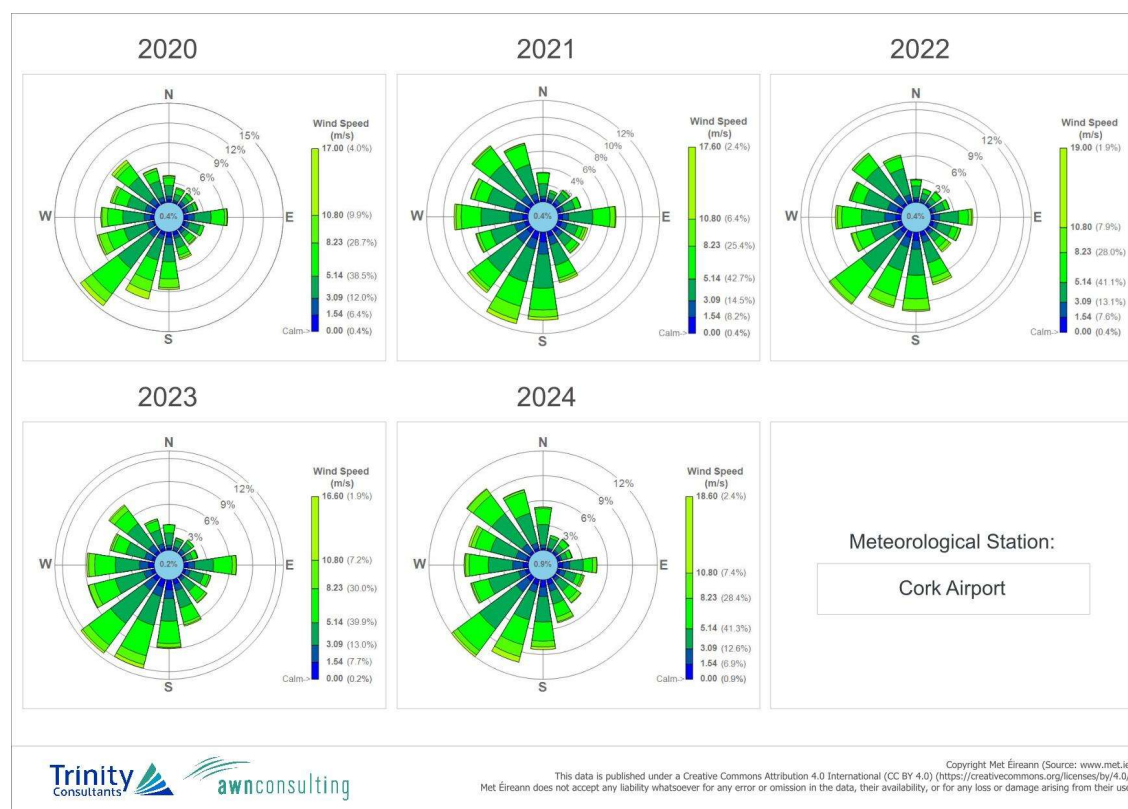


Figure 6-3 Cork Airport windrose 2020-2024 (Source: Met Éireann, 2025).

6.4.2 Air Quality Baseline

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 B (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. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.)

6.4.2.1 NO₂

Long-term NO₂ monitoring was carried out at the representative Zone B suburban background location of UCC Distillery Fields for the period 2020 – 2024 (Table 6-14) (EPA, 2025). Long-term average concentrations are significantly below the annual average limit of 40 µg/m³. Average results range from 7 – 9 µg/m³. The overall annual average concentration for this 5-year period is 8 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 9 µg/m³.

For the modelling assessment as per section 6.2.4.2.6, 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 6-1). 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 6-14 Trends in Zone B air quality – nitrogen dioxide (NO₂).

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
UCC Distillery Fields	Annual Mean NO ₂ (µg/m ³)	8	9	9	8	7
	1-hr Mean > 200 µg/m ³ (days)	0	0	0	0	0
Annual Mean NO ₂ (µg/m ³)		40				
1 hr Mean NO ₂ (as 99.8 th ile) (µg/m ³)		200				

1-hr Mean NO ₂ values >200 µg/m ³	Limit Value (to be attained by 2026 and applicable until 2030)	No more than 18 exceedances
---	--	-----------------------------

6.4.2.2 PM₁₀

Continuous PM₁₀ monitoring was carried out at two representative Zone B locations from 2020 – 2024; UCC Distillery Fields and Heatherton Park. Annual average PM₁₀ concentrations across the sites ranged from 11 – 15 µg/m³ over the 2020 – 2024 period (Table 6-15). The overall annual average concentration for this 5-year period is 13 µg/m³. There were at most two exceedances of the daily limit of 50 µg/m³ in 2020 (at Heatherton Park). However, 35 exceedances are permitted per year (EPA, 2025). Based on the EPA data, a conservative estimate of the current background PM₁₀ concentration in the region of the proposed development is 13 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 from the UK DEFRA (UK DEFRA, 2022) and the EPA (EPA, 2020) advises that for PM₁₀ an estimate of the maximum combined pollutant concentration can be obtained as shown below:

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

- (a) 90.4thile of 24-hour mean background PM₁₀ + annual mean process contribution PM₁₀
- (b) 90.4thile 24-hour mean process contribution PM₁₀ + annual mean background PM₁₀

A 90.4th percentile 24-hour background concentration of 22 µg/m³ was used in the assessment, based on the overall 5-year average concentrations for the monitoring locations (Table 6-15) over the period 2020 – 2024.

Table 6-15 Trends in Zone B air quality – PM₁₀.

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
UCC Distillery Fields	Annual Mean PM ₁₀ (µg/m ³)	14	13	14	11	11
	24 hr Mean PM ₁₀ (as 90.4th%ile) (µg/m ³)	25	23	24	-	
	24-hr Mean > 50 µg/m ³ (days)	0	1	0	-	0
Heatherton Park	Annual Mean PM ₁₀ (µg/m ³)	11	11	12	11	12
	24 hr Mean PM ₁₀ (as 90.4th%ile) (µg/m ³)	20	19	20	-	
	24-hr Mean > 50 µg/m ³ (days)	2	1	0	-	0
Annual Mean PM ₁₀ (µg/m ³)		40				
24-hr Mean PM ₁₀ (as 90.4th%ile) (µg/m ³)		200				
24-hr Mean PM ₁₀ values >50 µg/m ³		No more than 18 exceedances				

6.4.2.3 $PM_{2.5}$

Average $PM_{2.5}$ levels in Heatherton Park, UCC Distillery Fields and Bishopstown MTU over the period 2020 - 2024 ranged from 5 - 8 $\mu\text{g}/\text{m}^3$ (EPA, 2025). The overall annual average concentration for this 5-year period is 7 $\mu\text{g}/\text{m}^3$ (Table 6-16). Based on this information, an estimate of the background $PM_{2.5}$ concentration in the region of the proposed development is 7 $\mu\text{g}/\text{m}^3$.

Table 6-16 Trends in Zone B air quality – $PM_{2.5}$.

Station	Averaging Period	Year				
		2020	2021	2022	2023	2024
Heatherton Park	Annual Mean $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$)	8	8	5	6	5
UCC Distillery Fields	Annual Mean $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$)	7	7	5	-	-
Bishopstown MTU	Annual Mean $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$)	-	-	-	7	6.5
Annual Mean $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$)	Limit Value (to be attained by 2026 and applicable until 2030)	25				

The current background concentrations have been used in the operational phase air quality assessment for both the Opening Year and Design Year as a conservative approach in order to predict pollutant concentrations in future years. This is in line with the TII methodology (TII, 2025).

Based on the above information, the air quality in Zone B locations, such as the proposed development area, is generally good, with concentrations of the key pollutants generally well below the relevant limit values. However, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2 with the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2025).

6.4.2.4 VOCs

Background levels of all VOCs are likely to be well below 1 $\mu\text{g}/\text{m}^3$ in the vicinity of the facility. As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.

6.4.2.5 Ecology

Background concentrations for NO_x 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, 2025), in line with UKEA (UKEA, 2014) and UK DEFRA (UK DEFRA, 2022) guidance and are shown in Table 6-17. The background concentrations are added directly to the modelled process contributions to give a total predicted environmental concentration.

Table 6-17 Background concentrations for NO_x, Nitrogen and Acid Deposition (Coniferous Grid Average) (APIS, 2025)

Closest Sensitive Designated Habitat	NO _x (µg/m ³)	Nitrogen Deposition (Grid Average) (kg/ha/yr)	Acid Deposition (Grid Average) (kg/ha/yr)
Great Island Channel SAC	4.6	5.2	0.4
Cork Harbour SPA	4.8	5.4	0.4

6.4.3 Sensitive Receptors

6.4.3.1 Construction Dust

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (IAQM, 2024) prior to assessing the impact of dust from a proposed development, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas (ZoI defined in section 6.3.3) are taken into consideration.

The type of receptors and their sensitivity to dust soiling, human health effects of PM₁₀ and ecological effects are defined in the IAQM guidance (IAQM, 2024). High sensitivity receptors are regarded as residential properties, hospitals, schools and residential care homes where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods (such as public footpaths or parks) or do not expect a high level of amenity. Table 6-18 outlines the criteria for determining the sensitivity of the area to dust soiling and dust-related human health effects as per the IAQM guidance (IAQM, 2024).

Table 6-18 Criteria for determining the sensitivity of the area update.

Sensitivity of the Area to Dust Soiling Effects on People and Property					
Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Sensitivity of the Area to Human Health Impacts						
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)	Receptor Sensitivity	Number of Receptors	Distance from Source (m)
			<20	<50	<100	<250
High	< 24 µg/m³	>100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Medium	< 24 µg/m³	>10	Low	Low	Low	Low

Sensitivity of the Area to Human Health Impacts						
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)	Receptor Sensitivity	Number of Receptors	Distance from Source (m)
			<20	<50	<100	<250
		1 - 10	Low	Low	Low	Low
Low	< 24 µg/m ³	>1	Low	Low	Low	Low

In terms of receptor sensitivity to dust soiling, there is at least one medium sensitivity commercial property within 20 m of the proposed development boundary (see Figure 6-4). There are no high sensitivity receptors within 250 m of the proposed development construction activities. Based on these receptor numbers and using the IAQM criteria in Table 6-18, the sensitivity of the area to dust soiling impacts from the proposed development is medium.

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean 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 annual mean PM₁₀ concentration in the vicinity of the proposed development is 13 µg/m³. There are 1-10 medium sensitivity commercial properties within 20 m of the proposed development boundary (see Figure 6-4). There are no high sensitivity receptors within 250 m of the proposed development construction activities. Based on the IAQM criteria outlined in Table 6-8 the worst-case sensitivity of the area to dust-related human health effects is low.

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant, as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site, and 50 m from site access roads, up to 250 m from 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. The Cork Harbour SPA and Dunkettle Shore pNHA are greater than 50 m from the proposed development boundary and construction compound (see Figure 6-4), as well as greater than 50 m from the site entrance, site exit and site access road (up to 250 m from the site entrance and exit). As there are no sensitive ecological receptors that meet the assessment criteria within the study area, there is no potential for significant effects on sensitive ecology from construction dust emissions and no further assessment is required.

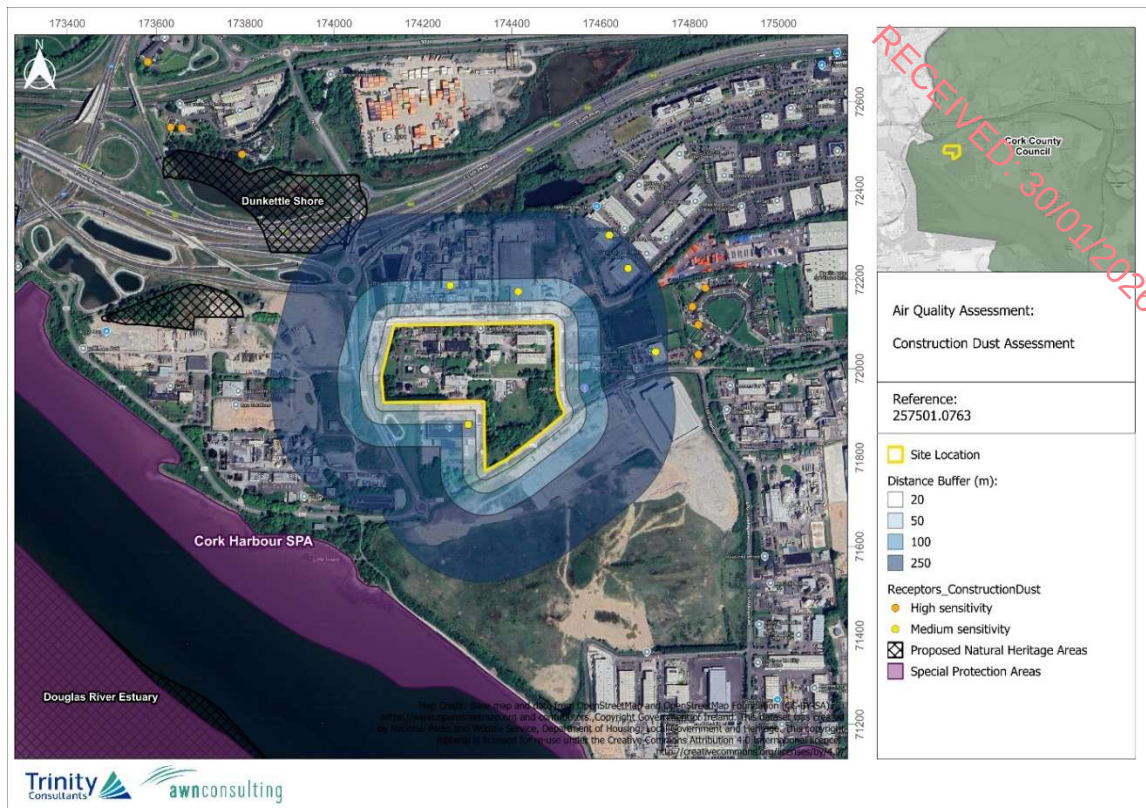


Figure 6-4 Construction dust assessment – sensitive receptors within 250 m of site.

6.4.3.2 Operational Phase

6.4.3.2.1 Modelled Human Receptors

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

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

Boundary receptor locations were also placed along the ownership boundary of the site at 25 m intervals giving a total of 4,090 calculation points for the model.

The impact of the emission sources was also measured at nearby residential receptors (AQ) (identified via a combination of satellite imagery and Eircode search) which were added to the model as discrete receptors (shown in Figure 6-5; 1 km buffer for scale purposes, ZoI as per above).

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 6-19 and Figure 6-5).

All receptors were modelled at 1.5 m to represent breathing height.

Table 6-19 Modelled discrete sensitive receptors.

Receptor	Co-Ordinates (UTM Zone 29 N)		Receptor	Co-Ordinates (UTM Zone 29 N)		Receptor	Co-Ordinates (UTM Zone 29 N)	
	X	Y		X	Y		X	Y
AQ1	541627	5750940	AQ32	541538	5749639	AQ69	543017	5750933
AQ2	542264	5750975	AQ33	541543	5749619	AQ70	543079	5750937
AQ3	542212	5750998	AQ34	541552	5749594	AQ71	543149	5750941
AQ4	542179	5751042	AQ35	541548	5749569	AQ72	543210	5750947
AQ5	541997	5750998	AQ36	541340	5750913	AQ73	542692	5750899
AQ6	542335	5750815	AQ37	541137	5750907	AQ74	542767	5750907
AQ7	542412	5750667	AQ38	541090	5750875	AQ75	542904	5750919
AQ8	542387	5750668	AQ39	540960	5750838	AQ76	542831	5750913
AQ9	542547	5750608	AQ40	541350	5749890	AQ77	542976	5750928
AQ11	543573	5750224	AQ41	541300	5749978	AQ78	542636	5750889
AQ12	543560	5750265	AQ42	541240	5750005	AQ79	542589	5750885
AQ13	543589	5750307	AQ43	541533	5749348	AQ80	542458	5750966
AQ14	542673	5750893	AQ44	541542	5749316	AQ81	543252	5750955
AQ15	542854	5750916	AQ45	541581	5749228	AQ82	543295	5750968
AQ16	542940	5750922	AQ46	541598	5749146	AQ83	543338	5750954
AQ17	543017	5750933	AQ47	541610	5749064	AQ84	543376	5750970
AQ18	543079	5750937	AQ48	543252	5750955	AQ85	543416	5750964
AQ19	543149	5750941	AQ49	543295	5750968	AQ86	543432	5750972
AQ20	543210	5750947	AQ50	543338	5750954	AQ87	543456	5750968
AQ21	542692	5750899	AQ51	543376	5750970	AQ88	543480	5750970
AQ22	542767	5750907	AQ52	543416	5750964	AQ83	543338	5750954
AQ23	542904	5750919	AQ53	543432	5750972	AQ84	543376	5750970
AQ24	542831	5750913	AQ54	543456	5750968	AQ85	543416	5750964
AQ25	542976	5750928	AQ55	543480	5750970	AQ86	543432	5750972
AQ26	542636	5750889	AQ56	541824	5748795	AQ87	543456	5750968
AQ27	542589	5750885	AQ57	541773	5748790	AQ88	543480	5750970
AQ28	542458	5750966	AQ58	541673	5748840			
AQ29	541379	5749855	AQ59	541669	5748784			
AQ30	541487	5749729	AQ60	542412	5750667			
AQ31	541514	5749693	AQ61	542547	5750608			
AQ32	541538	5749639	AQ62	543573	5750157			
AQ33	541543	5749619	AQ63	543573	5750224			
AQ34	541552	5749594	AQ64	543560	5750265			
AQ35	541548	5749569	AQ65	543589	5750307			
AQ29	541379	5749855	AQ66	542673	5750893			
AQ30	541487	5749729	AQ67	542854	5750916			
AQ31	541514	5749693	AQ68	542940	5750922			

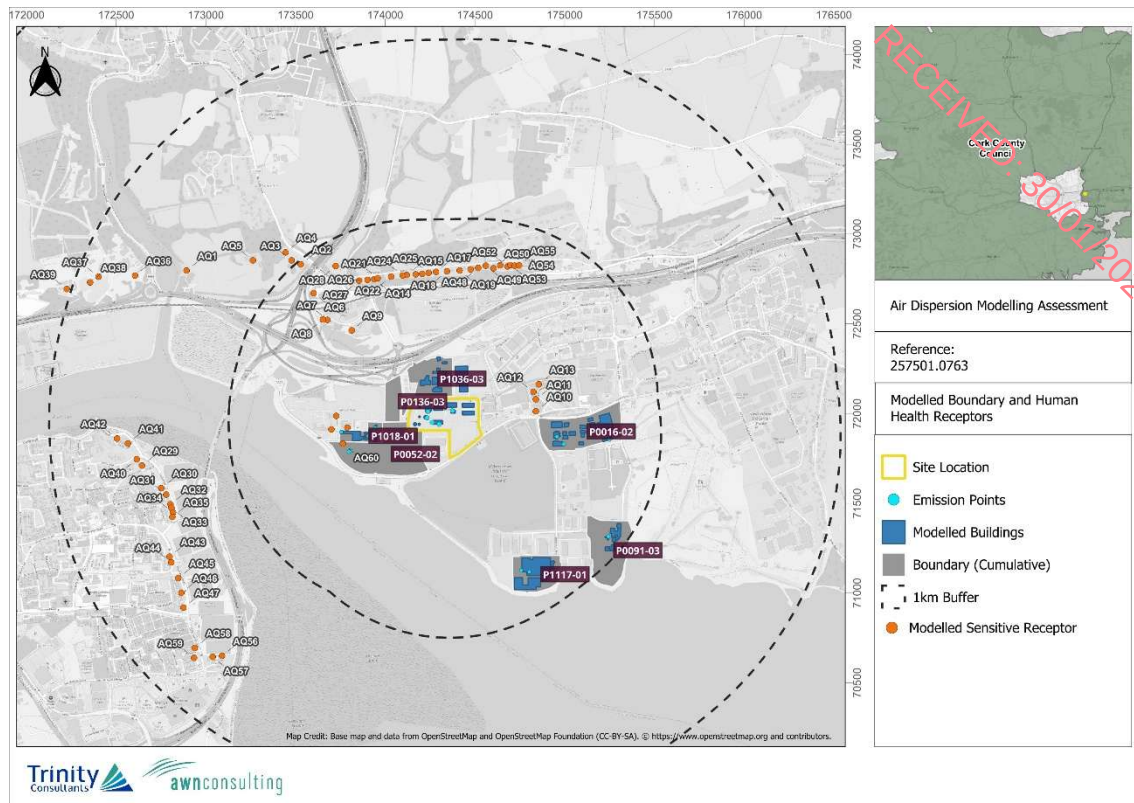


Figure 6-5 Modelled boundary and discrete receptors.

6.4.3.2.2 Modelled Ecology Receptors

The impact of emissions of NO_x and nutrient and acid deposition from the proposed development on ambient ground level concentrations was assessed using AERMOD within SACs, SPAs and NHAs, the locations of which were identified using the National Parks and Wildlife Service database (NPWS, 2025). The Zone of Influence (Zoi), or study area, for the effects on these designated sites has been defined based on the extent of the concentration contours as discussed in section 6.3.4.2.5. The concentration contours show the extent of the area within which NO_x and nitrogen deposition levels from the proposed development are greater than 1% (as defined section 6.3.2.2.3) of the relevant critical level and lowest critical loads. Areas outside these concentration contours are unlikely to experience a significant effect as pollutant concentrations are predicted to be less than 1% of the relevant critical level and lowest critical loads.

The ecology receptors included in the dispersion model are shown in Table 6-20 and Figure 6-6.

Table 6-20 Ecology receptors included in dispersion model.

Special Area of Conservation (SAC)	Special Protection Area (SPA)	Natural Heritage Area (NHA)
Great Island Channel SAC	Cork Harbour SPA	No NHAs within 2km

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

The closest ecology receptor is the Cork Harbour SPA approx. 90 m south-west of the facility.

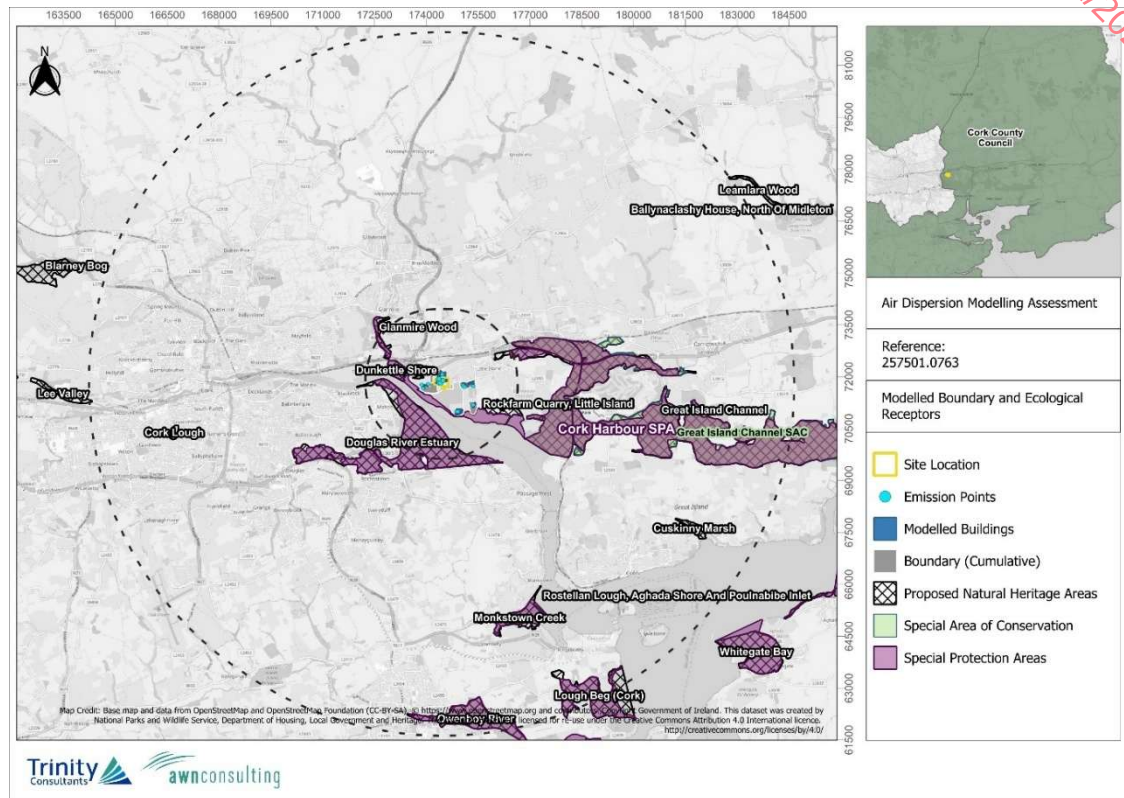


Figure 6-6 Modelled boundary and ecology receptors.

6.5 Potential Impacts

6.5.1 Do Nothing

Under the 'Do Nothing' Scenario, the proposed development will not be constructed, no construction works associated with the proposed development will take place and the previously identified effects of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur.

The existing facility would continue to operate with existing emissions sources as per its Industrial Emissions Licence P0017-02.

Therefore, the construction and operational phase impacts outlined in this assessment are likely to occur in the future even in the absence of the proposed development.

6.5.1.1 Air Dispersion Modelling -Human Health

6.5.1.1.1 NO₂ – Do Nothing

The results indicate that ambient ground level concentrations of NO₂, detailed in Table 6-21, 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 maximum emissions year, emissions from the existing sources lead to an ambient NO₂ concentration (including background) at the worst-case receptor which are at most:

- 32% of the annual mean limit value
- 35% of the 1-hour mean (measured as a 99.8th percentile) limit value

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 6-7 (1-hour mean) and Figure 6-8 (annual mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO₂ are close to the boundary of the site 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 **not significant**

Table 6-21 Do Nothing – dispersion model results for nitrogen dioxide (NO₂).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC	Limit Value	
NO ₂ / 2020	Annual Mean	Boundary	543110, 5750317	3.9	9	12.9	40	32%
	1-hr Mean (as 99.8 th ile)	Grid	543110, 5750242	52.8	18	70.8	200	35%
NO ₂ / 2021	Annual Mean	Boundary	543093, 5750051	2.6	9	11.6	40	29%
	1-hr Mean (as 99.8 th ile)	Grid	543086, 5750241	51.1	18	69.1	200	35%
NO ₂ / 2022	Annual Mean	Boundary	543110, 5750317	3.2	9	12.2	40	30%
	1-hr Mean (as 99.8 th ile)	Grid	543086, 5750241	50.9	18	68.9	200	34%
NO ₂ / 2023	Annual Mean	Boundary	543110, 5750317	3.4	9	12.4	40	31%
	1-hr Mean (as 99.8 th ile)	Grid	543086, 5750241	52.5	18	70.5	200	35%
NO ₂ / 2024	Annual Mean	Boundary	543110, 5750292	3.1	9	12.1	40	30%
	1-hr Mean (as 99.8 th ile)	Grid	543086, 5750241	52.8	18	70.8	200	35%

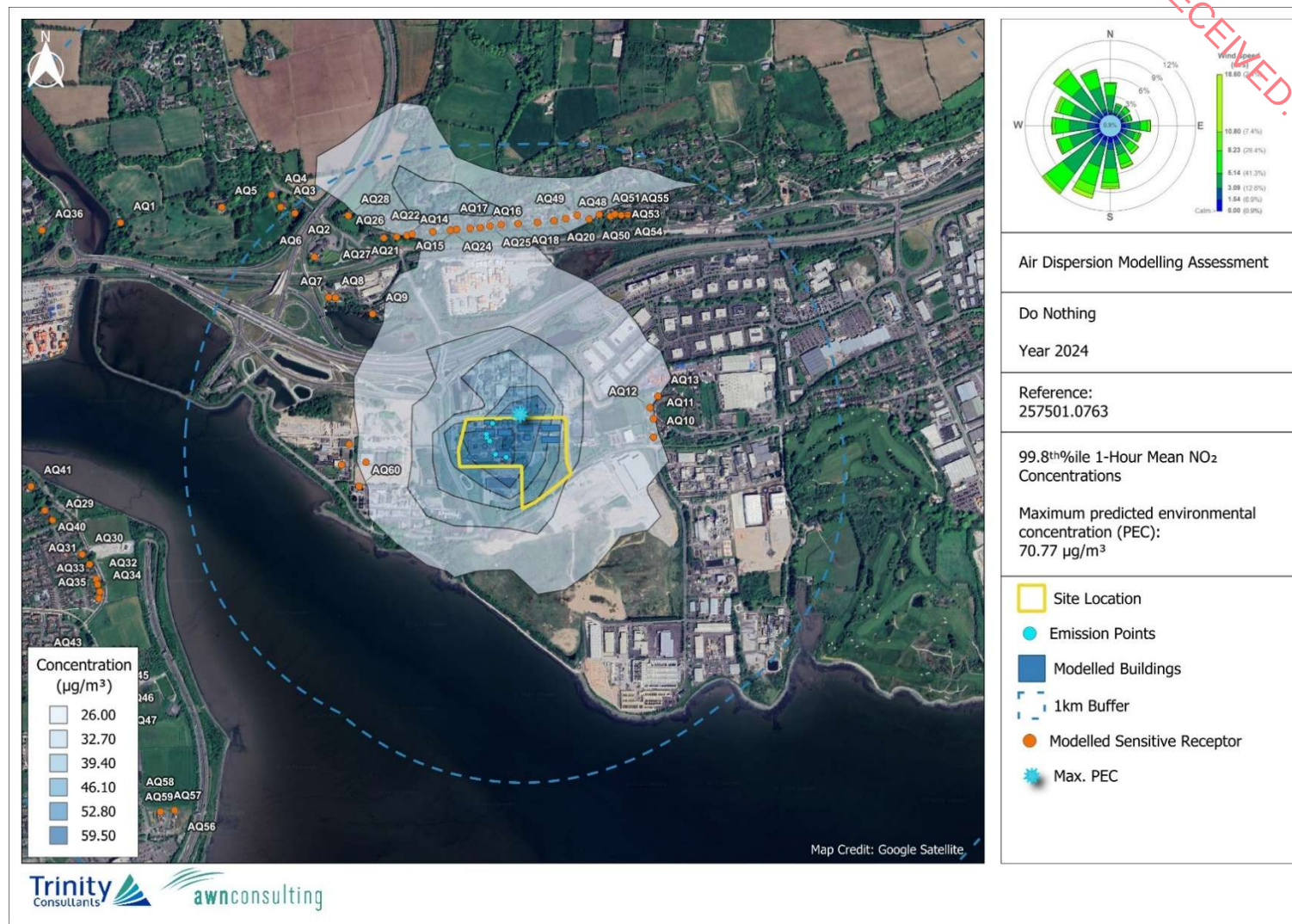


Figure 6-7 Do Nothing – maximum 1-Hour NO₂ concentrations (as 99.8th%ile) ($\mu\text{g}/\text{m}^3$).

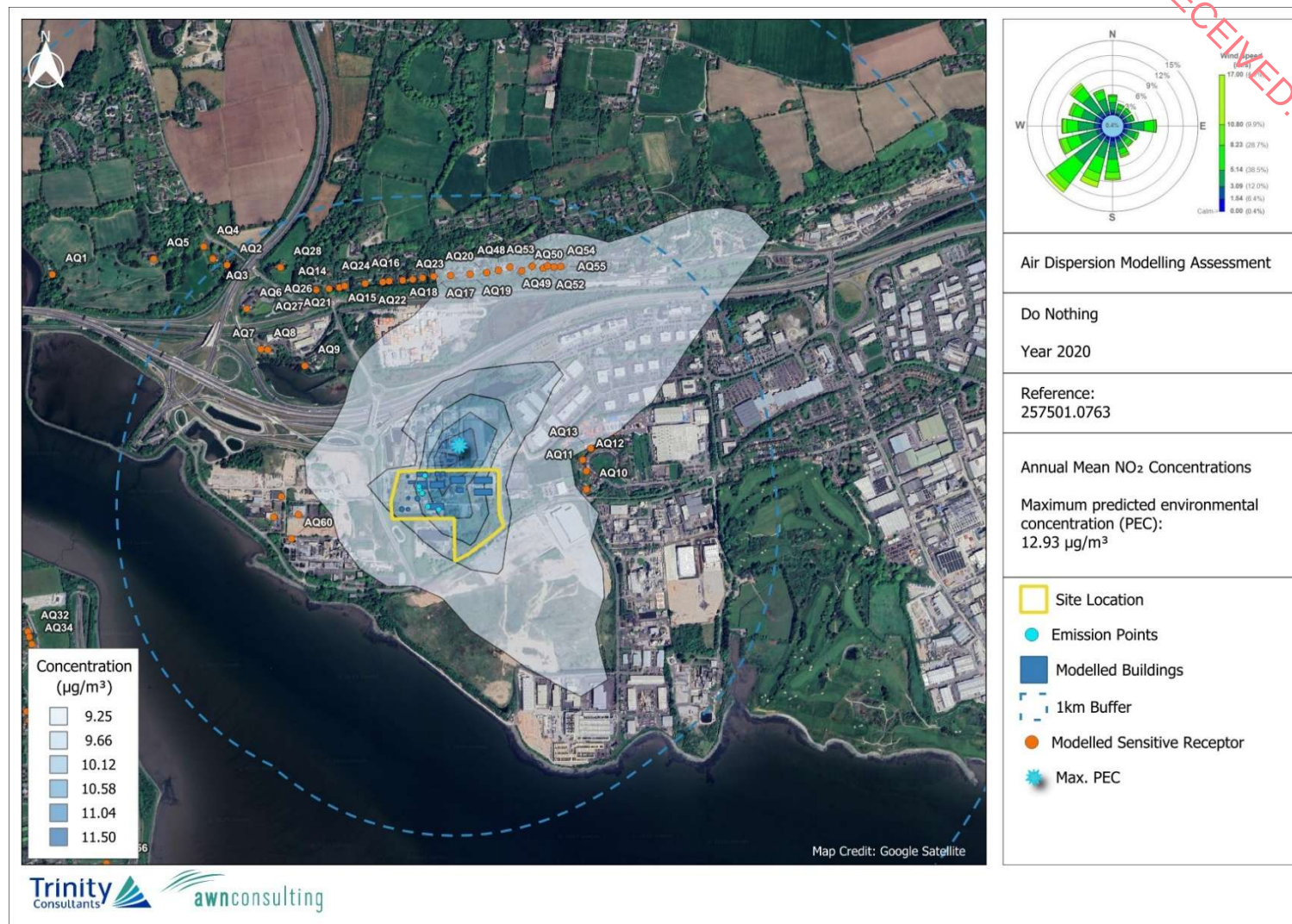


Figure 6-8 Do Nothing – maximum annual mean NO_2 concentrations ($\mu\text{g}/\text{m}^3$).

6.5.1.1.2 *PM₁₀ – Do Nothing*

The results indicate that ambient ground level concentrations of PM₁₀, detailed in Table 6-22, 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 maximum emissions year, emissions from the existing sources lead to an ambient PM₁₀ concentration (including background) at the worst-case receptor which are at most:

- 35% of the annual mean limit value
- 46% of the 24-hour mean (measured as a 90.4th percentile) limit value

Calculating the maximum 24-hour mean PM₁₀ (90.4thile) 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 6.4.2, which states that for PM₁₀ an estimate of the maximum PEC can be obtained from the methods shown below:

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

- (a) Annual mean process contribution PM₁₀ + 90.4thile of 24-hour mean background PM₁₀
- (b) 90.4thile 24-hour mean process contribution PM₁₀ + annual mean background PM₁₀

The results of this calculation process are highlighted (bold, underlined) and shown in Table 6-22 as “PEC A” and “PEC B”, and determined that the maximum 24-hour mean PM₁₀ (90.4thile) PEC is based on method A (“PEC A”).

The geographical variation in the 24-hour mean (90.4thile) and annual mean PM₁₀ ground level predicted environmental concentrations (PEC) beyond the Installation boundary for the worst-case years modelled are illustrated as concentration contours in Figure 6-9 (24-hour mean) and Figure 6-10 (annual mean), to demonstrate the direction and extent of the emission plume.

Table 6-22 Do Nothing – dispersion model results for Particulate Matter (PM₁₀).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations					PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	Process Contribution (PC) (µg/m³)	Background Concentration (µg/m³)	Predicted Environmental Concentration (PEC) (µg/m³) Method A	Predicted Environmental Concentration (PEC) (µg/m³) Method B	Limit Values (µg/Nm³)	
PM ₁₀ / 2020	Annual Mean	Boundary	543013, 5750225	0.898	13	13.90	13.90	40	35%
	24-hr Mean (as 90.4 th ile)	Boundary	543013, 5750225	2.158	22	22.90	15.16	50	46%
PM ₁₀ / 2021	Annual Mean	Boundary	543013, 5750225	0.778	13	13.78	13.78	40	34%
	24-hr Mean (as 90.4 th ile)	Boundary	543013, 5750225	2.069	22	22.78	15.07	50	46%
PM ₁₀ / 2022	Annual Mean	Boundary	543013, 5750225	0.835	13	13.84	13.84	40	35%
	24-hr Mean (as 90.4 th ile)	Boundary	543013, 5750225	2.118	22	22.84	15.12	50	46%
PM ₁₀ / 2023	Annual Mean	Boundary	543013, 5750225	0.921	13	13.92	13.92	40	35%
	24-hr Mean (as 90.4 th ile)	Boundary	543013, 5750225	2.214	22	22.92	15.21	50	46%
PM ₁₀ / 2024	Annual Mean	Boundary	543013, 5750225	0.839	13	13.84	13.84	40	35%
	24-hr Mean (as 90.4 th ile)	Boundary	543013, 5750225	2.217	22	22.84	15.22	50	46%

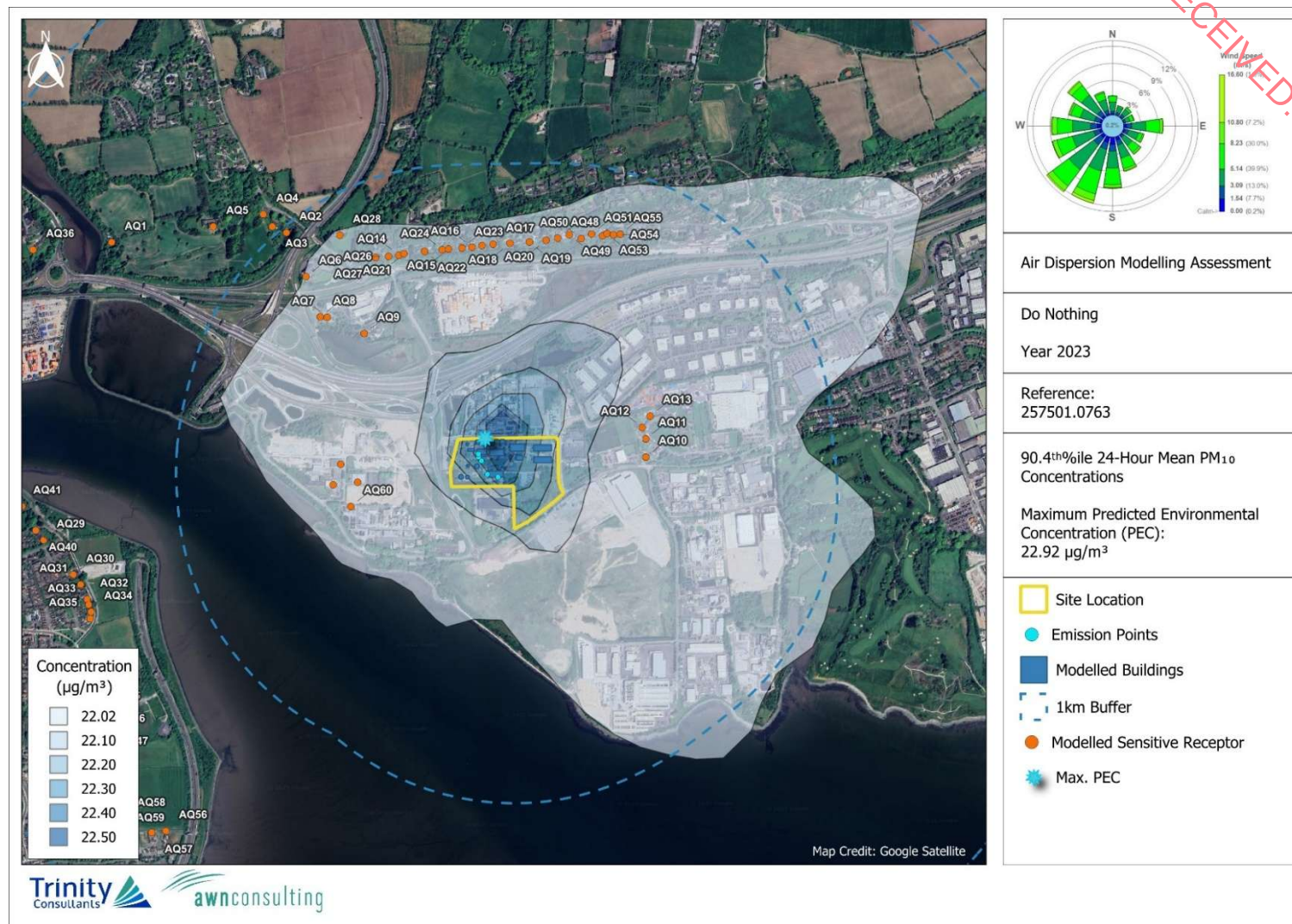


Figure 6-9 Do Nothing – maximum 24-Hour PM_{10} concentrations (as 90.4th%ile).

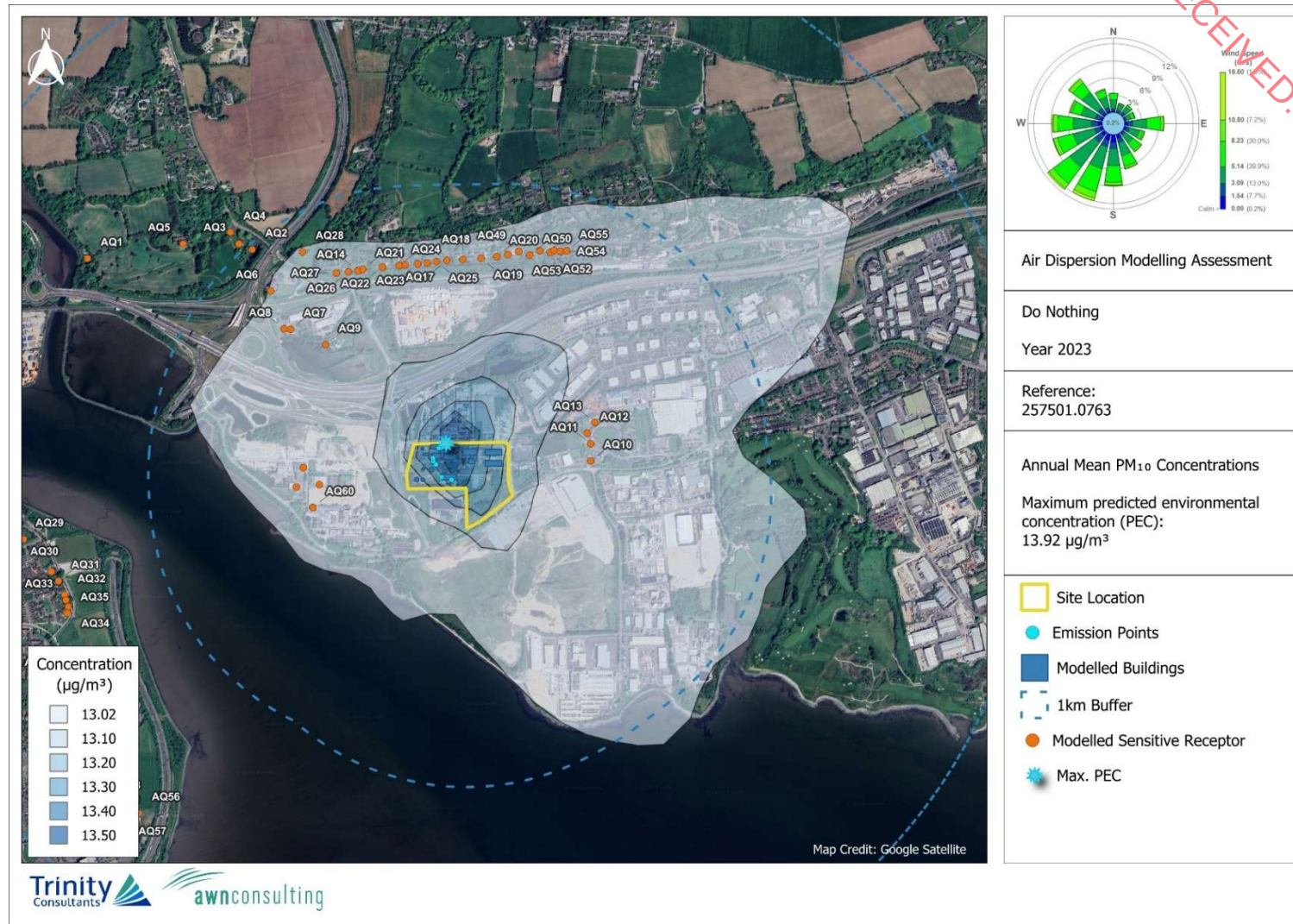


Figure 6-10 Do Nothing – maximum annual mean PM_{10} concentration.

6.5.1.1.1 *PM_{2.5} – Do Nothing*

The results indicate that ambient ground level concentrations of PM_{2.5}, detailed in Table 6-23, 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 Installation 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, ambient concentrations (including background) will be 34% of the annual mean PM_{2.5} limit value of 25 µg/m³ at the worst-case receptor (location shown in Figure 6-10). As the annual mean PM_{2.5} concentrations have been conservatively assumed equal to the annual mean PM₁₀ concentrations, the direction and extent of the emission plume is identical to that shown in Figure 6-10.

Table 6-23 Do Nothing – dispersion model results for Particulate Matter (PM_{2.5}).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC	Limit Value	
PM _{2.5} / 2020	Annual Mean	Boundary	543013, 5750225	0.673	7	7.673	25	31%
PM _{2.5} / 2021	Annual Mean	Boundary	543013, 5750225	1.618	7	8.618	25	34%
PM _{2.5} / 2022	Annual Mean	Boundary	543013, 5750225	0.584	7	7.584	25	30%
PM _{2.5} / 2023	Annual Mean	Boundary	543013, 5750225	1.552	7	8.552	25	34%
PM _{2.5} / 2024	Annual Mean	Boundary	543013, 5750225	0.627	7	7.627	25	31%

6.5.1.1.2 *VOC – Do Nothing*

The Do-Nothing VOC modelling results are detailed in Table 6-24 and Table 6-25. The results indicate that the ambient ground level concentrations are below the relevant air quality guidelines for individual VOCs even when it is assumed that each emission point is emitting solely the VOC of concern at the IED emission limit for the full year. Emissions from the proposed VOC abatement system onsite lead to ambient individual VOC concentrations which are no more than 0.6% of the maximum 1-hour limit value at the worst-case receptor (see Figure 6-11) and no more than 0.1% of the annual mean limit value at the worst-case off-site location (see Figure 6-12).

Table 6-24 VOCs dispersion model results – Do Nothing process contributions – maximum 1-hour scenario.

Pollutant	1-Hour EAL $\mu\text{g}/\text{m}^3$	2020	2021	2022	2023	2024	Max PEC % of EAL
Methanol	33,300	50.1	45.9	47.2	42.3	43.0	0.2%
Ethanol	576,000	36.0	33.0	33.9	30.4	30.9	0.006%
Acetone	362,000	30.3	27.7	28.5	25.5	26.0	0.01%
Heptane	6,255	22.4	20.5	21.1	18.9	19.2	0.4%
MEK (Methyl Ethyl Ketone)	89,900	28.2	25.8	26.6	23.8	24.2	0.03%
Butanol	4,500	29.0	26.5	27.3	24.4	24.9	0.6%
Background levels of all VOCs are likely to be well below $1 \mu\text{g}/\text{m}^3$ in the vicinity of the facility. As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.							

Table 6-25 VOCs dispersion model results – Do Nothing process contributions – annual mean scenario.

Pollutant	Annual Mean EAL $\mu\text{g}/\text{m}^3$	2020	2021	2022	2023	2024	Max PEC % of EAL
Methanol	2,660	1.92	1.74	1.73	1.95	1.79	0.1%
Ethanol	19,200	1.38	1.25	1.24	1.40	1.29	0.01%
Acetone	18,100	1.16	1.05	1.04	1.18	1.08	0.01%
Heptane	208,500	0.86	0.78	0.77	0.87	0.80	0.0004%
MEK (Methyl Ethyl Ketone)	6,000	1.08	0.98	0.97	1.10	1.01	0.02%
Butanol	30,000	1.11	1.01	1.00	1.13	1.04	0.004%
Background levels of all VOCs are likely to be well below $1 \mu\text{g}/\text{m}^3$ in the vicinity of the facility. As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.							

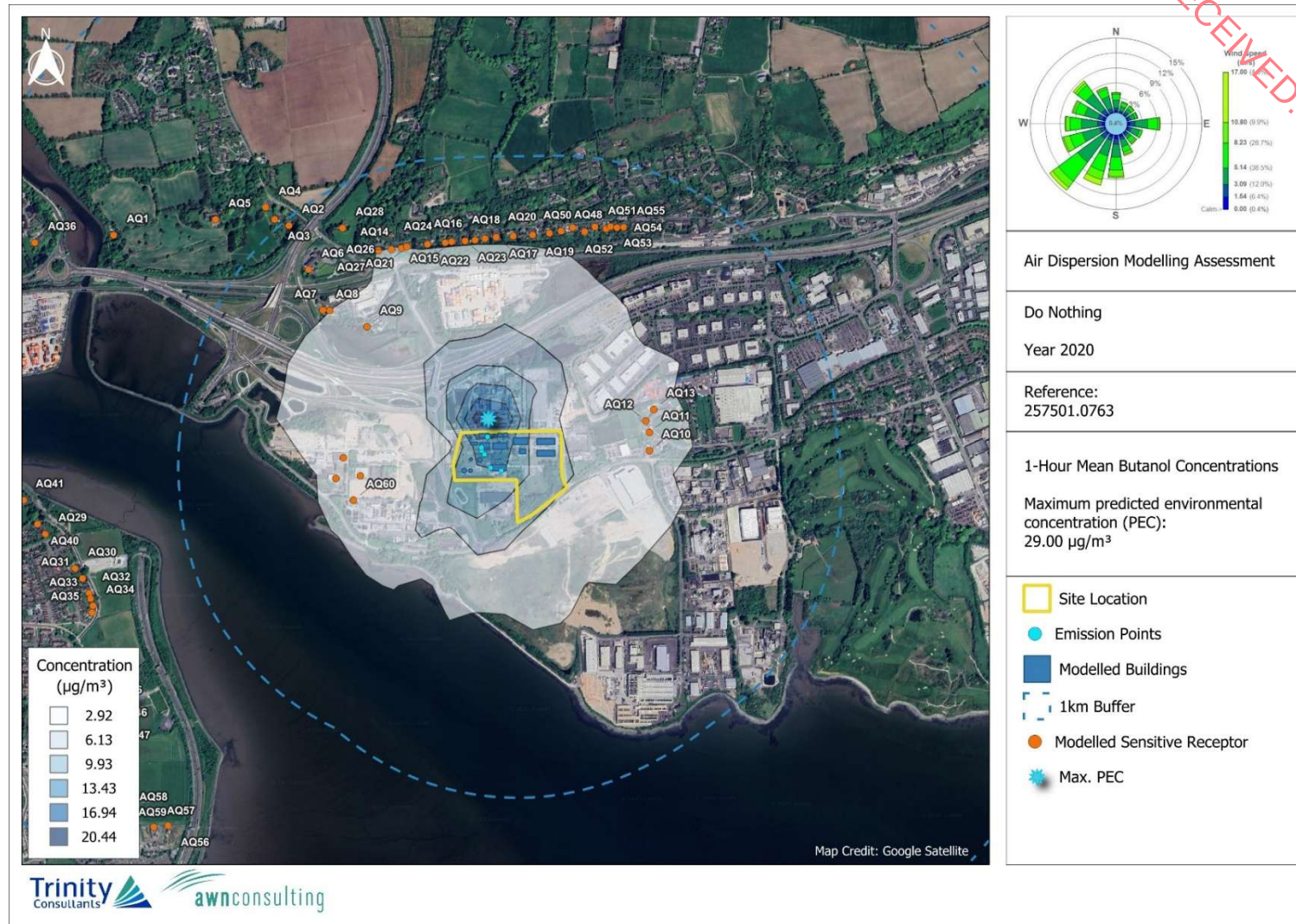


Figure 6-11 Do Nothing – maximum 1-hour mean VOC (butanol) concentrations ($\mu\text{g}/\text{m}^3$, as carbon).

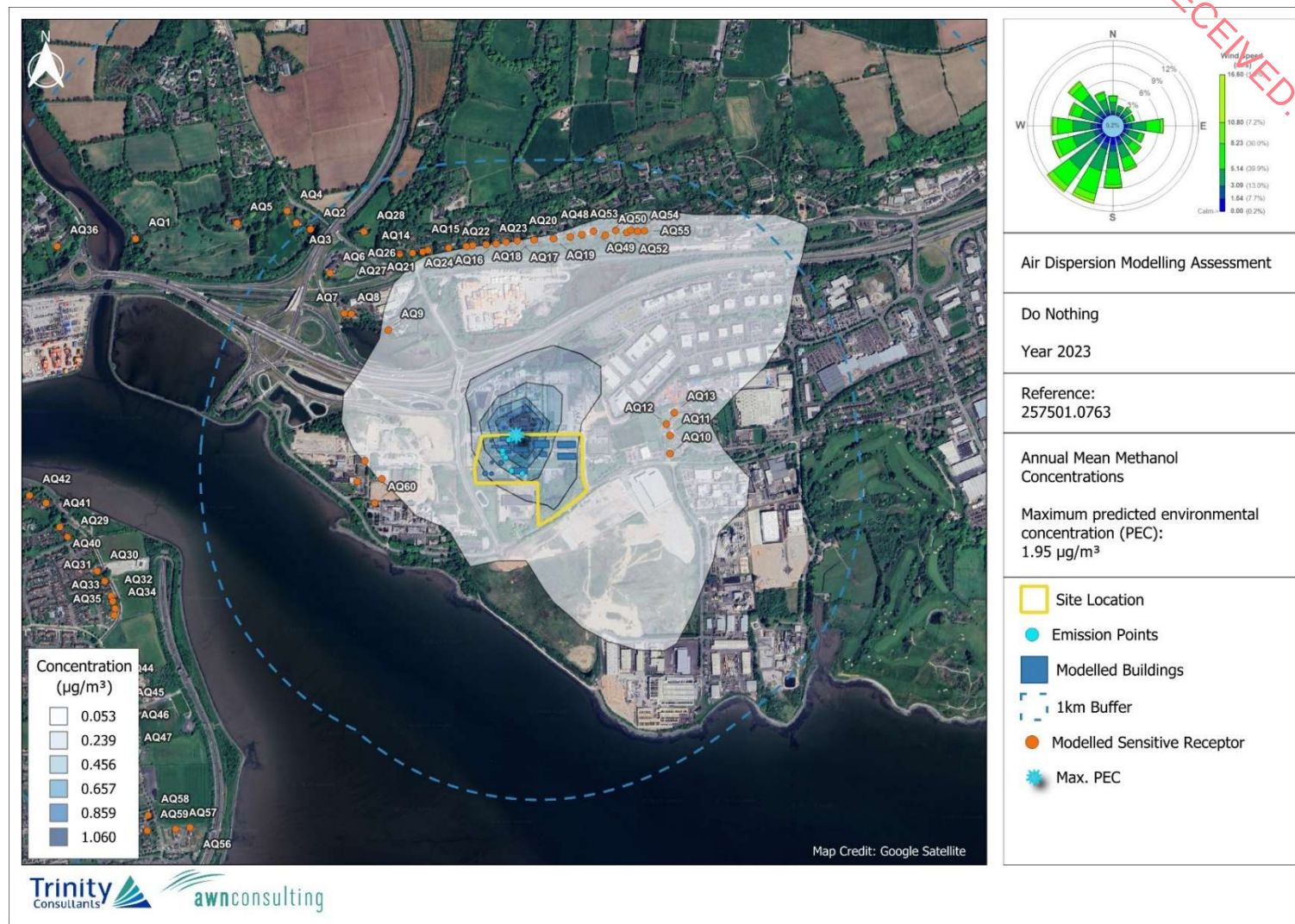


Figure 6-12 Do Nothing – maximum 1-hour mean VOC (methanol) concentrations ($\mu\text{g}/\text{m}^3$, as carbon).

6.5.1.2 Air Dispersion Modelling Assessment – Ecology

6.5.1.2.1 NO_x – Do Nothing

The NO_x modelling results for ecological receptors under the Do-Nothing scenario are detailed in Table 6-26 and Table 6-27.

Process contributions (PCs) of NO_x at ecological receptors within the model study area identified in section 6.4.3.2.2 were compared to the relevant critical level (identified in section 6.3.2.2.1).

As per the IN2 guidance, where a PC is greater than 1% of the critical level, this site has been included in further assessment where the Predicted Environmental Concentrations (PEC) is determined by combining the background concentration with the PC. These results are presented below.

There are no PCs greater than 1% of the relevant critical level within the most impacted European site. At the worst-case location within this site (Cork Harbour SPA, in terms of PEC) (shown in Figure 6-22), emissions from the proposed development lead to an ambient NO_x concentration (including background) which is at most 0.8% of the annual limit value over the five years of meteorological data modelled.

Figure 6-13 shows the extent of the area, as a concentration contour, within which annual mean NO_x concentrations in the Do Nothing are less than 1% of the critical level for NO_x of 30 µg/m³.

Table 6-26 Do Nothing – NO_x designated habitat dispersion model results.

Ecological Receptor	NO _x Process Contributions (µg/m ³)					Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024	X	Y
Great Island Channel SAC	0.097	0.085	0.088	0.104	0.085	545154	5751198
Cork Harbour SPA	0.219	0.246	0.238	0.185	0.253	543765	5749257

Table 6-27 Do Nothing – NO_x designated habitat dispersion model results (continued).

Ecological Receptor	Max. PC (µg/m ³)	Critical Level (µg/m ³)	Max PC % of Critical Level	Considered for further assessment?	Back-ground (µg/m ³)	PEC (µg/m ³)	PEC % of critical level
Great Island Channel SAC	0.104	30	0.3%	No	n/a	n/a	n/a
Cork Harbour SPA	0.253	30	0.8%	No	n/a	n/a	n/a

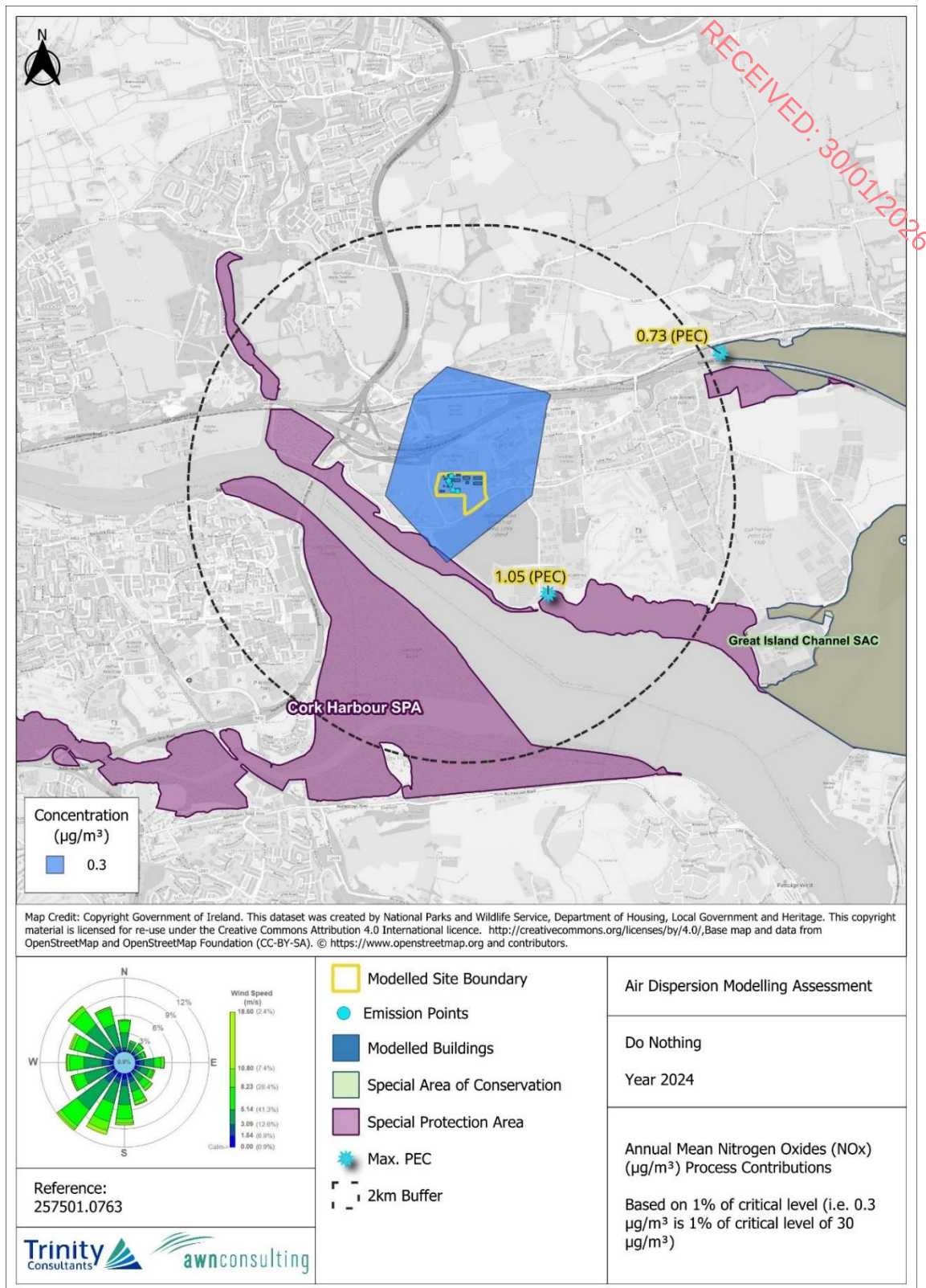


Figure 6-13 Do Nothing – NO_x process contributions as 1% of Critical Level.

6.5.1.2.2 Nitrogen Deposition – Do Nothing

In order to consider the effects of nitrogen deposition (as N) owing to emissions from the proposed development on 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 6.1.6) and shown in Table 6-28 and Table 6-29.

As per section 3.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors within the model study area identified in section 4.2 were compared to the relevant critical load (identified in section 3.2.2).

As per the IN2 guidance, 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.

Within the most impacted European site (Cork Harbour SPA, in terms of PEC), at the worst-case location (shown in Figure 6-23), the maximum nitrogen deposition level is 6.318 kg N/ha/yr. This is within the lowest critical load range of 5-10 kg N/ha/yr but above the lowest critical load of 5 kg N/ha/yr for the most sensitive feature *A193 Sterna hirundo (Northern/Eastern Europe - breeding)* and its corresponding nitrogen critical load class *Shifting coastal dunes (EUNIS code is B1.3 which includes both H2110 Embryonic Shifting Dunes and H2120 Marram Dunes (White Dunes) habitats)*.

Figure 6-14 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 load of 5 kg N/ha/yr. None of the sensitive features listed above are within the 1% contour (the closest H2110 and H2120 habitat to the proposed development is approx. 25km to the south-east), indicating that nitrogen deposition in the Do Nothing is unlikely to have a significant effect on these features.

Table 6-28 Do Nothing – nitrogen deposition dispersion model results at ecological receptors.

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Nitrogen Deposition (kg/ha/yr)
	2020	2021	2022	2023	2024		
Great Island Channel SAC	0.09	0.08	0.08	0.09	0.08	0.0001	0.013
Cork Harbour SPA	0.20	0.22	0.21	0.17	0.23	0.0003	0.033

Table 6-29 Do Nothing – nitrogen deposition dispersion model results at ecological receptors (continued).

Ecological Receptor	Total PC Nitrogen Dep. (kg N/ha /yr)	Assessment critical load (kg N/ha /yr)	PC % of critical load	Further assessment?	APIS Background Nitrogen Dep. (kg N/ha /yr)	Total PEC Nitrogen Dep. (kg N/ha /yr)	Location of max. PC (UTM Zone 29 N)	
							X	Y
Great Island Channel SAC	0.013	7.5	0.2%	No	6.437	6.450	545154	5751198
Cork Harbour SPA	0.033	7.5	0.4%	No	7.533	7.566	552139	5747643
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.								

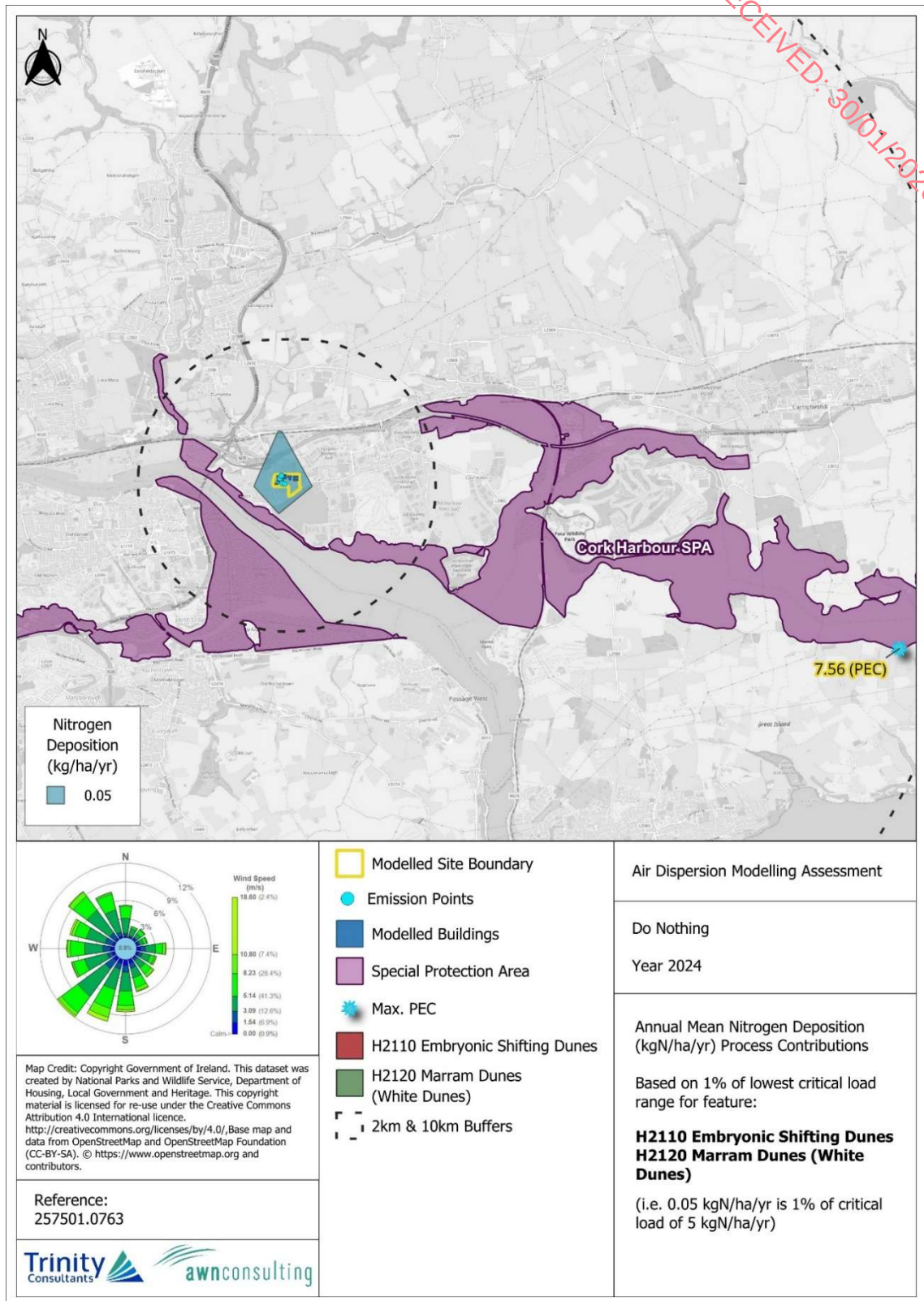


Figure 6-14 Do Nothing – nitrogen deposition process contributions as 1% of Critical Load (5 kg N/ha/yr).

6.5.1.2.3 Acid Deposition (as N) - Proposed Operations

In order to consider the effects of acid deposition (as N) owing to emissions from the proposed development on ecological habitat sites, 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 6.2.4).

As per section 6.2.4.3, process contributions (PCs) of acid deposition (as N) at ecological receptors within the model study area identified in section 6.4.3.2.2 were compared to the relevant critical load (identified in section 6.2.2.2), and are shown Table 6-30 and Table 6-31.

As per the IN2 guidance, 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 (Cork Harbour SPA, in terms of PEC). At the worst-case location, the maximum total acid deposition (as N) flux is 0.562 keq/ha/yr. This is below the maximum critical load of 0.714 keq/ha/yr for the most sensitive features *A017 Phalacrocorax carbo (North-western Europe)*, *A005 Podiceps cristatus (North-western Europe - wintering)* and *A193 Sterna hirundo (Northern/Eastern Europe - breeding)*.

Figure 6-15 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 0.143 kg N/ha/yr. None of the relevant acid critical load classes (acid grassland, calcareous grassland and freshwater, and their associated individual habitats) for the sensitive features are within the Cork Harbour SPA where it overlaps with the 1% contour, indicating that acid deposition (as N) from the Do Nothing is unlikely to have a significant effect on these features.

Table 6-30 Do Nothing – acid deposition (as N) dispersion model Results at ecological receptors.

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Acid Deposition (keq/ha/year)	Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024			X	Y
Great Island Channel SAC	0.09	0.08	0.08	0.09	0.08	0.00014	0.001	545154	5751198
Cork Harbour SPA	0.20	0.22	0.21	0.17	0.23	0.00034	0.002	552139	5747643

Table 6-31 Do Nothing – 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	Considered for further assessment?	APIS Background Acid Dep. (keq/ha/yr)	Total PEC Acid Dep. (N) (keq/ha/yr)	Critical load (MaxCLminN) for PEC (keq/ha/yr)
Great Island Channel SAC	0.0010	n/a	n/a	No	n/a	n/a	n/a
Cork Harbour SPA	0.0023	0.143	1.6%	Yes	0.560	0.562	0.714

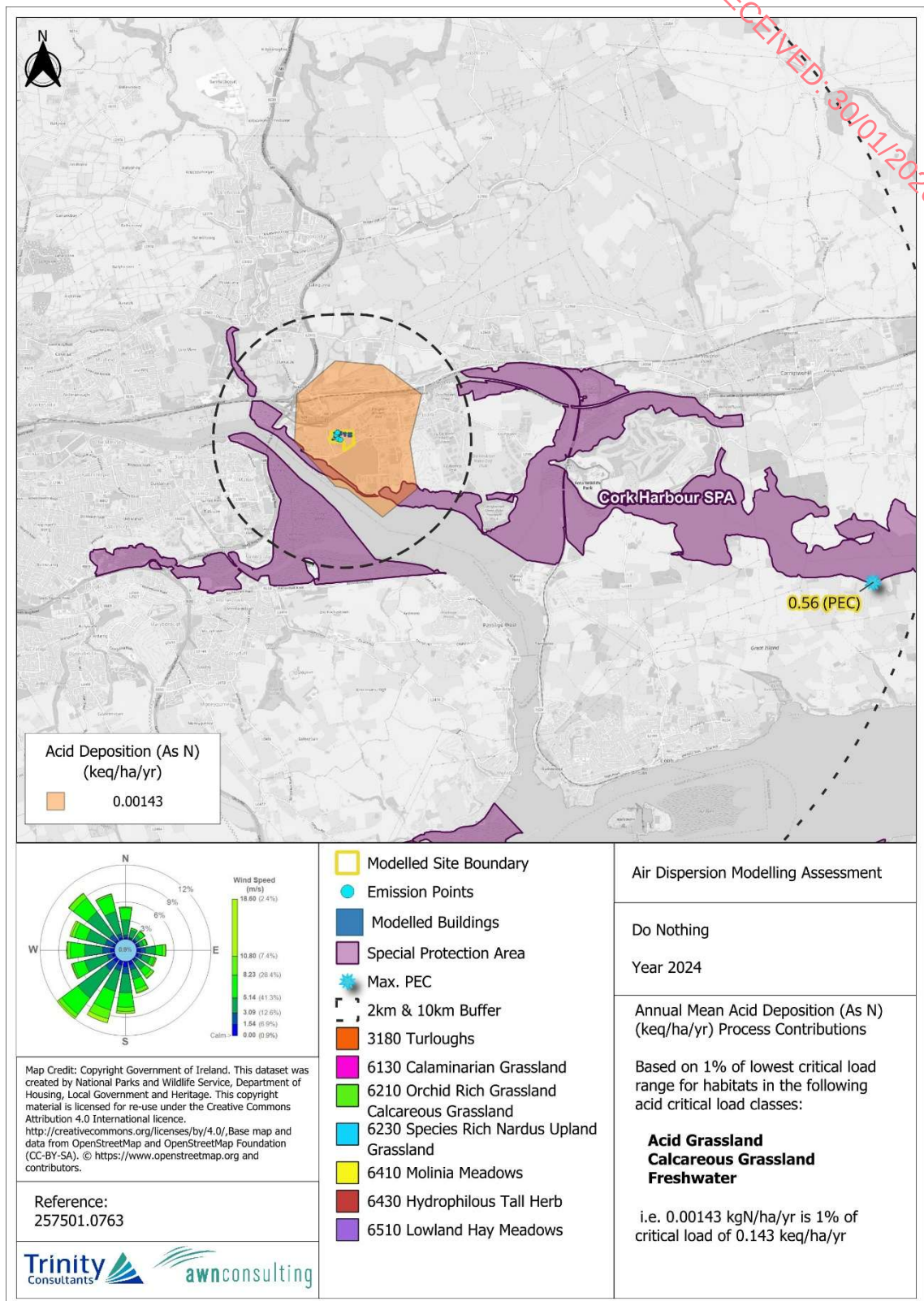


Figure 6-15 Do Nothing – acid deposition (as N) process contributions as 1% of Critical Load (0.143 keq/ha/yr).

6.5.2 Construction Phase

6.5.2.1 Construction Dust Assessment

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 250 m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2024). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

A review of Cork Airport meteorological data indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature (section 6.4.1). In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30-year average data for Cork Airport meteorological station indicates that on average 194 days per year have rainfall over 0.2 mm (Met Éireann, 2025). Therefore, it can be determined that 53% of the time dust generation will be reduced due to natural meteorological conditions. To determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (section 6.4.3.1). The major dust generating activities are divided into four types within the IAQM (IAQM, 2024) guidance to reflect their different potential impacts. These are: demolition, earthworks, construction and trackout (movement of heavy vehicles).

6.5.2.1.1 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 section 6.3.3.

- Demolition: There is no demolition required as part of the proposed development.
- Earthworks: The dust emission magnitude for the proposed earthwork activities can be classified as medium.
- Construction: The total volume of structures with dust generating potential during their construction will be between 12,000 m³ - 75,000 m³, therefore the dust emission magnitude for the proposed construction activities can be classified as medium.
- Trackout: The dust emission magnitude for the proposed trackout can be classified as medium, as worst-case there will be between 20 and 50 outward HGV movements per day at peak times during the construction phase of the proposed development.

6.5.2.1.2 Determining the Risk of Dust Impacts

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (IAQM, 2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling and dust-related human health effects (Section 6.4.3.1). The level of risk associated with each activity is determined using the criteria in Table 6-8. The overall risk of dust impacts from the construction works is shown in Table 6-32 for each category.

- Demolition: There is no demolition required as part of the proposed development.
- Earthworks: Combining the medium dust emissions magnitude for the earthwork activities with the medium sensitivity to dust soiling results in a medium risk of dust soiling impacts using the criteria in Table 6-8. There is an overall low risk of dust-related human health impacts as a result of the proposed earthwork activities.
- Construction: Combining the medium dust emissions magnitude for the construction activities with the medium sensitivity to dust soiling results in a medium risk of dust soiling impacts using the criteria in Table 6-8. There is an overall low risk of dust-related human health impacts as a result of the proposed construction activities.
- Trackout: Combining the medium dust emission magnitude for the trackout activities with the medium sensitivity to dust soiling results in a medium risk of dust soiling impacts using the criteria in Table 6-8. There is an overall low risk of dust-related human health impacts as a result of the proposed trackout activities.

6.5.2.1.3 Summary of Dust Emission Risks

There is at most a medium risk of dust soiling impacts and a low risk of dust-related human health 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 6-32 Risk of Dust Impacts used to Define Site-Specific Mitigation

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

Dust Soiling	Medium	Medium	Medium Risk
Human Health	Low		Low Risk

RECEIVED: 30/01/2026

6.5.3 Operational Phase

6.5.3.1 Air Dispersion Modelling Assessment – Human Health

6.5.3.1.1 NO₂ – Proposed Operations

The results indicate that ambient ground level concentrations of NO₂, detailed in Table 6-33, 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 maximum emissions year, emissions from the proposed development lead to an ambient NO₂ concentration (including background) at the worst-case receptor which are at most:

- 58% of the annual mean limit value
- 47% of the 1-hour mean (measured as a 99.8th percentile) limit value

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 6-16 (1-hour mean) and Figure 6-17 (annual mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO₂ are close to the boundary of the site 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 **not significant**.

Table 6-33 Proposed Operations – dispersion model results for nitrogen dioxide (NO₂).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC	Limit Value	
NO ₂ / 2020	Annual Mean	Boundary	543013, 5750225	14.3	9	23.3	40	58%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.7	18	94.7	200	47%
NO ₂ / 2021	Annual Mean	Boundary	542988, 5750225	12.7	9	21.7	40	54%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	75.9	18	93.9	200	47%
NO ₂ / 2022	Annual Mean	Boundary	542988, 5750225	13.1	9	22.1	40	55%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.2	18	94.2	200	47%
NO ₂ / 2023	Annual Mean	Boundary	543013, 5750225	14.2	9	23.2	40	58%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.0	18	94.0	200	47%
NO ₂ / 2024	Annual Mean	Boundary	543013, 5750225	12.5	9	21.5	40	54%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.2	18	94.2	200	47%

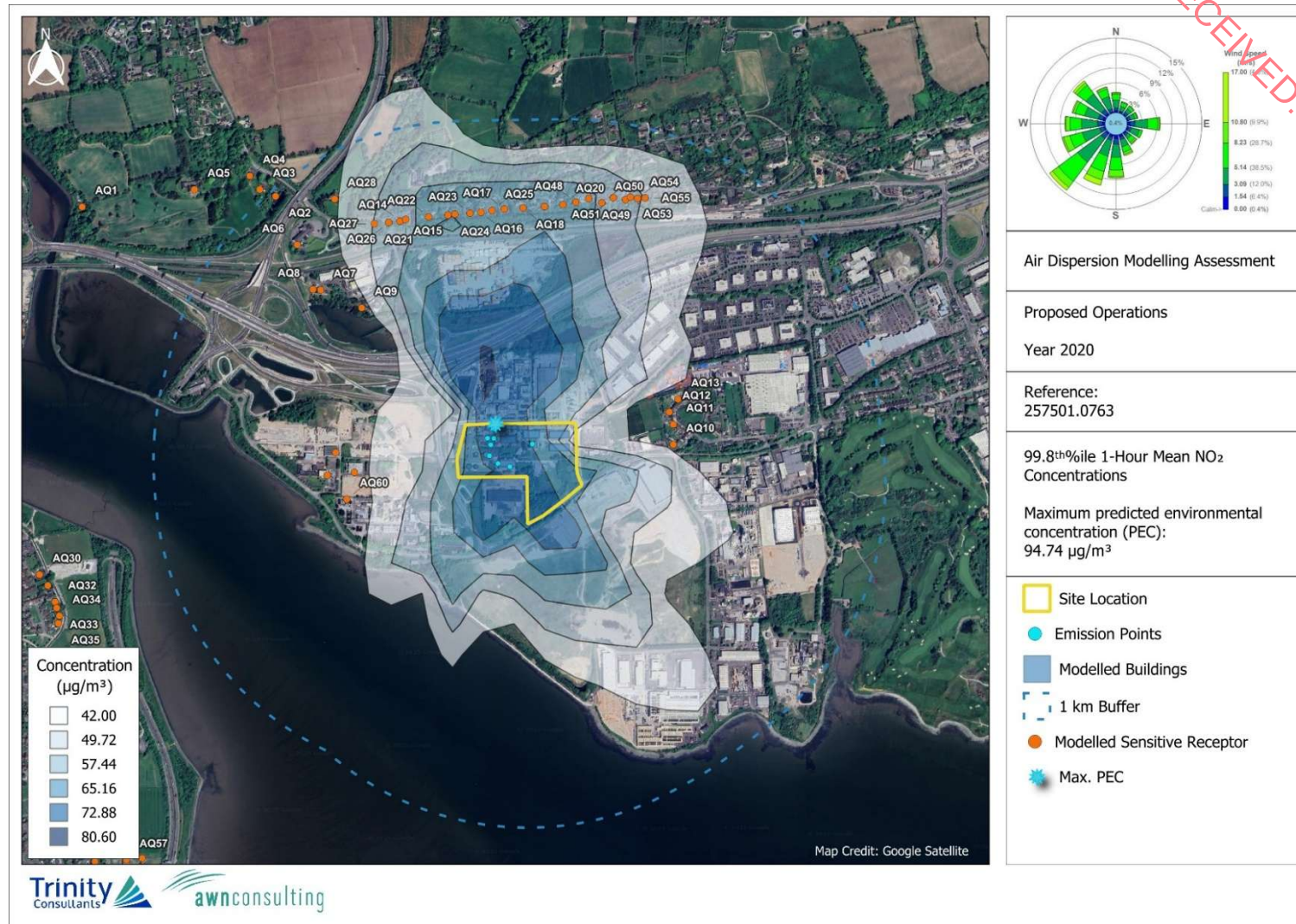


Figure 6-16 Proposed Operations – maximum 1-hour NO_2 concentrations (as 99.8thile).

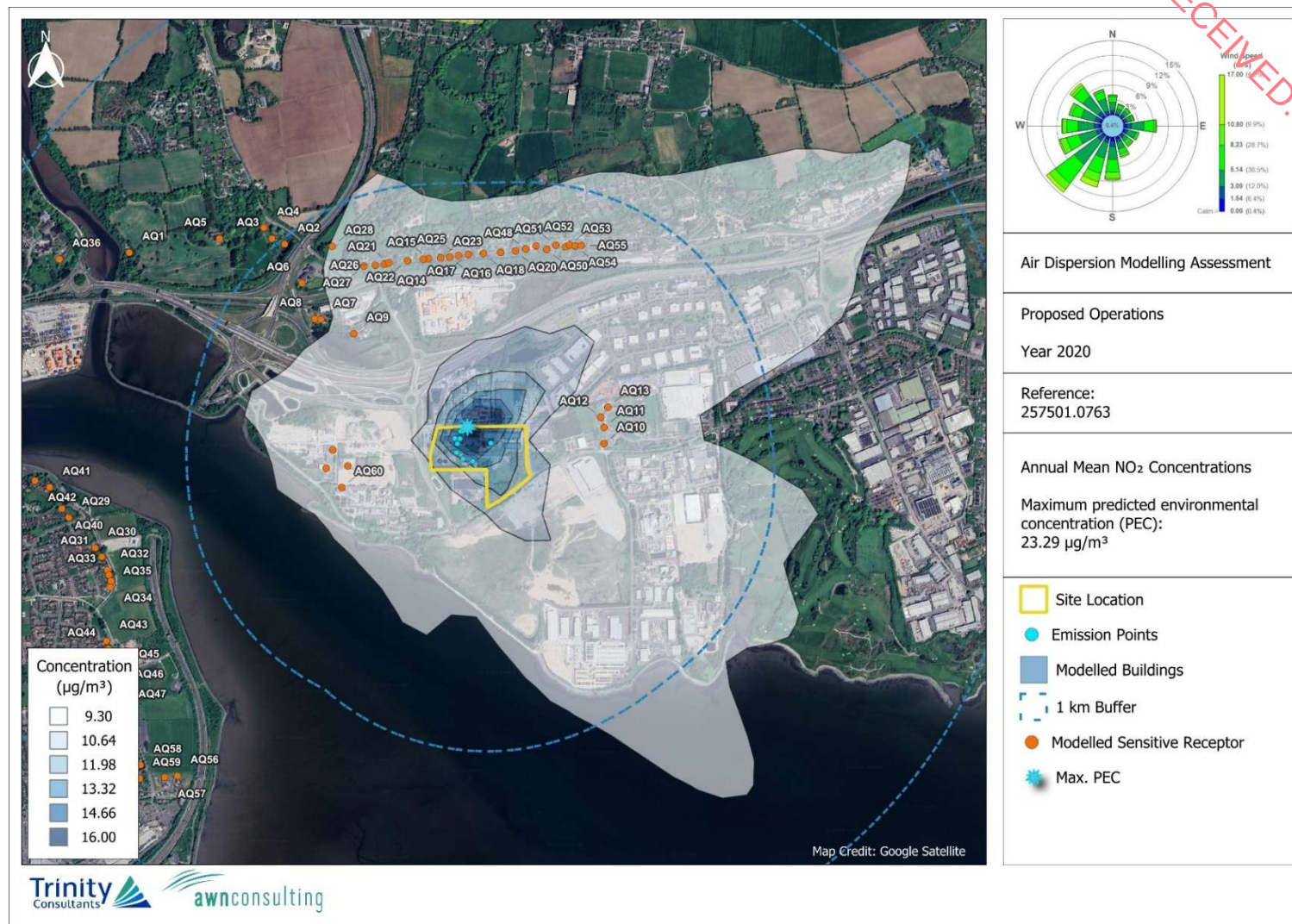


Figure 6-17 Proposed Operations – annual mean NO_2 concentration.

6.5.3.1.2 PM_{10} – Proposed Operations

The results indicate that ambient ground level concentrations of PM_{10} , detailed in Table 6-34, 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 maximum emissions year, emissions from the proposed development lead to an ambient PM_{10} concentration (including background) at the worst-case receptor which are at most:

- 34% of the annual mean limit value
- 45% of the 24-hour mean (measured as a 90.4th percentile) limit value

Calculating the maximum 24-hour mean PM_{10} (90.4thile) 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 6.4.2, which states that for PM_{10} an estimate of the maximum PEC can be obtained from the methods shown below:

PM_{10} - The 90.4thile of total 24-hour mean PM_{10} is equal to the maximum of either A or B below:

- (a) Annual mean process contribution PM_{10} + 90.4thile of 24-hour mean background PM_{10}
- (b) 90.4thile 24-hour mean process contribution PM_{10} + annual mean background PM_{10}

The results of this calculation process are highlighted (bold, underlined) and shown in Table 6-34 as “PEC A” and “PEC B”, and determined that the maximum 24-hour mean PM_{10} (90.4thile) PEC is based on method A (“PEC A”).

The geographical variation in the 24-hour mean (90.4thile) and annual mean PM_{10} ground level predicted environmental concentrations (PEC) beyond the Installation boundary for the worst-case years modelled are illustrated as concentration contours in Figure 6-18 (24-hour mean) and Figure 6-19 (annual mean), to demonstrate the direction and extent of the emission plume.

Table 6-34 Proposed Operations – dispersion model results for particulate matter (PM₁₀).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)					PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC A	PEC B	Limit Value	
PM ₁₀ / 2020	Annual mean	Boundary	543088, 5750051	0.247	13	13.25	13.25	40	33%
	90.4 th ile of 24-hr mean	Boundary	543088, 5750051	1.749	22	22.25	14.75	50	44%
PM ₁₀ / 2021	Annual mean	Boundary	542988, 5750225	0.718	13	13.72	13.72	40	34%
	90.4 th ile of 24-hr mean	Boundary	542988, 5750225	1.839	22	22.72	14.84	50	45%
PM ₁₀ / 2022	Annual mean	Boundary	542988, 5750225	0.689	13	13.69	13.69	40	34%
	90.4 th ile of 24-hr mean	Boundary	542988, 5750225	1.681	22	22.69	14.68	50	45%
PM ₁₀ / 2023	Annual mean	Boundary	542988, 5750225	0.747	13	13.75	13.75	40	34%
	90.4 th ile of 24-hr mean	Boundary	542988, 5750225	1.873	22	22.75	14.87	50	45%
PM ₁₀ / 2024	Annual mean	Boundary	542988, 5750225	0.668	13	13.67	13.67	40	34%
	90.4 th ile of 24-hr mean	Boundary	542988, 5750225	1.714	22	22.67	14.71	50	45%

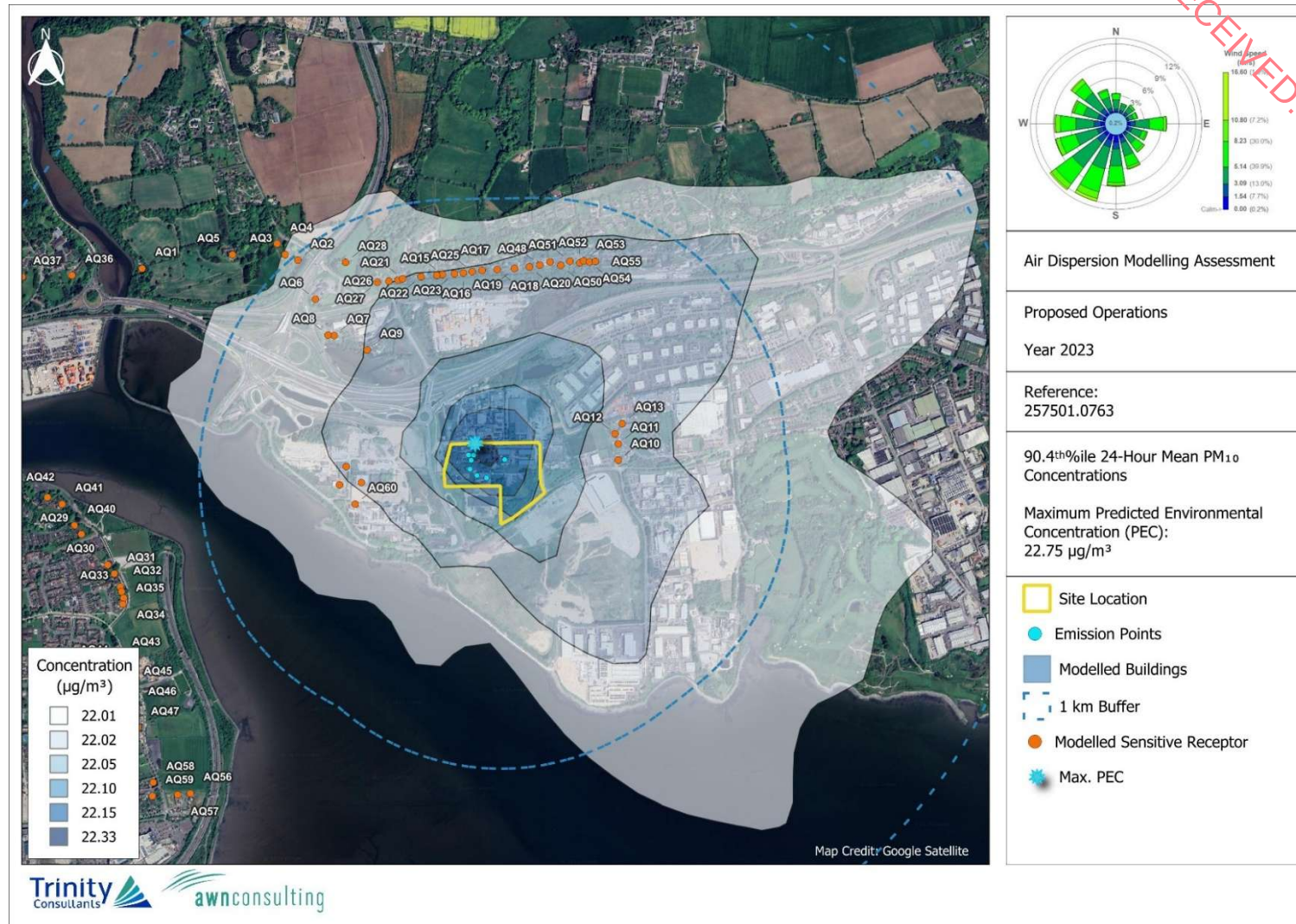


Figure 6-18 Proposed Operations – maximum 24-Hour PM_{10} concentrations (as 90.4th%ile).

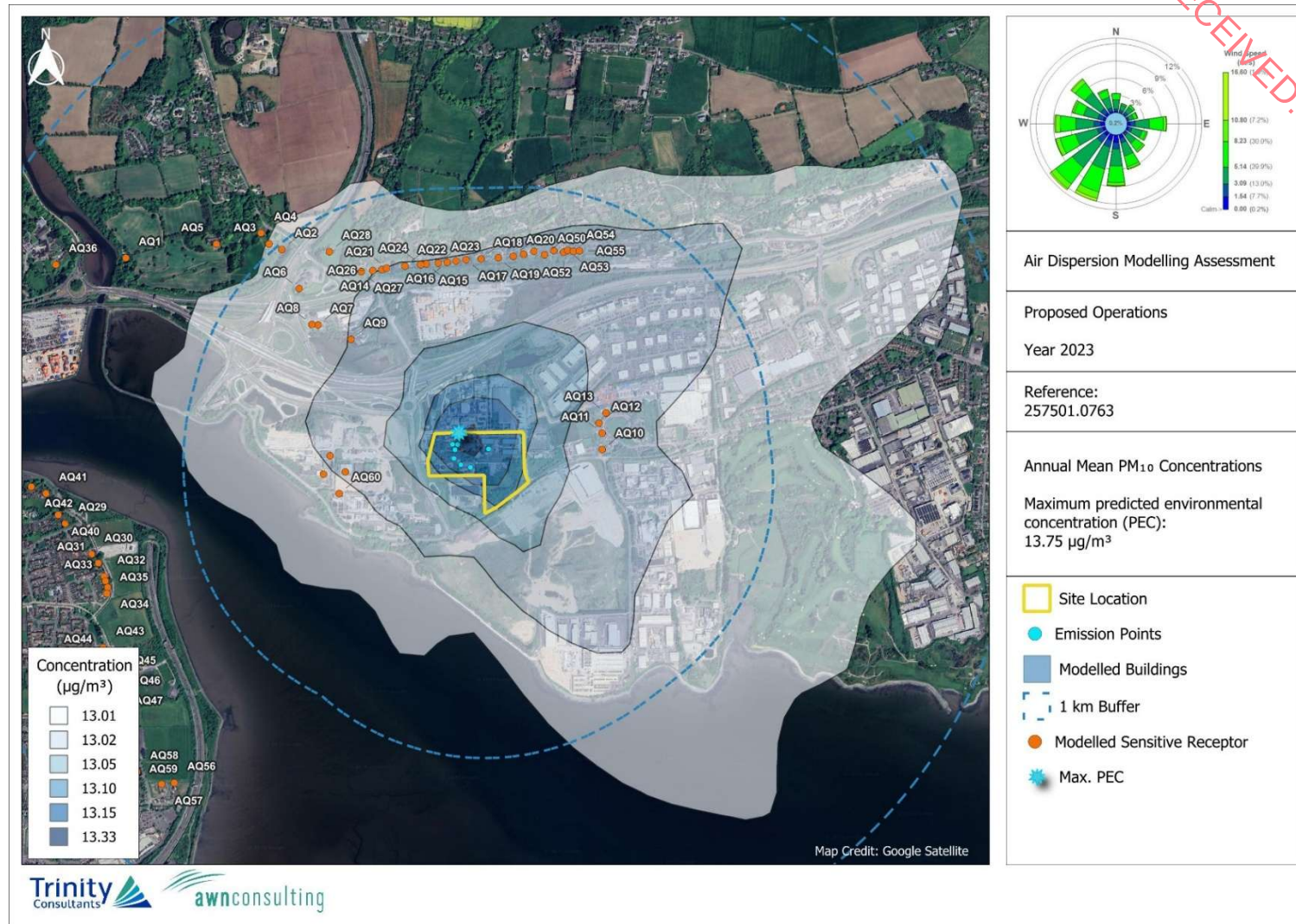


Figure 6-19 Proposed Operations – annual mean PM_{10} concentration.

6.5.3.1.3 *PM_{2.5} – Proposed Operations*

The results indicate that ambient ground level concentrations of PM_{2.5}, detailed in Table 6-35, 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 Installation 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, ambient concentrations (including background) will be 34% of the annual mean PM_{2.5} limit value of 25 µg/m³ at the worst-case receptor (location shown in Figure 6-19). As the annual mean PM_{2.5} concentrations have been conservatively assumed equal to the annual mean PM₁₀ concentrations, the direction and extent of the emission plume is identical to that shown in Figure 6-19.

Table 6-35 Proposed Operations – dispersion model results for particulate matter (PM_{2.5}).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC	Limit Value	
PM _{2.5} / 2020	Annual Mean	Boundary	542988, 5750225	0.488	7	7.488	25	30%
PM _{2.5} / 2021	Annual Mean	Boundary	542988, 5750225	1.312	7	8.312	25	33%
PM _{2.5} / 2022	Annual Mean	Boundary	542988, 5750225	0.539	7	7.539	25	30%
PM _{2.5} / 2023	Annual Mean	Boundary	542988, 5750225	1.379	7	8.379	25	34%
PM _{2.5} / 2024	Annual Mean	Boundary	542988, 5750225	0.517	7	7.517	25	30%

6.5.3.1.4 *VOC – Proposed Operations*

The VOC modelling results are detailed in Table 6-36 and Table 6-37. The results indicate that the ambient ground level concentrations are below the relevant air quality guidelines for individual VOCs even when it is assumed that each emission point is emitting solely the VOC of concern at the IED emission limit for the full year. Emissions from the proposed VOC abatement system onsite lead to ambient individual VOC concentrations which are no more than 0.5% of the maximum 1-hour limit value at the worst-case receptor (see Figure 6-20) and no more than 0.1% of the annual mean limit value at the worst-case off-site location (see Figure 6-21).

Table 6-36 VOCs dispersion model results – process contributions under normal operations – maximum 1-Hour scenario.

Pollutant	1-Hour EAL $\mu\text{g}/\text{m}^3$	2020	2021	2022	2023	2024	Max PEC % of EAL
Methanol	33,300	35	34	34	37	36	0.1%
Ethanol	576,000	25	24	25	27	26	0.005%
Acetone	362,000	21	20	21	22	22	0.01%
Heptane	6,255	15	15	15	17	16	0.3%
MEK (Methyl Ethyl Ketone)	89,900	19	19	19	21	20	0.02%
Butanol	4,500	20	20	20	22	21	0.5%
Background levels of all VOCs are likely to be well below $1 \mu\text{g}/\text{m}^3$ in the vicinity of the facility. As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.							

Table 6-37 VOCs dispersion model results – process contributions under normal operations – annual mean scenario.

Pollutant	Annual Mean EAL $\mu\text{g}/\text{m}^3$	2020	2021	2022	2023	2024	Max PEC % of EAL
Methanol	2,660	3.2	3.7	3.5	3.67	3.3	0.1%
Ethanol	19,200	2.3	2.7	2.5	2.6	2.4	0.01%
Acetone	18,100	2.0	2.2	2.1	2.2	2.0	0.01%
Heptane	208,500	1.4	1.7	1.5	1.6	1.5	0.001%
MEK (Methyl Ethyl Ketone)	6,000	1.8	2.1	1.9	2.1	1.8	0.03%
Butanol	30,000	1.9	2.1	2.0	2.1	1.9	0.01%
Background levels of all VOCs are likely to be well below $1 \mu\text{g}/\text{m}^3$ in the vicinity of the facility. As a worst-case all VOCs released assumed to consist of each individual VOC in turn for the annual mean scenario.							

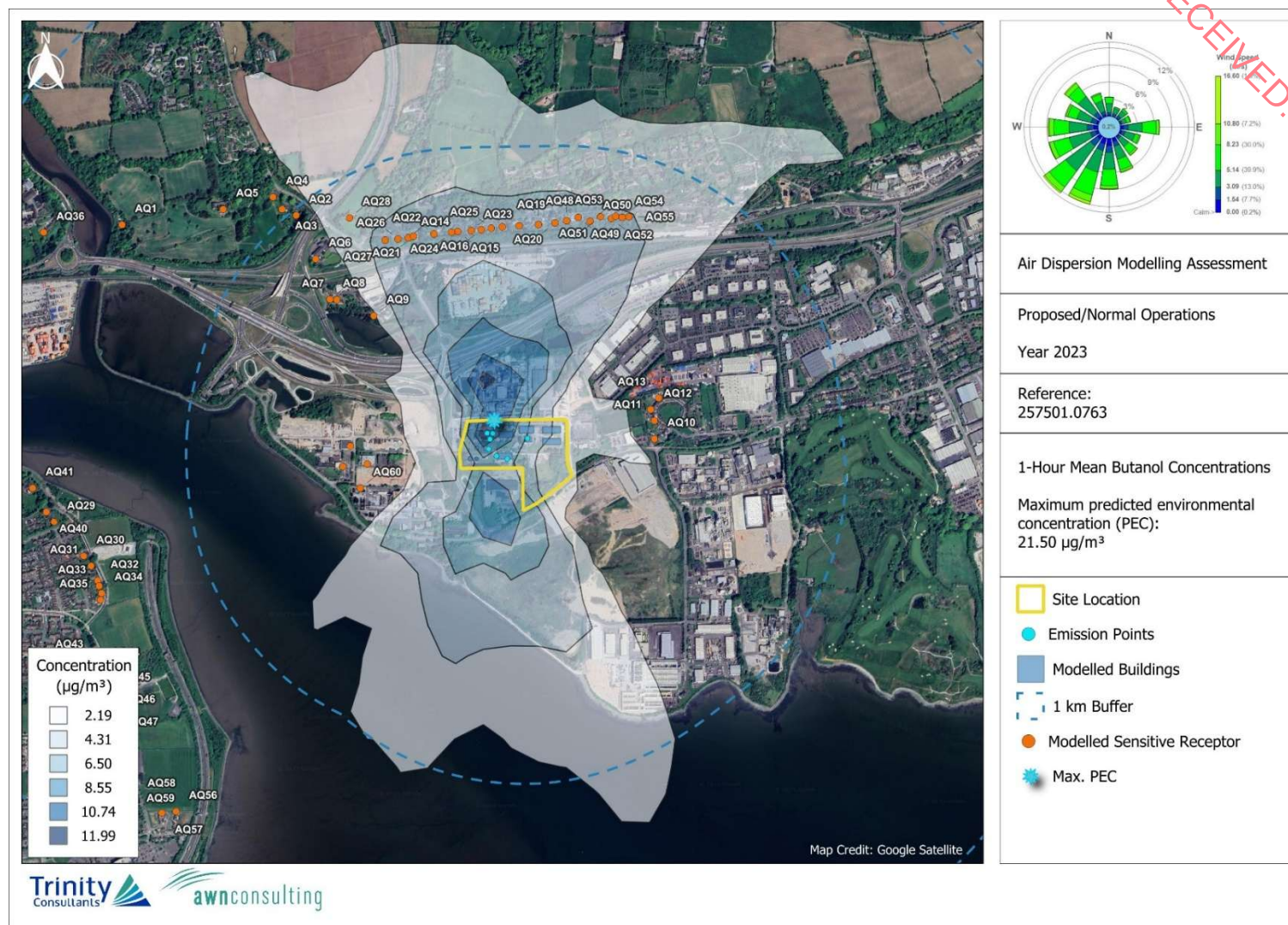


Figure 6-20 Maximum 1-hour mean VOC (butanol) concentrations ($\mu\text{g}/\text{m}^3$, as carbon).

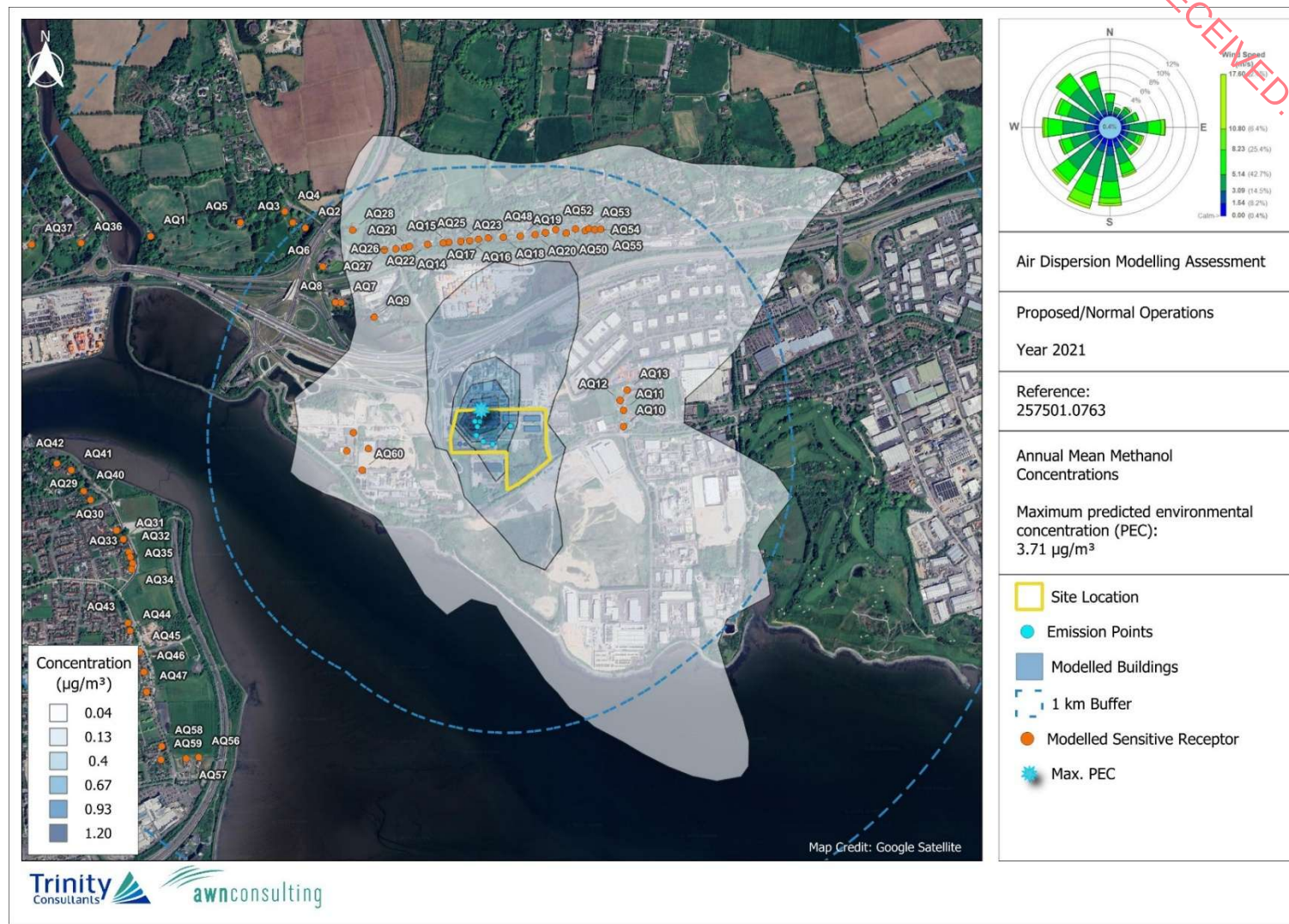


Figure 6-21 Maximum annual mean VOC (methanol) concentrations ($\mu\text{g}/\text{m}^3$, as carbon).

6.5.3.2 Air Dispersion Modelling Assessment – Ecology

6.5.3.2.1 NO_x - Proposed Operations

The NO_x modelling results for ecological receptors under the Proposed Operations scenario are detailed in Table 6-38 and Table 6-39.

Process contributions (PCs) of NO_x at ecological receptors within the model study area identified in section 6.4.3.2.2 were compared to the relevant critical level (identified in section 6.3.2.2.1).

As per the IN2 guidance, where a PC is greater than 1% of the critical level, this site has been included in further assessment where the Predicted Environmental Concentrations (PEC) is determined by combining the background concentration with the PC. These results are presented below.

PCs are greater than 1% of the relevant critical level within the most impacted European site (Cork Harbour SPA, in terms of PEC). At the worst-case location within this site (shown in Figure 6-22), emissions from the proposed development lead to an ambient NO_x concentration (including background) which is at most 5% of the annual limit value over the five years of meteorological data modelled.

Figure 6-22 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 6-38 Proposed Operations – NO_x designated habitat dispersion model results.

Ecological Receptor	NO _x Process Contributions (µg/m ³)					Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024	X	Y
Great Island Channel SAC	0.22	0.19	0.20	0.23	0.19	545154	5751198
Cork Harbour SPA	0.62	0.68	0.69	0.53	0.69	543765	5749257

Table 6-39 Proposed Operations – NO_x designated habitat dispersion model results (continued).

Ecological Receptor	Max. PC (µg/m ³)	Critical Level (µg/m ³)	Max PC % of Critical Level	Considered for further assessment?	Back-ground (µg/m ³)	PEC (µg/m ³)	PEC % of critical level
Great Island Channel SAC	0.23	30	0.8%	No	0.624	0.86	3%
Cork Harbour SPA	0.69	30	2.3%	Yes	0.799	1.49	5%

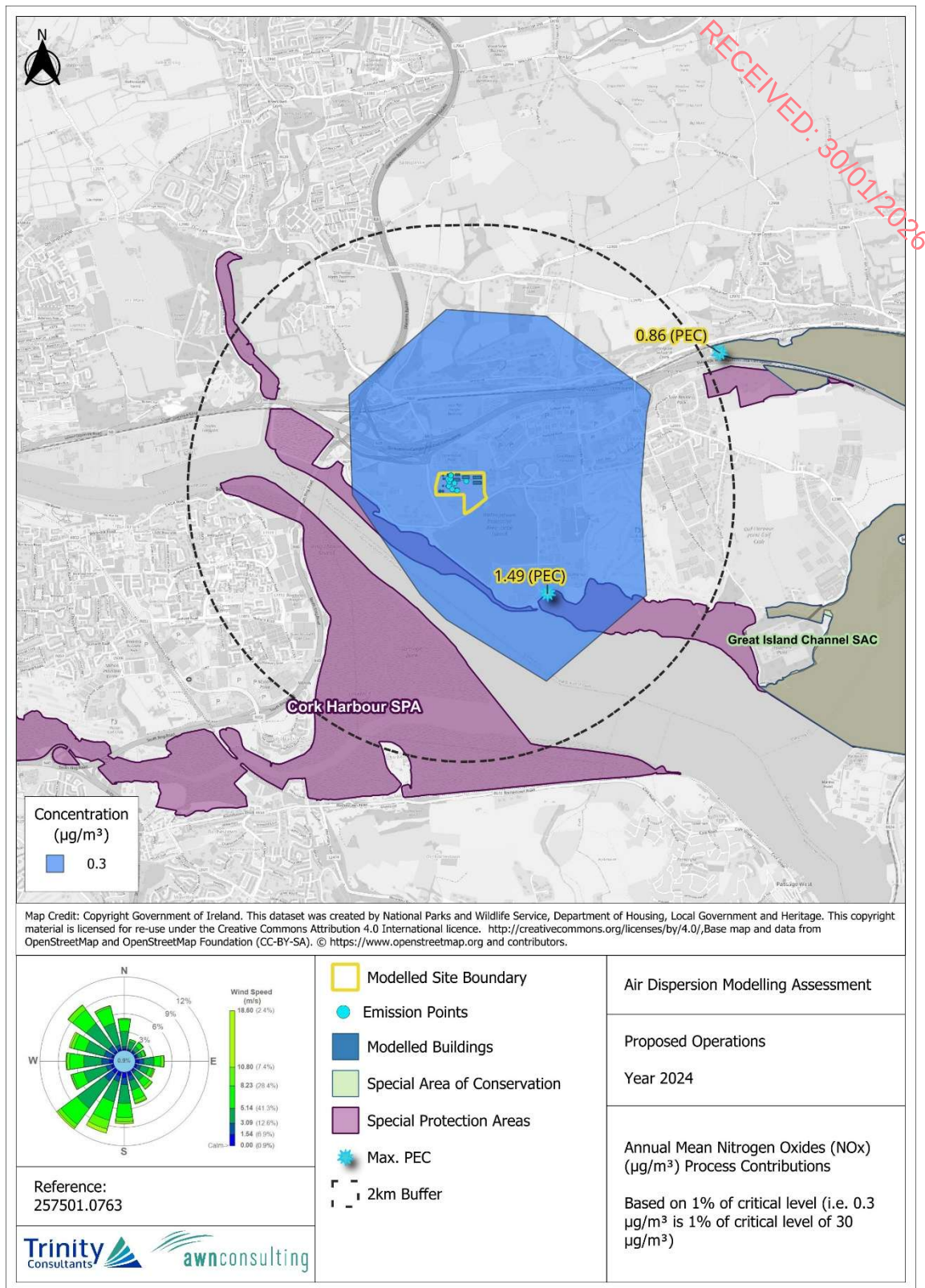


Figure 6-22 Proposed Operations – NO_x process contributions as 1% of Critical Level.

6.5.3.2.2 Nitrogen Deposition - Proposed Operations

In order to consider the effects of nitrogen deposition (as N) owing to emissions from the proposed development on 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 6.1.6) and shown in Table 6-40 and Table 6-41.

As per section 3.2.3, process contributions (PCs) of nitrogen deposition at ecological receptors within the model study area identified in section 4.2 were compared to the relevant critical load (identified in section 3.2.2).

As per the IN2 guidance, 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.

Within the most impacted European site (Cork Harbour SPA, in terms of PEC), at the worst-case location (shown in Figure 6-23), the maximum nitrogen deposition level is 5.489 kg N/ha/yr. This is within the lowest critical load range of 5-10 kg N/ha/yr but above the lowest critical load of 5 kg N/ha/yr for the most sensitive feature *A193 Sterna hirundo (Northern/Eastern Europe - breeding)* and its corresponding nitrogen critical load class *Shifting coastal dunes (EUNIS code is B1.3 which includes both H2110 Embryonic Shifting Dunes and H2120 Marram Dunes (White Dunes) habitats)*.

Figure 6-23 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 load of 5 kg N/ha/yr. None of the sensitive features listed above are within the 1% contour (the closest H2110 and H2120 habitat to the proposed development is approx. 25km to the south-east), indicating that nitrogen deposition from the proposed development is unlikely to have a significant effect on these features.

Table 6-40 Proposed Operations – nitrogen deposition dispersion model results at ecological receptors.

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Nitrogen Deposition (kg/ha/yr)
	2020	2021	2022	2023	2024		
Great Island Channel SAC	0.20	0.17	0.18	0.21	0.17	0.0003	0.030
Cork Harbour SPA	0.56	0.61	0.62	0.48	0.62	0.0009	0.089

Table 6-41 Proposed Operations – nitrogen deposition dispersion model results at ecological receptors (continued).

Ecological Receptor	Total PC Nitrogen Dep. (kg N/ha /yr)	Assessment critical load (kg N/ha/yr)	PC % of critical load	Further assessment?	APIS Background Nitrogen Dep. (kg N/ha/yr)	Total PEC Nitrogen Dep. (kg N/ha /yr)	Location of max. PC (UTM Zone 29 N)	
							X	Y
Great Island Channel SAC	0.030	7.5	0.4%	No	5.200	5.230	549514	5750447
Cork Harbour SPA	0.089	5.0	1.8%	Yes	5.400	5.489	543765	5749257
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.								

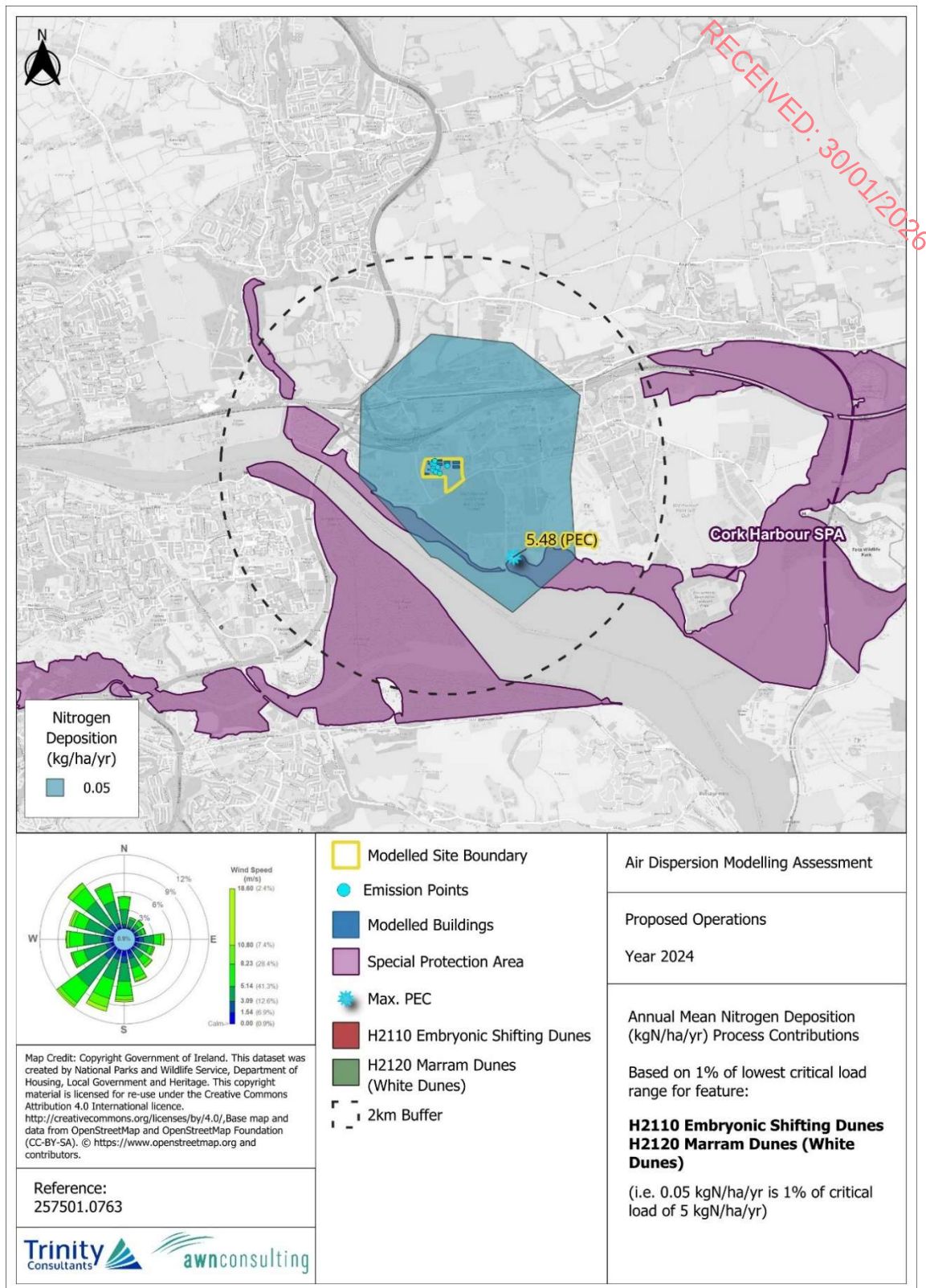


Figure 6-23 Proposed Operations – nitrogen deposition process contributions as 1% of Critical Load (5 kg N/ha/yr).

6.5.3.2.3 Acid Deposition (as N) - Proposed Operations

In order to consider the effects of acid deposition (as N) owing to emissions from the proposed development on ecological habitat sites, 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 6.2.4).

As per section 6.2.4.3, process contributions (PCs) of acid deposition (as N) at ecological receptors within the model study area identified in section 6.4.3.2.2 were compared to the relevant critical load (identified in section 6.2.2.2), and are shown Table 6-43 and Table 6-42.

As per the IN2 guidance, 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 (Cork Harbour SPA, in terms of PEC). At the worst-case location, the maximum total acid deposition (as N) flux is 0.566 keq/ha/yr. This is below the maximum critical load of 0.714 keq/ha/yr for the most sensitive features *A017 Phalacrocorax carbo (North-western Europe)*, *A005 Podiceps cristatus (North-western Europe - wintering)* and *A193 Sterna hirundo (Northern/Eastern Europe - breeding)*.

Figure 6-24 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 0.143 kg N/ha/yr. None of the relevant acid critical load classes (acid grassland, calcareous grassland and freshwater, and their associated individual habitats) for the sensitive features are within the Cork Harbour SPA where it overlaps with the 1% contour, indicating that acid deposition (as N) from the proposed development is unlikely to have a significant effect on these features.

Table 6-42 Proposed Operations – acid deposition (as N) dispersion model results at ecological receptors.

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Acid Deposition (keq/ha/year)	Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024			X	Y
Great Island Channel SAC	0.20	0.17	0.18	0.21	0.17	0.00032	0.002	549514	5750447
Cork Harbour SPA	0.56	0.61	0.62	0.48	0.62	0.00093	0.006	543765	5749257

Table 6-43 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	Considered for further assessment?	APIS Back-ground Acid Dep. (keq/ha/yr)	Total PEC Acid Dep. (N) (keq/ha/yr)	Critical load (MaxCLminN) for PEC (keq/ha/yr)
Great Island Channel SAC	0.0022	n/a	n/a	No	0.454	0.456	n/a
Cork Harbour SPA	0.0064	0.143	4.4%	Yes	0.560	0.566	0.714

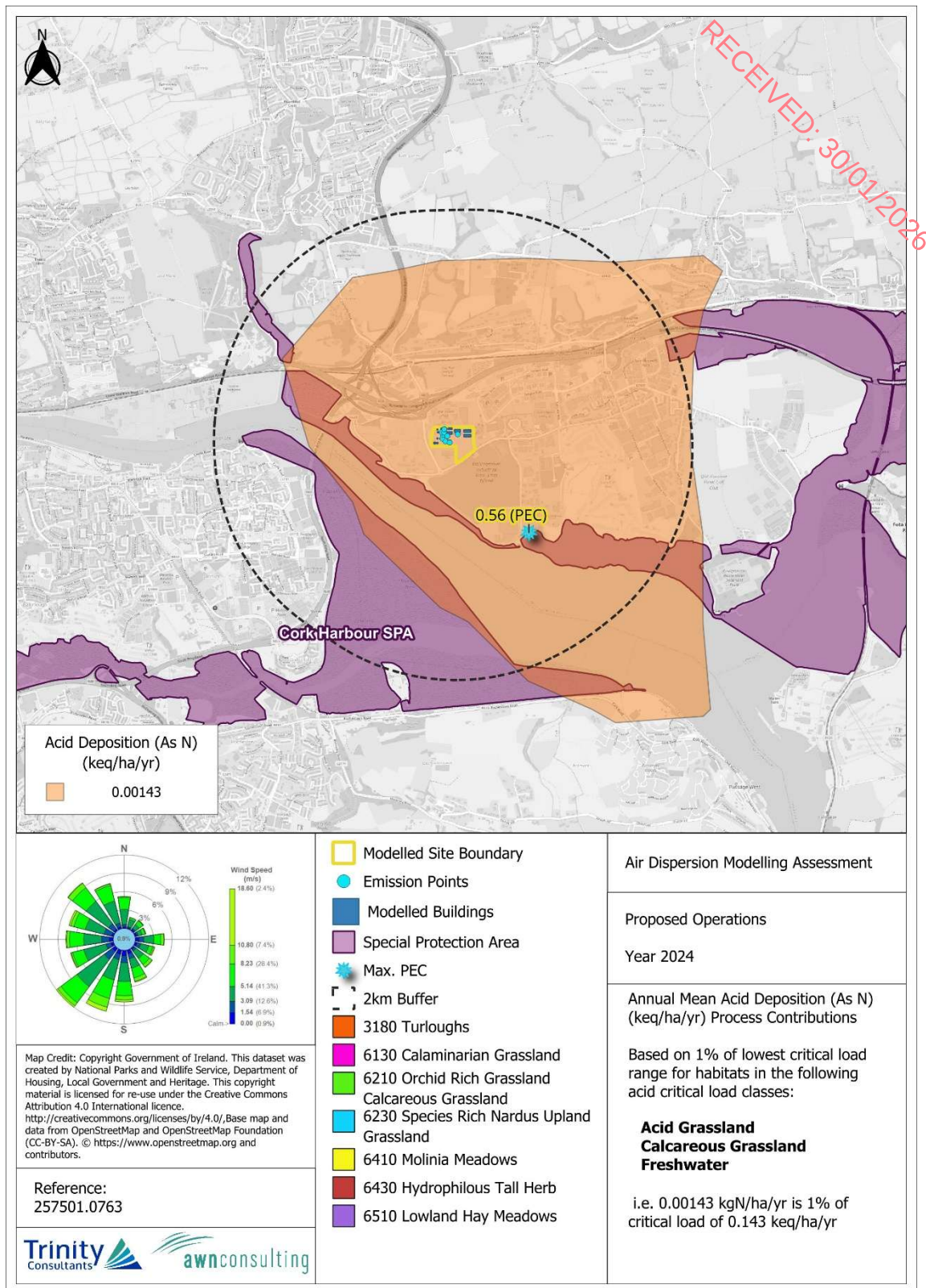


Figure 6-24 Proposed Operations – acid deposition (as N) process contributions as 1% of Critical Load (0.143 keq/ha/yr).

6.5.4 Cumulative Impacts

6.5.4.1 Construction Phase

According to the IAQM guidance (2024) should the construction phase of the proposed development coincide with the construction of any other permitted developments within 500m of the site, then there is the potential for cumulative dust impacts to the nearby sensitive receptors. Should simultaneous construction phases occur, it would lead to cumulative dust soiling and dust-related impacts on human health, specifically localised to the works area associated with the proposed works.

A review of the planned and permitted projects within the vicinity of the site was undertaken and is described in Chapter 4 – Planning and Development Context.

There is the potential for cumulative construction dust effects should the construction phases of the proposed development overlap. However, the dust mitigation measures outlined in section 6.6.1 will be applied throughout the construction phase of the proposed development which will avoid significant cumulative effects on air quality. With appropriate mitigation measures in place, the predicted cumulative effect on air quality associated with the construction phase of the proposed development are considered **direct, short-term, negative** and **not significant**.

6.5.4.2 Operational Phase

As the operational phase traffic has been scoped out of a detailed air quality assessment, it can therefore be determined that the potential cumulative operational stage traffic and future baseline traffic will have a **direct, long-term, negative** and **imperceptible** impact on air quality.

The potential for cumulative impact of the emissions from the facility with Industrial Emissions (IE) licenced or Integrated Pollution Control (IPC) installations has been considered, in line with the methodology of AG4 (EPA, 2020). In summary, emissions to atmosphere of NO₂ from the operational phase of the site will be in compliance with the ambient air quality standards which are based on the protection of the environment and human health. The effect of NO₂ emissions on air quality is therefore considered **direct, long-term, negative** and **not significant**.

6.5.4.2.1 Air Dispersion Modelling Assessment – Human Health

6.5.4.2.1.1 NO₂ – Cumulative

The results indicate that ambient ground level concentrations of NO₂, detailed in Table 6-44, 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 maximum emissions year, cumulative emissions lead to an ambient NO₂ concentration (including background) at the worst-case receptor which are at most:

- 96% of the annual mean limit value

- 47% of the 1-hour mean (measured as a 99.8th percentile) limit value

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 6-25 (1-hour mean) and Figure 6-26 (annual mean), to demonstrate the direction and extent of the emission plume. The locations of the maximum concentrations for NO₂ are close to the boundary of the site 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 **not significant**.

Table 6-44 Proposed Operations – dispersion model results for nitrogen dioxide (NO₂).

Pollutant / Year	Averaging Period	Worst Case Receptor		Concentrations (µg/m ³)				PEC as a % of Limit Value
		Type	X, Y (UTM Zone 29 N)	PC	Background	PEC	Limit Value	
NO ₂ / 2020	Annual Mean	Boundary	543977, 5749992	29.4	9	38.4	40	96%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.9	18	94.9	200	47%
NO ₂ / 2021	Annual Mean	Boundary	543977, 5749992	26.1	9	35.1	40	88%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.1	18	94.1	200	47%
NO ₂ / 2022	Annual Mean	Boundary	543977, 5749992	26.8	9	35.8	40	89%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.7	18	94.7	200	47%
NO ₂ / 2023	Annual Mean	Boundary	543977, 5749992	27.8	9	36.8	40	92%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.4	18	94.4	200	47%
NO ₂ / 2024	Annual Mean	Boundary	543977, 5749992	27.8	9	36.8	40	92%
	1-hr Mean (as 99.8 th ile)	Boundary	542988, 5750225	76.5	18	94.5	200	47%

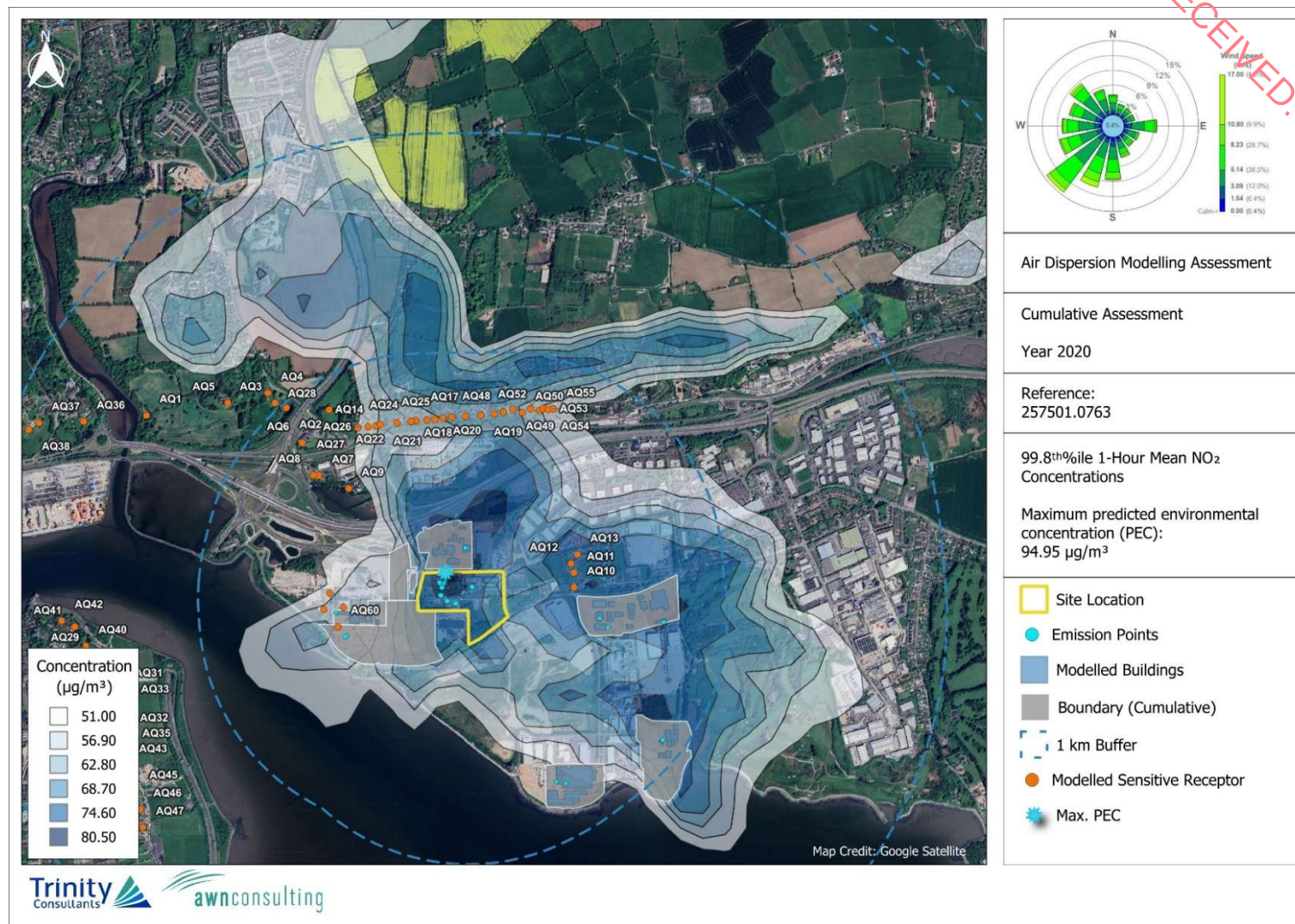


Figure 6-25 Cumulative assessment – maximum 1-hour NO₂ concentrations (as 99.8thile).

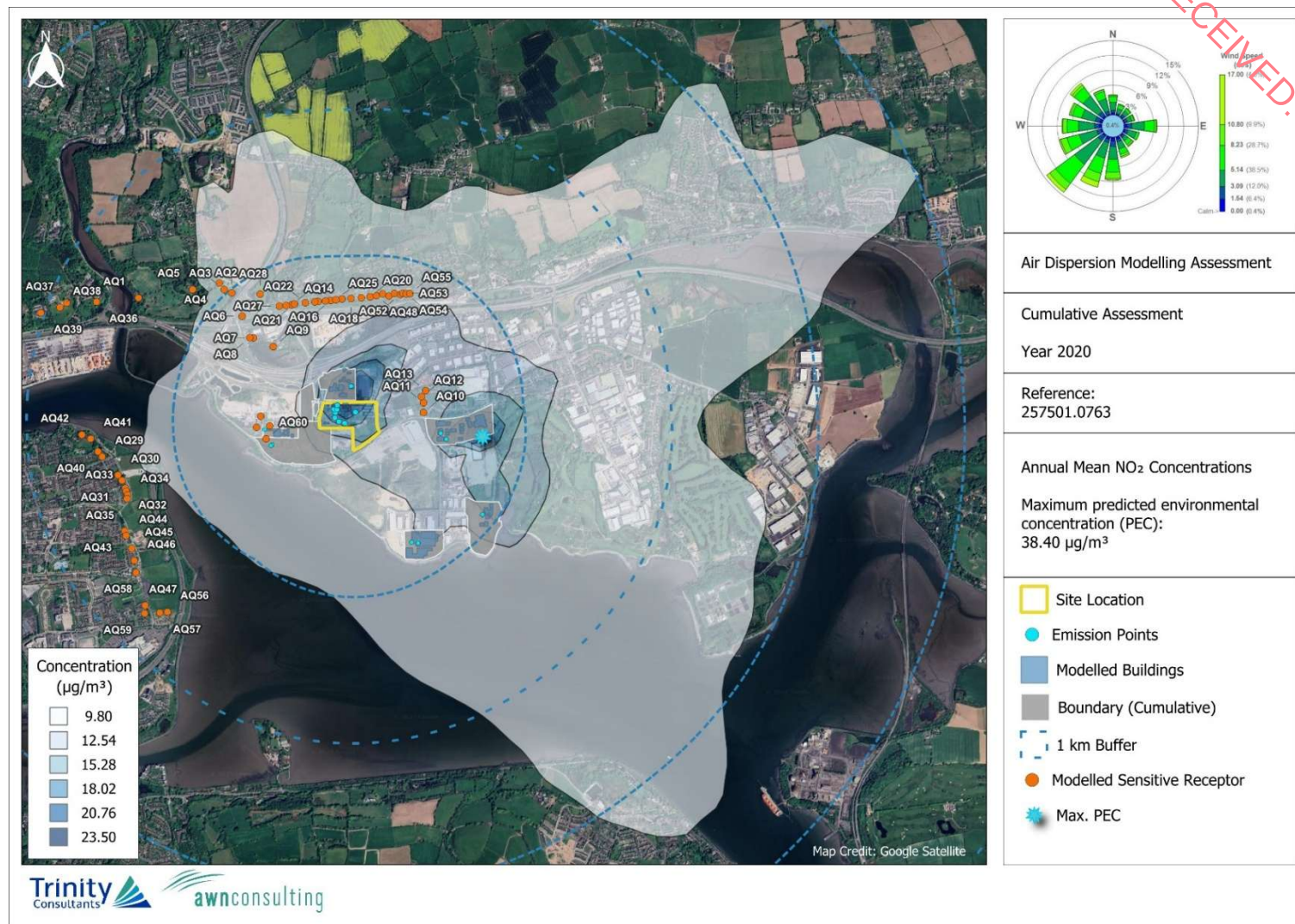


Figure 6-26 Cumulative assessment – maximum annual mean NO_2 concentration.

6.5.4.2.2 Air Dispersion Modelling Assessment – Ecology

6.5.4.2.2.1 NO_x – Cumulative

The NO_x modelling results for ecological receptors under the Cumulative Assessment scenario are detailed in Table 6-45 and Table 6-46.

Within the most impacted European site (in terms of PEC) (Cork Harbour SPA), at the worst-case location, cumulative emissions lead to a maximum ambient NO_x concentration (including background) which is at most 26% of the annual limit value site over the five years of meteorological data modelled.

Table 6-45 Cumulative assessment – NO_x designated habitat dispersion model results.

Ecological Receptor	NO _x Process Contributions (µg/m ³)					Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024	X	Y
Great Island Channel SAC	1.80	1.28	1.56	1.76	1.57	545154	5751198
Cork Harbour SPA	5.97	6.66	6.45	5.33	7.14	543765	5749257

Table 6-46 Cumulative assessment – NO_x designated habitat dispersion model results (continued).

Ecological Receptor	Max. PC (µg/m ³)	Critical Level (µg/m ³)	Max PC % of Critical Level	Considered for further assessment?	Background (µg/m ³)	PEC (µg/m ³)	PEC % of critical level
Great Island Channel SAC	1.80	30	6%	Yes	0.624	2.42	8%
Cork Harbour SPA	7.14	30	24%	Yes	0.799	7.94	26%

6.5.4.2.2.1 Nitrogen Deposition – Cumulative

In order to consider the effects of nitrogen deposition (as N) owing to emissions from the proposed development and cumulative sites on 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 6.3.4.3) and shown in Table 6-47 and Table 6-48.

Within the most impacted European site (Cork Harbour SPA, in terms of PEC), at the worst-case location, the maximum nitrogen deposition level is 6.318 kgN/ha/yr. This is within the critical load range of 5-10 kg N/ha/yr but above the lowest critical load of 5 kg N/ha/yr for the most sensitive most sensitive feature A193 *Sterna hirundo* (Northern/Eastern Europe - breeding) and its corresponding nitrogen critical load class *Shifting coastal dunes* (EUNIS code is B1.3 which includes both H2110 Embryonic Shifting Dunes and H2120 Marram Dunes (White Dunes) habitats).

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 6-47 Cumulative assessment – nitrogen deposition dispersion model results at ecological receptors

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Nitrogen Deposition (kg/ha/yr)
	2020	2021	2022	2023	2024		
Great Island Channel SAC	1.62	1.15	1.40	1.58	1.41	0.0024	0.233
Cork Harbour SPA	5.32	5.94	5.76	4.75	6.38	0.0096	0.918

Table 6-48 Cumulative Assessment – nitrogen deposition dispersion model results at ecological receptors (continued).

Ecological Receptor	Total PC Nitrogen Dep. (kg N/ha /yr)	Assessment critical load (kg N/ha /yr)	PC % of critical load	Further assessment?	APIS Background Nitrogen Dep. (kg N/ha /yr)	Total PEC Nitrogen Dep. (kg N/ha /yr)	Location of max. PC (UTM Zone 29 N)	
							X	Y
Great Island Channel SAC	0.233	7.5	3.1%	Yes	5.200	5.433	549514	5750447
Cork Harbour SPA	0.918	5.0	18.4%	Yes	5.400	6.318	543765	5749257

6.5.4.2.2.1 Acid Deposition (As N) – Cumulative

In order to consider the effects of acid deposition (as N) owing to emissions from the proposed development and cumulative sites on ecological habitat sites, 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 6.3.4.2.1) and shown in Table 6-49 and Table 6-50.

Within the most impacted European site (Cork Harbour SPA, in terms of PEC). At the worst-case location, the maximum total acid deposition (as N) flux is 0.625 keq/ha/yr. This is below the maximum critical load of 0.714 keq/ha/yr for the most sensitive features most sensitive features A017 *Phalacrocorax carbo* (North-western Europe), A005 *Podiceps cristatus* (North-western Europe - wintering) and A193 *Sterna hirundo* (Northern/Eastern Europe - breeding).

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 6-49 Cumulative assessment – acid deposition (as N) dispersion model results at ecological receptors.

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Acid Deposition (keq/ha/yr)	Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024			X	Y
Great Island Channel SAC	1.62	1.15	1.40	1.58	1.41	0.0024	0.017	549514	5750447

Ecological Receptor	NO ₂ Process Contributions (µg/m ³)					NO ₂ Dry Deposition (µg/m ² /s)	NO ₂ Acid Deposition (keq/ha/yr)	Location of max. PC (UTM Zone 29 N)	
	2020	2021	2022	2023	2024			X	Y
Cork Harbour SPA	5.32	5.94	5.76	4.75	6.38	0.0096	0.065	543765	5749257

Table 6-50 Cumulative assessment – 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)
Great Island Channel SAC	0.0166	n/a	n/a	No	0.454	0.471	n/a
Cork Harbour SPA	0.0655	0.143	45.8%	Yes	0.560	0.625	0.714

6.6 Mitigation Measures

6.6.1 Construction Phase

Based on the assessment results in section 6.5.2.1, mitigation associated with a medium risk of construction dust impacts is required. Mitigation measures for high-risk sites as recommended by IAQM construction dust guidance are detailed in Table 6-51.

Table 6-51 Construction phase dust mitigation measures.

Category	Mitigation Measure
Communications	- 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.
Site Management	- 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.
Preparing and Maintaining the Site	- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period - Avoid site runoff of water or mud. - Keep site fencing, barriers and scaffolding clean using wet methods. - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. - Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel	- Ensure all vehicles switch off engines 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 km/hr on surfaced and 15 km/hr 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).
Operations	- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate - Use enclosed chutes and conveyors and covered skips.

Category	Mitigation Measure
	- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. - Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management	Bonfires and burning of waste materials are legally prohibited.
Measures Specific to Earthworks	- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as is practicable. - Only remove the cover in small areas during work and not all at once.
Measures Specific to Construction	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.
Measures Specific to Trackout	- 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. - Record all inspections of haul routes and any subsequent action in a site logbook. - 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 permit. - Access gates to be located at least 10 m from receptors where possible.

6.6.2 Operational Phase

There is no mitigation required for the operational phase of the development as effects on air quality are predicted to be **direct, long-term, negative and not significant**, which is overall **not significant** in EIA terms.

6.6.3 Monitoring Measures

The following monitoring measures for construction phase are proposed (as stated in Table 6-51) to ensure the dust mitigation measures are working satisfactorily:

- To determine if any short-term dust impacts will occur, undertaking daily on-site and off-site inspections where receptors (including roads) are nearby highly recommended by the IAQM guidance. Inspection results should be recorded in the site inspection log. This should 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 CEMP, 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. The potential for dust generation increases when rainfall is less than 0.2 mm/day and at wind speeds of greater than 10 m/s. To determine if these conditions are likely to affect the site, the weather forecast should be consulted daily, specifically the hourly forecasts for wind speeds as well as 12-hour rainfall radar showing anticipated amounts of precipitation in mm.
- Monitoring of operational phase emissions as per the conditions of the existing and future reviewed IE Licence for the site will be undertaken in line with the EPA requirements.

6.7 Residual Impacts

6.7.1 Construction Phase

To minimise dust emissions during construction, a series of mitigation measures have been prepared as outlined in section 6.6.1. Provided the dust minimisation measures are adhered to, the predicted residual air quality impacts during the construction phase are **short-term, direct, negative, localised** and **not significant**.

6.7.2 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 section 6.3.4.4.2. Therefore, emissions from the proposed development will have a **direct, long-term, negative** and **not significant** impact on air quality.

6.7.3 Risk to Human Health

Dust emissions from the construction phase of the proposed development have the potential to affect human health through the release of PM₁₀ and PM_{2.5} emissions. As per section 6.4.3.1, the surrounding area is of low sensitivity to dust related human health impacts. It was determined that there is an overall low risk of dust related human health effects as a result of the construction phase of the proposed development.

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development

complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of the construction phase of the proposed development is likely to be **direct, short-term, negative** and **not significant** with respect to human health, which is overall not significant in EIA terms.

RECEIVED: 30/01/2026

6.8 References

- Air Pollution Information System (APIS) (2025) GIS map tool <https://www.apis.ac.uk/app>
- Alaska Department of Environmental Conservation (ADEC) (2008) ADEC Guidance re AERMET Geometric Means (<http://dec.alaska.gov/air/ap/modeling.htm>)
- BRE (2003) Controlling Particles, Vapours & Noise Pollution from Construction Sites
- Danish Environmental Guidelines (2002) Guidelines for Air Emission Regulation “C”
- Department of the Environment Heritage and Local Government (DEHLG) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities
- Electric Power Research Institute (EPRI) (2020) Phase II Assessment of NO₂/NO_x Ratios at Fossil Fuel Power Plants. Palo Alto, CA: 3002017533.
- Environmental Protection Agency (EPA) (2006) Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)
- Environmental Protection Agency (EPA) and University College Dublin (UCD) (2017) Ambient Atmospheric Ammonia in Ireland, 2013-2014
- Environmental Protection Agency (EPA) (2019) Odour Emissions Guidance Note (AG9)
- Environmental Protection Agency (EPA) (2020) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)
- Environmental Protection Agency (EPA) (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
- Environmental Protection Agency (EPA) (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)
- Environmental Protection Agency (EPA) (2025) Air Quality in Ireland 2024 (& previous annual reports 2019-2023)
- German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft
- Government of Ireland (2023) Clean Air Strategy for Ireland
- Hanrahan, P (1999a) The Plume Volume Molar Ratio Method for Determining NO₂/NO_x Ratios in Modelling – Part 1: Methodology J. Air & Waste Management Assoc. 49 1324-1331.
- Hanrahan, P (1999b) The Plume Volume Molar Ratio Method for Determining NO₂/NO_x Ratios in Modelling – Part 21: Evaluation Studies J. Air & Waste Management Assoc. 49 1332-1338.
- Institute of Air Quality Management (IAQM) (2020) A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1)
- Institute of Air Quality Management (IAQM) (2024) Guidance on the Assessment of Dust from Demolition and Construction (Version 2.2)

Met Éireann (2025) Met Éireann website: <https://www.met.ie/>

National Parks and Wildlife Service (NPWS) (2025). NPWS Designations Viewer. Available online at: <https://experience.arcgis.com/experience/edf34d92e28040fd87d3d14f55d8d95f>

Paine, R & Lew, F. (1997a) "Consequence Analysis for Adoption of PRIME: an Advanced Building Downwash Model" Prepared for the EPRI, ENSR Document No. 2460-026-450.

Paine, R & Lew, F. (1997b) "Results of the Independent Evaluation of ISCST3 and ISC-PRIME" Prepared for the EPRI, ENSR Document No. 2460-026-3527-02.

Schulman, L.L; Strimaitis, D.G.; Scire, J.S. (2000) Development and evaluation of the PRIME plume rise and building downwash model. Journal of the Air & Waste Management Association, 50, 378-390.

The Scottish 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

Transport Infrastructure Ireland (2025) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

UK DEFRA (2022) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(22)

UK Environment Agency (2003) IPPC Environmental Assessment and Appraisal of BAT

UK Environment Agency (2014) AGTAG06 – Technical Guidance on Detailed Modelling Approach for An Appropriate Assessment for Emissions to Air

UK Environment Agency (2025) Air emissions risk assessment for your environmental permit. Available online at: <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas>

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

United Nations Economic Commission for Europe (UNECE) (2003). Critical Loads for Nitrogen Expert Workshop 2002

United Nations Economic Commission for Europe (UNECE) and German Environment Agency (GEA) (2022) Review of Internationally Proposed Critical Levels for Ammonia Proceedings of an Expert Workshop held in Dessau and online on 28/29 March 2022

US Environmental Protection Agency (USEPA) (1985) Good Engineering Practice Stack Height (Technical Support Document for The Stack Height Regulations) (Revised)

US Environmental Protection Agency (USEPA) (1995) User's Guide for the Industrial Source Complex (ISC3) Dispersion Model Vol I & II

US Environmental Protection Agency (USEPA) (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

US Environmental Protection Agency (USEPA) (1998) Human Health Risk Assessment Protocol, Chapter 3: Air Dispersion and Deposition Modelling, Region 6 Centre for Combustion Science and Engineering

US Environmental Protection Agency (USEPA) (1999) Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3 vs. CTDM PLUS

US Environmental Protection Agency (USEPA) (2000) Seventh Conference on Air Quality Modelling (June 2000) Vol I & II

US Environmental Protection Agency (USEPA) (2005) Guidelines on Air Quality Models, Appendix W to Part 51, 40 CFR Ch.1

US Environmental Protection Agency (USEPA) (2008) AERSURFACE User's Guide

US Environmental Protection Agency (USEPA) (2017) AERMAP Users Guide

US Environmental Protection Agency (USEPA) (2018) User's Guide to the AERMOD Meteorological Preprocessor (AERMET)

US Environmental Protection Agency (USEPA) (2022) AERMOD Description of Model Formulation and Evaluation

World Health Organisation (2021) Air Quality Guidelines (and previous Air Quality Guideline Reports 1999 & 2000 & 2006)

This page is intentionally blank.

RECEIVED: 30/01/2026

Appendix 6-A

Description of the AERMOD Model

The AERMOD dispersion model has been developed in part by the U.S. Environmental Protection Agency (USEPA) (USEPA, 1995; 1998; 1999; 2000; 2005; 2022). The model is a steady-state Gaussian model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement on the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources.

Improvements over the ISCST3 model include the treatment of the vertical distribution of concentration within the plume. ISCST3 assumes a Gaussian distribution in both the horizontal and vertical direction under all weather conditions. AERMOD with PRIME, however, treats the vertical distribution as non-Gaussian under convective (unstable) conditions while maintaining a Gaussian distribution in both the horizontal and vertical direction during stable conditions. This treatment reflects the fact that the plume is skewed upwards under convective conditions due to the greater intensity of turbulence above the plume than below. The result is a more accurate portrayal of actual conditions using the AERMOD model. AERMOD also enhances the turbulence of night-time urban boundary layers thus simulating the influence of the urban heat island.

In contrast to ISCST3, AERMOD is widely applicable in all types of terrain. Differentiation of the simple versus complex terrain is unnecessary with AERMOD. In complex terrain, AERMOD employs the dividing-streamline concept in a simplified simulation of the effects of plume-terrain interactions. In the dividing-streamline concept, flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. Extensive validation studies have found that AERMOD (precursor to AERMOD with PRIME) performs better than ISCST3 for many applications and as well or better than CTDMPPLUS for several complex terrain data sets (Paine, 1997b).

Due to the proximity to surrounding buildings, the PRIME (Plume Rise Model Enhancements) building downwash algorithm has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered. The PRIME algorithm takes into account the position of the stack relative to the building in calculating building downwash. In the absence of the building, the plume from the stack will rise due to momentum and/or buoyancy forces. Wind streamlines act on the plume leads to the bending over of the plume as it disperses. However, due to the presence of the building, wind streamlines are disrupted leading to a lowering of the plume centreline.

When there are multiple buildings, the building tier leading to the largest cavity height is used to determine building downwash. The cavity height calculation is an empirical formula based on building height, the length scale (which is a factor of building height & width) and the cavity length (which is based on building width, length and height). As the direction of the wind will lead to the identification of differing dominant tiers, calculations are carried out in intervals of 10 degrees.

In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. Once the streamline encounters the zone of influence of the building, two forces act on the plume. Firstly, the disruption caused by the building leads to increased

turbulence and enhances horizontal and vertical dispersion. Secondly, the streamline descends in the lee of the building due to the reduced pressure and drags the plume (or part of) nearer to the ground, leading to higher ground level concentrations. The model calculates the descent of the plume as a function of the building shape and, using a numerical plume rise model, calculates the change in the plume centreline location with distance downwind.

The immediate zone in the lee of the building is termed the cavity or near wake and is characterised by high intensity turbulence and an area of uniform low pressure. Plume mass captured by the cavity region is re-emitted to the far wake as a ground-level volume source. The volume source is located at the base of the lee wall of the building, but is only evaluated near the end of the near wake and beyond. In this region, the disruption caused by the building downwash gradually fades with distance to ambient values downwind of the building.

AERMOD has made substantial improvements in the area of plume growth rates in comparison to ISCST3 (Paine, 1997a; Paine, 1997b; USEPA, 1999). ISCST3 approximates turbulence using six Pasquill-Gifford-Turner Stability Classes and bases the resulting dispersion curves upon surface release experiments. This treatment, however, cannot explicitly account for turbulence in the formulation. AERMOD is based on the more realistic modern planetary boundary layer (PBL) theory which allows turbulence to vary with height. This use of turbulence-based plume growth with height leads to a substantial advancement over the ISCST3 treatment.

Improvements have also been made in relation to mixing height (Paine, 1997a; Paine, 1997b; USEPA, 1999; USEPA, 2022). The treatment of mixing height by ISCST3 is based on a single morning upper air sounding each day. AERMOD, however, calculates mixing height on an hourly basis based on the morning upper air sounding and the surface energy balance, accounting for the solar radiation, cloud cover, reflectivity of the ground and the latent heat due to evaporation from the ground cover. This more advanced formulation provides a more realistic sequence of the diurnal mixing height changes.

AERMOD also has the capability of modelling both unstable (convective) conditions and stable (inversion) conditions. The stability of the atmosphere is defined by the sign of the sensible heat flux. Where the sensible heat flux is positive, the atmosphere is unstable whereas when the sensible heat flux is negative the atmosphere is defined as stable. The sensible heat flux is dependent on the net radiation and the available surface moisture (Bowen Ratio). Under stable (inversion) conditions, AERMOD has specific algorithms to account for plume rise under stable conditions, mechanical mixing heights under stable conditions and vertical and lateral dispersion in the stable boundary layer.

AERMOD also contains improved algorithms for dealing with low wind speed (near calm) conditions. As a result, AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s, but still greater than the instrument threshold.

Appendix 6-B

Meteorological Data – AERMET

AERMOD incorporates a meteorological pre-processor AERMET (version 16216) (USEPA, 2018). AERMET allows AERMOD to account for changes in the plume behaviour with height. AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, convective (CBL) and stable boundary layer (SBL) height and surface heat flux. AERMOD uses this information to calculate concentrations in a manner that accounts for changes in dispersion rate with height, allows for a non-Gaussian plume in convective conditions, and accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET meteorological preprocessor 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. A morning sounding from a representative upper air station, latitude, longitude, time zone, and wind speed threshold are also required.

Two files are produced by AERMET for input to the AERMOD dispersion model. The surface file contains observed and calculated surface variables, one record per hour. The profile file contains the observations made at each level of a meteorological tower, if available, or the one-level observations taken from other representative data, one record level per hour.

From the surface characteristics (i.e. surface roughness, albedo and amount of moisture available (Bowen Ratio) AERMET calculates several boundary layer parameters that are important in the evolution of the boundary layer, which, in turn, influences the dispersion of pollutants. These parameters include the surface friction velocity, which is a measure of the vertical transport of horizontal momentum; the sensible heat flux, which is the vertical transport of heat to/from the surface; the Monin-Obukhov length which is a stability parameter relating the surface friction velocity to the sensible heat flux; the daytime mixed layer height; the nocturnal surface layer height and the convective velocity scale which combines the daytime mixed layer height and the sensible heat flux. These parameters all depend on the underlying surface.

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 types was carried out in line with USEPA recommendations (USEPA, 2005) and using the detailed methodology outlined by the Alaska Department of Environmental Conservation (ADEC, 2008). AERMET has also been updated to allow for an adjustment of the surface friction velocity (u^*) for low wind speed stable conditions based on the work of Qian and Venkatram. Previously, the model had a tendency to over-predict concentrations produced by near-ground sources in stable conditions.

Surface roughness

Surface roughness length is the height above the ground at which the wind speed goes to zero. Surface roughness length is defined by the individual elements on the landscape such as trees and buildings. In order to determine surface roughness length, the USEPA recommends that a

representative length be defined for each sector, based on geometric mean of the inverse distance area-weighted land use within the sector, by using the eight land use categories outlined by the USEPA. The area-weighted surface roughness length derived from the land use classification within a radius of 1 km from Cork Airport is shown in Table 6-52.

Table 6-52 Surface roughness based on an inverse distance area-weighted average of the land use within a 1 km radius of Cork Airport.

Sector	Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note 1}
350-50	60% Urban, 40% Grassland	0.213	0.305	0.093	0.093
50-350	100% Grassland	0.050	0.100	0.010	0.010
^{Note 1} Winter defined as periods when surfaces covered permanently by snow whereas autumn is defined as periods when freezing conditions are common, deciduous trees are leafless and no snow is present. Thus for the current location autumn more accurately defines "winter" conditions at the facility.					

Albedo

Noon-time Albedo is the fraction of the incoming solar radiation that is reflected from the ground when the sun is directly overhead. Albedo is used in calculating the hourly net heat balance at the surface for calculating hourly values of Monin-Obuklov length. The area-weighted arithmetic mean albedo derived from the land use classification over a 10 km x 10 km area centred on Cork Airport is shown in Table 6-53.

Table 6-53 Albedo based on an area-weighted arithmetic mean of the land use over a 10 km x 10 km area centred on Cork Airport.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note 1}
19% Urban, 81% Grassland	0.17	0.18	0.20	0.20
^{Note 1} For the current location autumn more accurately defines "winter" conditions at the facility.				

Bowen Ratio

The Bowen ratio is a measure of the amount of moisture at the surface of the earth. The presence of moisture affects the heat balance resulting from evaporative cooling which, in turn, affects the Monin-Obukhov length which is used in the formulation of the boundary layer. The area-weighted geometric mean Bowen ratio derived from the land use classification over a 10 km x 10 km area centred on Cork Airport is shown in Table 6-54.

Table 6-54 Bowen Ratio based on an area-weighted geometric mean of the land use over a 10 km x 10 km area centred on Cork Airport.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note 1}
19% Urban, 81% Grassland	0.47	0.95	1.14	1.14
^{Note 1} For the current location autumn more accurately defines "winter" conditions at the facility.				

7.0 NOISE AND VIBRATION

7.1 Introduction

This chapter assesses the potential noise and vibration impact of the proposed development at the Cara Partners site at Little Island Industrial Estate, Co. Cork. The assessment of impacts has been undertaken in the context of current relevant standards and guidance and identifies any requirements or possibilities for mitigation. A full description of the development can be found in Chapter 2 – Description of Proposed Development.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed in an environmentally sustainable manner to ensure minimal impact on the receiving environment.

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd:

Abe Scheele holds the Institute of Acoustics Diploma in Acoustics and Noise Control, along with City & Guilds Level 1 and 2 in Sound Engineering and City & Guilds Music Technology. Abe has been working in the field of acoustics since 2016. He is experienced in environmental, building and architectural acoustics. He has extensive experience of environmental surveying, noise modelling, impact assessment of environmental noise and architectural acoustic assessments for various sectors, including industrial, commercial and residential.

Mike Simms (Principal Acoustic Consultant) holds a BE and M Eng Sc in Mechanical Engineering and is a member of the Institute of Acoustics and of the Institution of Engineering and Technology. Mike has worked in the field of acoustics for 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

7.1.1 Fundamentals of Acoustics

To provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. To take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. To rank the SPL of various noise sources, the measured level must be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 7-1.

The 'A' subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.

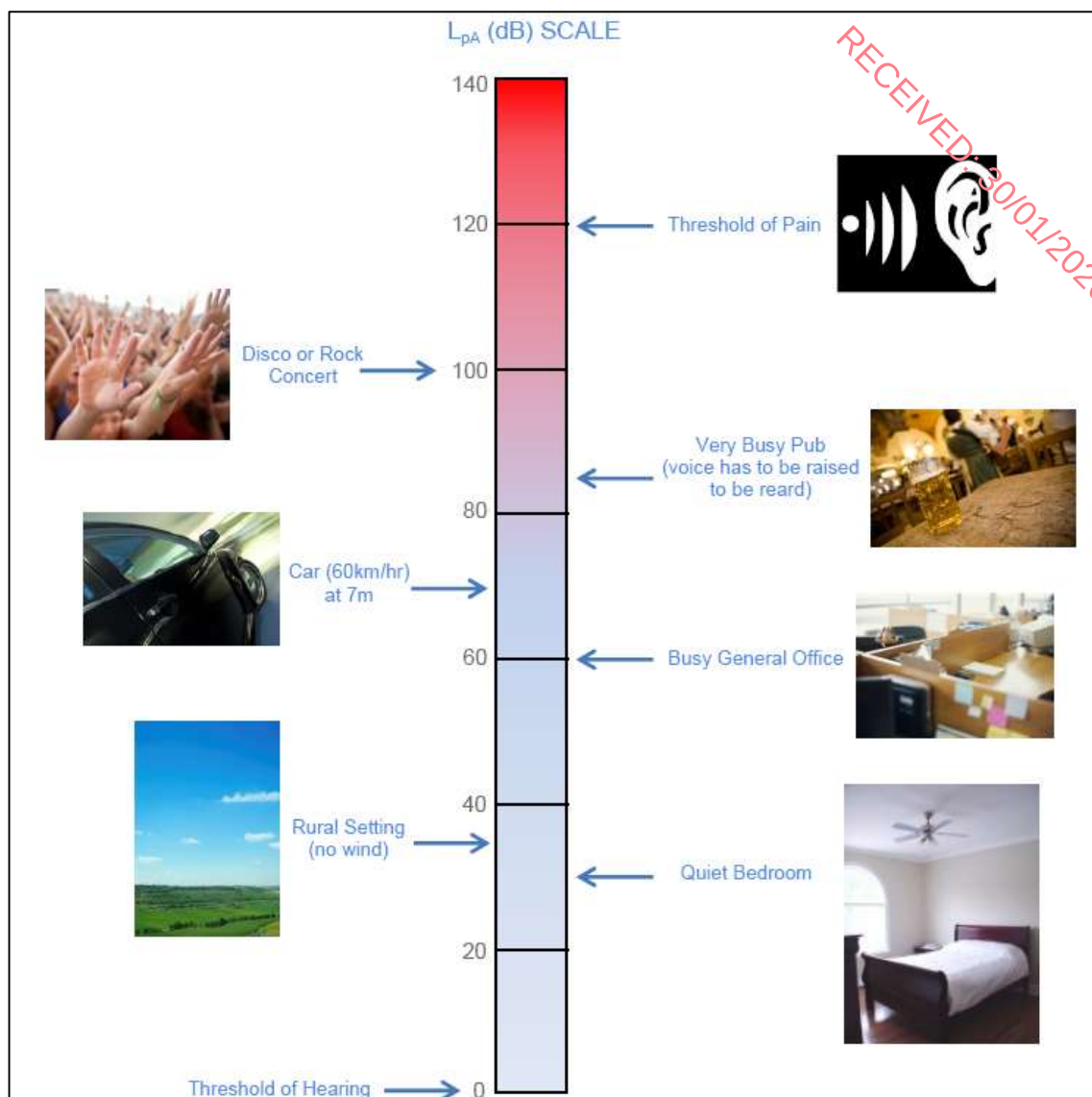


Figure 7-1 dB(A) scale and indicative noise levels¹.

Appendix 7-A of this document presents a glossary of the acoustic terminology used throughout this document.

7.2 Assessment Methodology

The following methodology has been prepared based on the requirements of the EPA Guidelines *the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2022) and on AWN's experience of preparing the noise and vibration chapters for similar developments. The following approach has been used for this assessment:

¹ From EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016)

- A review of the current Industrial Emissions Licence (IEL), appropriate standards, guidance, typical local authority planning conditions etc. to identify appropriate noise criteria for the site operations has been undertaken.
- Baseline noise monitoring has been undertaken at locations representative of the nearest noise sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development.
- Predictive calculations have been performed during the construction phase of the project at the nearest sensitive locations to the development site.
- Predictive calculations have been performed to assess the potential effects associated with the operation of the proposed development at NSLs surrounding the site.
- The predicted levels have been assessed against the appropriate criteria and existing noise levels to determine the requirement for noise mitigation measures (if any).

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. There are no statutory standards in Ireland relating to noise and vibration limit values for construction works or for environmental noise relating to the operational phase. In the absence of specific statutory Irish guidelines, the assessment has made reference to non-statutory national guidelines, where available, in addition to international standards and guidelines relating to noise and/or vibration impact for environmental sources (outlined in section 7.2 below).

In addition to specific noise and vibration guidance documents, Environmental Protection Agency (EPA); *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA 2022) was considered and consulted in the preparation of this chapter.

The significance of noise and vibration effects has been assessed in accordance with the EPA 2022 guidelines. With regard to the quality of the effect, ratings may have positive, neutral or negative applications.

- British Standard BS 8233: 2014: *Guidance on sound insulation and noise reduction for buildings*.
- British Standard BS 4142: 2014+A1:2019: *Methods for Rating and Assessing Industrial and Commercial Sound*.
- British Standard BS 5228: 2009 +A1:2014: *Code of Practice for Control of Noise and Vibration on Construction and Open Sites Part 1: Noise & Part 2: Vibration*.
- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*.
- *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988.
- *Design Manual for Roads & Bridges – Volume 11 Section 3*.
- EPA *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EIA Reports) (2022).
- EPA: *Guidance Note for Noise – Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (2016).
- IEMA *Guidelines for Environmental Noise Impact Assessment*, 2014.

- ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.
- ISO 9613-2: 2024 *Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors*.

7.2.1 Construction Phase – Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228 – 1: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities, depending on context.

This document sets out guidance on Construction Noise Thresholds (CNTs) relative to the existing noise environment. Table 7-1 sets out the threshold values which, when exceeded, signify a potential significant effect at the facades of residential receptors as recommended by BS5228-1:2009+A1:2014.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night-time) the ambient noise level is determined and rounded to the nearest 5 dB. If the construction noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

Table 7-1 Example threshold of potential significant effect at dwellings.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A ^{Note A}	Category B ^{Note B}	Category C ^{Note C}
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends ^{Note D}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

See section 7.5.1 for the construction noise assessment in relation to this site. This assessment process determines if a significant construction noise impact is likely.

In order to assist with interpretation of significance, Table 7-2 includes guidance as to the likely magnitude of noise impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of *Design Manual for Roads and Bridges (DMRB), LA111 Noise and Vibration: Highways England, Transport Scotland, The Welsh Government and The Department of Infrastructure, May 2020* (DMRB 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022) using professional expertise and judgment.

In accordance with the DMRB Noise and Vibration (UKHA 2020), construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- Ten or more days or nights in any 15 consecutive days or nights; and
- A total number of days exceeding 40 in any six consecutive months.

Table 7-2 Construction noise significance ratings.

Location	DMRB Magnitude of Impact	EPA Mapped Impacts	Determination
Below or equal to baseline noise level	Negligible	Not Significant	Depending on CNT, duration & baseline noise level
Above baseline noise level and below or equal to CNT	Minor	Slight to Moderate ^{Note A}	
Above CNT and below or equal to CNT +5dB	Moderate	Moderate to Significant	
Above CNT +5 and below or equal to CNT +15dB	Major	Significant, to Very Significant	
Above +15dB		Very Significant to Profound ^{Note B}	
Note A) CNLs at the upper end of this range will result in higher potential impacts, therefore this range is categorised as slight to moderate, acknowledging that values approaching the CNT are greater than slight. In accordance with DMRB, noise levels below the CNT are deemed 'Not Significant.'			
Note B) The DMRB does not distinguish beyond a 'Major' impact. For the purposes of distinguishing between a Very Significant and Profound Impact, CNLs exceeding the CNT by +15 dB are categorised as Profound.			

The adapted DMRB Noise and Vibration (UKHA 2020) guidance is used to assess the overall significance of construction noise at NSLs across the proposed Project.

7.2.2 Construction Phase – Vibration

Vibration standards are generally split into two categories, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385-2:1993 *Evaluation and Measurement for Vibration In Buildings - Guide to Damage Levels from Ground Borne Vibration*, and;
- British Standard BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration*.

BS7385-2 (BSI 1993) and BS5228-2 (BSI 2014b) advise that, for soundly constructed residential properties and similar light-framed structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above for transient vibration. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table B.2 of BS5228-2 (BSI 2014b) might need to be reduced by up to 50%.

On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. For buildings or structures that are structurally unsound, lower vibration magnitudes will apply, typically 50% of those for structurally sound buildings. Protected or historic buildings are not automatically assumed to be more vulnerable to vibration unless they have existing structural defects. The recommend transient vibration thresholds from BS5228-2 (BSI 2014b) for the avoidance of cosmetic damage to light framed and residential buildings are summarised in Table 7-3.

Table 7-3 Recommended construction vibration threshold for control of building damage.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of: -		
Less than 15Hz	15 to 40 Hz	40 Hz and above
15mm/s	20 mm/s	50 mm/s

BS5228-1:2009+A1:2014 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50 %. BS 5228-2:2009+A1:2014 also comments that important buildings which are difficult to repair might require special consideration on a case-by-case basis.

Table 7-4 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS 5228 – 2 (BSI 2014b), the DMRB Noise and Vibration (UKHA 2020) and associated EPA significance ratings (EPA 2022).

Table 7-4 Human response vibration significance ratings.

Criteria	Likely Effect	Significance Rating
≥10 mm/s PPV	Vibration is likely to be intolerable for any more than a brief exposure to a level of 10 mm/s	Very Significant
≥1 to <10 mm/s PPV	Increasing likelihood of complaints in residential environments but can be tolerated at the lower end of the scale if prior warning and explanation has been given to residents	Significant to Very Significant
≥0.3 to <1 mm/s PPV	Increasing likelihood of perceptible vibration in residential environments	Slight to Moderate
≥0.14 to 0.3 mm/s PPV	Vibration is unlikely to be perceptible in even the most sensitive situations for most vibration frequencies associated with construction	Not Significant
Less than 0.14 mm/s PPV		Imperceptible

7.2.3 Traffic Noise

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. In this instance, to assist with the interpretation of the noise associated with vehicular traffic on public roads, DMRB Noise and Vibration (UKHA 2020) offers guidance as to the likely impact associated with any particular change in traffic noise level.

Table 7-5 Subjective impact associated with change in traffic noise level (DMRB 2020).

Noise Level Change dB(A)	Subjective Response	DMRB Magnitude of Impact (Long-term)	Effect Guidelines on the Information to be contained in EIARs (EPA)
0	No change	No impact	Imperceptible
0.1 – 2.9	Barely perceptible	Negligible	Not significant
3.0 – 4.9	Noticeable	Minor	Slight, Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Moderate	Significant
10.0 or more	More than a doubling or halving of loudness	Major	Very significant, Profound

7.2.4 Operational Phase – Noise

The existing site operates under an Industrial Emissions Licence (IEL) and it is understood that the provisions and conditions of the existing IEL will continue to apply. It is understood that the existing IEL will be revised upon completion of the planning process.

7.2.4.1 IEL Noise Conditions

Condition 4.5 of IEL P0017-02 states:

4.5 Noise

Noise from the installation shall not give rise to sound pressure levels ($L_{eq,T}$) measured at noise sensitive locations which exceed the limit value(s).

Condition 6.11 of IEL P0017-02 states:

6.11 Noise

The licensee shall carry out a noise survey of the site operations annually. The survey programme shall be undertaken in accordance with the methodology specified in the 'Environmental Noise Survey Guidance Document' as published by the Agency.

Schedule B.4 of IEL P0017-02 states:

B.4 Noise Emissions

Daytime dB(A) L_{Aeq} (30 minutes)	Night-time dB(A) L_{Aeq} (30 minutes)
55 Note 1	45 Note 1
Note 1: There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.	

Overall Comment

Based on a review of the EPA licence associated with the site and NG4 the noise limits ascribed are directly comparable. For the purposes of this assessment, given potential for future IEL licence revisions it is proposed that a significant effect would occur where the predicted operational noise levels exceed the following at the relevant noise sensitive location:

Daytime (07:00 to 19:00hrs)	55 dB $L_{Ar,30min}$
Evening (19:00 to 23:00hrs)	50 dB $L_{Ar,30min}$
Night-time (23:00 to 07:00hrs)	45 dB $L_{Aeq,30min}$

During the night period, no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL. The applicable noise criteria identified are in line with the typical limit values for noise from licensed sites.

In relation to commercial noise sensitive locations, it is considered that 55 dB $L_{Ar,30min}$ limit is appropriate in order that suitable working conditions are maintained at these properties.

7.2.5 Operational Phase – Vibration

Giving consideration to both the distance of the development to the nearby receptor locations, and the types of activities proposed on site there is no expectation that vibration emissions will be perceptible at receptor locations during the operational phase. Consequently, no criterion is proposed.

7.2.6 Forecasting Methods

The following forecasting methods have been adopted for the key potential noise sources and scenarios associated with the proposed development:

- Construction noise calculations have been conducted generally in accordance with BS 5228: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise*.
- Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

7.2.7 EPA Description of Effects

The significance of effects of the proposed development shall be described in accordance with the EPA guidance document *Guidelines on the information to be contained in Environmental Assessment Reports*. Details of the methodology for describing the significance of the effects are provided in Chapter 1 – Introduction.

The effects associated with the proposed development are described in the relevant sections of this chapter with respect to the EPA guidance and description of effects as set out in Chapter 1 using the relevant significance tables discussed in section 7.2.

7.3 Characteristics of the Proposed Development

7.3.1 General Characteristics of the Proposed Development

The proposed development comprises various elements to be developed on a phased basis over a period of ten years. A proposed site layout drawing is presented in Drg. Ref. 5340-PLA-XXX-DR-DJF-AR-0010.

The proposed development comprises various elements to be developed on a phased basis over a period of ten years. A proposed site layout drawing is presented in Drg. Ref. 5340-PLA-XXX-DR-DJF-AR-0010.

1. **Unit 1 Production Building** – Construction of a replacement, multi-storey Unit 1 Production building approx. 34m L x 23m W x 26m H (approx. 3,000m²).
2. **In Process Tank Farm Bund** – Modifications to the existing 'In Process Tank Farm' bund and ancillary plant and services related to same including pipe racks.
3. **Laboratory Gas Bottle Store** – Construction of a new Laboratory Gas Bottle Store approx. 4m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
4. **Regenerative Thermal Oxidiser** – Provision of a new Regenerative Thermal Oxidiser, associated exhaust stack (approx. 10mAGL) and ancillary plant and services related to same including pipe racks.
5. **Process Cooling** – Provision of 1no. process cooling tower (approx. 5mAGL) to be installed to provide additional cooling for manufacturing processes and ancillary plant and services related to same including pipe racks.
6. **Combined Heat and Power Plant and Heat Recovery System** – addition of a new natural-gas fired containerised combined heat and power (CHP) plant (approx. 6 MW_{TH} Total Rated Thermal Input) and associated containerised waste heat boiler system with exhaust stack approx. 13mAGL and ancillary plant, kiosks and services related to same including pipe racks.
7. **Ethanol Storage Tank** – addition of a new ethanol storage tank (2.4m diameter x 7m H) in existing solvent tank farm bund and ancillary plant and services related to same including pipe racks.
8. **Car Park** – extension to existing car park including associated lighting to provide a net increase of additional 67no. permanent car parking spaces.
9. **Wastewater Treatment Plant (WWTP) Control and Blower Building** - Single storey building associated with WWTP expansion, approx. 11m L x 10m W x 4m H (approx. 90m²); and ancillary plant and services related to same including pipe racks.

10. **WWTP Chemical storage tanks and bund** – new concrete base and bund (approx. 45m²) with tanks approx. 3.5m H and ancillary plant and services related to same including pipe racks.
11. **WWTP Inlet works** – new screens, tanks up to approx. 9m H and ancillary plant and services related to same including pipe racks
12. **WWTP Dissolved Air Flotation tank** – new tank approx. 5m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
13. **Site Works** – All associated site services, site development works and landscaping to facilitate the proposed development.

7.3.2 Specific Characteristics

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

- construction phase, and;
- operational phase.

The construction phase will involve excavation, general site preparation over the development site and the erection of the new building over a phased construction period. Comment will also be presented in the following sections in relation to construction traffic on local roads in terms of noise and vibration.

The primary sources of outward noise in the operational context are deemed long term and will involve:

- building services noise, and;
- additional vehicular traffic on public roads

These issues are discussed in detailed in the following sections.

7.4 Receiving Environment

7.4.1 Environmental Noise Survey

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996:2017: *Acoustics – Description, measurement and assessment of environmental noise*.

The noise measurement locations were selected based on the proposed construction works locations to represent the noise environment at the NSLs surrounding the proposed development.

In the first instance it is considered appropriate to define a noise sensitive location. In this context, it is considered prudent to give consideration to the definition supplied by the EPA which states the following:

“NSL – any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.”

Figure 7-2 below highlights the nearest noise sensitive locations to which predictions have been carried out. Locations NSL1 and NSL2 represent NSLs in the immediate surroundings of the proposed site.

Figure 7-2 Representative noise sensitive locations.



These measurement locations are located to the East and North West of the site, which is similar to the existing NSLs identified in the annual IEL noise monitoring reports. Attended noise monitoring was carried out over daytime and night-time periods.

The monitoring locations are discussed below. Figure 7-3 illustrates the approximate location of the noise monitoring positions being considered here.

Location AT1 Located to the east of the site and representative of the residential noise sensitive locations at NSL1 (Lappin's Terrace), approximately 300m from the facility.

Location AT2 Located to the northwest of the site and representative noise of the residential sensitive locations at NSL2 (North Esk), approximately 500m from the facility.

Figure 7-3 Noise monitoring locations.



7.4.1.1 Survey Periods and conditions

An attended survey was completed at AT1 and AT2 during the following period:

- Day 09:15hrs to 20:15hrs on 17th November 2025
- Night 22:00hrs to 04:57hrs on 17th & 18th November 2025.

Weather conditions were dry and calm during all periods.

Measurements were conducted at the locations noted above. Sample periods for the noise measurements were typically 30 minutes for the day and evening surveys and 30 minutes for the night surveys. During the attended survey the results were noted onto a Survey Record Sheet immediately following each sample and all data was saved to the instrument memory for post analysis. Survey personnel noted the primary noise sources contributing to noise build-up.

7.4.1.2 Personnel and Instrumentation

CLV Consulting Limited conducted the noise survey, and the following instrumentation was used:

Table 7-6 Instrumentation details.

Equipment	Type	Serial Number	Calibration Due Date
Sound Level Meter	NTI Audio – XL2	A2A-18385-EO	13 January 2027
Sound Calibrator	Larson Davis – CAL200	18882	7 January 2026

7.4.1.3 Measurement Parameters

The survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AF90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The “A” suffix denotes that the sound levels have been “A-weighted” in order to account for the non-linear nature of human hearing. The “F” suffix denotes that the parameter has been measured with ‘Fast’ time-weighting applied. All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10⁻⁵ Pascal (pa).

7.4.1.4 Survey Results and Discussion

The survey results for the daytime attended monitoring are given in Table 7-7.

Table 7-7 Attended daytime monitoring results.

Location	Period	Start Time (hrs)	Sound Pressure Level (dB)	
			L _{Aeq,30mins}	L _{A90,30mins}
AT1	Day	09:52	65	56
		12:49	65	56
		16:25	63	54
AT2	Day	09:15	56	52
		12:14	61	54
		15:47	55	54

At AT1, daytime noise levels were in the range 63 to 65 dB L_{Aeq,30min} and 54 to 56 dB L_{A90,30min}. The daytime soundscape at AT1 was dominated by traffic noise from the R623. Birdsong in the nearby vegetation was audible, but its impact was marginal. The existing Cara site was not audible during the daytime period.

At AT2, N25 traffic noise dominated the daytime ambient noise levels. Vehicles accessing the nearby commercial units was noted as another significant daytime contributor. Birdsong was audible as a source of background noise during the daytime period. Daytime noise levels were

in the range 55 to 61 dB $L_{Aeq,30min}$ and 52 to 54 dB $L_{A90,30min}$. The existing Cara site was not audible during the daytime period.

The existing Cara Partners site was not audible during the daytime or night-time periods and there were no tonal or impulsive components noted at this location.

The survey results for the nighttime attended monitoring are given in Table 7-8.

Table 7-8 Attended night-time monitoring results.

Location	Period	Start Time (hrs)	Sound Pressure Level (dB)	
			$L_{Aeq,30mins}$	$L_{A90,30mins}$
AT1	Night	01:24	44	42
		03:51	43	42
AT2	Night	02:02	46	43
		04:27	44	43

At AT1, nighttime noise levels were in the range 43 to 44 dB $L_{Aeq,30min}$ and of the order of 42 dB $L_{A90,30min}$. Distant traffic noise from the N25 was audible. In the absence of R623 traffic noise emissions from neighbouring sites was audible. The existing Cara site was not audible during the daytime period.

At AT2, nighttime noise levels were in the range 44 to 46 dB $L_{Aeq,30min}$ and of the order of 43 dB $L_{A90,30min}$. N25 traffic noise dominated the night-time ambient noise levels. The existing Cara site was not audible during the daytime period.

7.4.1.5 Baseline Summary

Construction Noise Thresholds (CNT)

When setting the CNT for receivers to the north and west of the proposed development, background monitoring would indicate that the residential NSLs are in Category B e.g. daytime CNT 70 dB $L_{Aeq, 1 hour}$, evening and weekends CNT 60 dB $L_{Aeq, 1 hour}$.

For receivers to the south of the proposed development, background monitoring would indicate that the residential NSLs are in Category A e.g. daytime CNT 65 dB $L_{Aeq, 1 hour}$, evening and weekends CNT 55 dB $L_{Aeq, 1 hour}$.

Operational Noise Thresholds

To the north west of the site the night-time ambient noise levels typically range between 43 to 44 dB $L_{Aeq, 30 min}$ and the background noise levels were of the order of 42 dB $L_{A90,30min}$ with existing plant noise from the Cara site inaudible at all locations.

To the south of the site the night-time ambient noise levels typically range between 44 to 46 dB $L_{Aeq, 30 min}$ and the background noise levels of the order of 43 dB $L_{A90,30min}$.

7.4.1.6 *Do Nothing Scenario*

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged.

RECEIVED: 30/01/2026

7.5 Potential Impacts

7.5.1 Construction Phase

A variety of items of plant will be in use for the purpose of site clearance and construction works. There will also be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, there is potential for the generation of elevated levels of noise in the vicinity of existing noise sensitive properties.

7.5.1.1 Construction Noise

Due to the fact that the construction programme has been established in outline form, construction noise associated with activities on site during this phase are reviewed for the purposes of determining the likely significant effects. Indicative ranges of noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1:2009+A1:2014. This standard sets out sound power and sound pressure levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels. However, it is not possible to conduct detailed accurate prediction calculations for the construction phase of a project due to the level of variability during different construction stages over short periods of time

The construction noise threshold is determined by referring to the criteria in section 7.4.1.5 and the baseline ambient noise levels (as referred to in section 7.4.1.4), as outlined in the assessment criteria section.

The standard construction working hours for the proposed development as outlined within the Construction Environmental Management Plan (CEMP) and consistent with the existing planning permission are as follows:

- Monday to Friday: 08:00 to 20:00hrs;
- Saturdays: 08:00 to 18:00hrs,

The CEMP also notes that it is not anticipated that work will take place on Sundays and Bank Holidays. Should there be a requirement for works outside of the normal working hours a written authorisation will be sought from Cara Partners.

Rock Breaking

A limited amount of rock breaking will be taking place.

Reference to BS 5288-1 indicates that highest noise levels on the site are associated with activities associated with rock breaking and king post drilling associated with building foundations. Noise levels from these activity types are typically in the range of 80 to 90 dB L_{Aeq} at 10m.

For construction activities associated with rock breaking and foundation phase using king post drilling, a total construction noise level of 92 dB $L_{Aeq,T}$ at 10m has been used for the purposes of indicative calculations. This would involve for example, one item of plant at 90 dB L_{Aeq} and two

items of plant at 85 dB L_{Aeq} and one item of plant at 80 dB L_{Aeq} operating simultaneously within one work area which is considered a highly worst-case scenario.

Foundation Works

Some foundation works, are anticipated, typical plant items will include rock breaking, excavators, loaders, dozers, concreting works, mobile cranes and generators have been assessed.

Noise source levels are quoted in the range of 70 to 80 dB L_{Aeq} at distances of 10 m within BS 5228-1. For the purposes of this assessment, a combined sound pressure level of 85 dB $L_{Aeq,T}$ at 10m has been used for construction noise calculations. This would include, for example, 2 items of construction plant with a sound pressure level of 80 dB L_{Aeq} at 10 m and 3 no. items of plant with a sound pressure level of 75 dB L_{Aeq} at 10 m, resulting in a total noise level of 85 dB L_{Aeq} at 10m along the closest works boundary.

Given the nature of the proposed works, building techniques across the site, a cumulative construction noise level of 85 dB L_{Aeq} at 10m represents a conservative noise level used to assess construction activities associated with the earlier stages of construction will be employed. This worst-case scenario is a robust assumption made for developments of this size, on the basis that it is unlikely that more than 5 items of such plant/equipment would be operating simultaneously in such close proximity to each other at all times at the nearest site boundary or construction compound to the closest NSL's. In reality, items of construction plant and machinery will be operating at varying distances from any one NSL.

General Construction

Once the foundation works have been completed, a large portion of the work will involve manual labour and cranes with lower overall noise levels. For the purpose of this assessment a combined sound pressure level of 78 dB $L_{Aeq,T}$ at 10m has been used for construction noise calculations during ongoing site works and compounds once excavation works are completed. This would include, for example, one item of plant at 75 dB L_{Aeq} and three items of plant at 70 dB L_{Aeq} operating simultaneously within a work area resulting in a total noise level of 78 dB L_{Aeq} along the closest works boundary.

7.5.1.2 Construction Noise Calculations

Construction noise levels have been calculated at the closest NSLs, assuming the construction noise levels discussed above. For the purpose of the assessment no screening has been assumed. The calculations also assume that the equipment will operate for 66% of the working time. Table 7-9 summarises the result of this assessment.

Table 7-9 Indicative construction noise levels at nearest noise sensitive locations.

Construction phase	Cumulative Sound Pressure, dB L _{Aeq,T} at 10m	Calculated noise levels at varying distances, dB L _{Aeq,T}	
		300m	500m
Rock Breaking	92	55	51
Enabling works and other excavations	85	48	44
General Construction, Drainage Works, Compounds, Landscaping	78	41	37

The worst case predictions detailed in Table 7-9 indicate that construction activities can operate within the adopted construction noise thresholds outlined in section 7.4.1.5, at the closest NSLs from the construction works with higher noise emissions associated with rock breaking, enabling works, excavations, etc. Reference to Table 7-2 confirms the related effect is not significant. The associated construction noise effect is determined to be negative, not significant and short-term at distances of 300m and beyond.

The construction phase will be controlled through the use of construction noise threshold values which the contractor will be required to work within as much as is practicable. In this regard, the choice of plant, scheduling of works on site, provision of localised screening and other best practice control measures will be employed. As such it is predicted that construction traffic effects will be short term and not significant.

7.5.1.3 Construction Traffic

Construction access will be via a designated construction access via the existing site access.

It is estimated that the export of material/import of fill/concrete will generate a max. 50 truck movements/day, both in and out of the proposed construction site during this period. As peak construction staff activity will not coincide with this initial works period, the total daily traffic volumes generated during this phase would not have a significant adverse impact on the existing local road network capacity.

In order to increase the noise level associated with traffic to any significant degree, there would have to be an increase in traffic volumes of 25%. Traffic data has been provided by traffic consultants TTRSA (see Chapter 12 – Traffic and Transportation for further details). During the highest traffic volume peak hours, it's predicted that there will be 7 LGV and 3 HGV movements. As such it is predicted that construction traffic effects will be short term and not significant.

7.5.1.4 Construction Vibration

The potential for elevated levels of vibration at sensitive locations during construction activities associated with the proposed development is typically associated with surface breaking activities used for ground works. During surface breaking activities, there is potential for vibration to be generated through the ground. Empirical data for this activity is not provided in BS 5228-2 (BSI 2014b), however the likely levels of vibration from this activity will be significantly below the

vibration criteria for building damage based on monitoring data and experience from other sites. AWN Consulting has previously conducted vibration measurements under controlled conditions, during trial construction works on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator; and
- 6 tonne hydraulic breaker on large Liebherr tracked excavator.

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3-tonne breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10m to 50m respectively from the breaking activities. Using a 6-tonne breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10m to 50m respectively.

Whilst these measurements relate to a solid concrete slab, the range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking activity.

The vibration magnitudes outlined in above indicate that at distances up to 50m, vibration magnitudes are orders of magnitude below those associated with any form of cosmetic damage to buildings. The vibration magnitudes are also not significant to slight in terms of human response to vibration at these distances. The closest residential receptors are at distances of 300m from this activity and hence impacts are imperceptible and temporary at these properties.

Referring to the vibration magnitudes above and Table 7-4 the vibration impacts will be below those associated with perceptible vibration and will be neutral to negative, imperceptible to not significant and short-term.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in section 7.2.2.

7.5.2 Operational Phase

Potential noise impacts during the operational phase include the following:

- Vehicular traffic accessing the site; and,
- Proposed car parking

Each is assessed in the following sections.

7.5.2.1 Additional Traffic on Local Roads

Taking into account the small number of potential vehicle movements in comparison to the existing level of traffic on R623, the increase in traffic volume is expected to generate insignificant level of additional noise.

In order to increase the noise level associated with traffic to any significant degree, there would have to be an increase in traffic volumes of 25%.

The predictions indicate that the subjective reaction to the change in noise levels will be inaudible and the associated effect will be long term, imperceptible.

7.5.2.2 Proposed Car Parking

The Cara Partners facility currently has 91 existing carparking spaces associated with the operation of the proposed development, located at the northern site boundary. An increase of 67 no. additional car parking spaces is proposed for the facility.

The closest residences to the facility are located to the east at a distance of 300m from the eastern boundary of the site, and northwest at a distance of 500m from the northern boundary. Typical noise levels 10m beyond the boundary of a busy car park during peak periods are of the order of 48dB $L_{Aeq,T}$. Allowing for distance and estimated frequency of usage, the noise levels would be less than 30 dB $L_{Aeq,15\text{ min}}$ for the closest residences to the proposed and existing car parks respectively. These levels are within the daytime criterion of 55 dB $L_{Aeq,15\text{ min}}$ and at more than 10 dB below the measured day-time ambient noise levels at these locations. The likely noise impact of car park activities on the local environment is neutral, not significant and long-term.

7.5.2.3 Fixed Plant

The operational $L_{Ar,15\text{ min}}$ noise predictions at each of the monitoring locations are based on the prediction protocol contained within ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation' for fixed plant. The predictions assume that no mitigation measures have been implemented.

Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant in order that the plant noise emission levels are achieved on site (including any system regenerated noise).

Table 7-10 Sources utilised in noise model.

Reference	Source	Noise Level dB(L_{WA})	Working Hours	ITM Coordinates	
				N	E
AS001	Chiller-01	94	24/7 Intermittent	572114	574156
AS002	Chiller-02	94	24/7 Intermittent	572113	574162
AS003	Heat Pump	78	24/7 Intermittent	572113	574167
AS004	AHU-01 - Supply Air	83	24/7 Continuous	572126	574158
AS005	AHU-01 - Exhaust Air	94	24/7 Intermittent	572122	574169
AS006	AHU-02 - Supply Air	99	24/7 Intermittent	572123	574157

Reference	Source	Noise Level dB(L _{WA})	Working Hours	ITM Coordinates	
				N	E
AS007	AHU-02 - Exhaust Air	99	24/7 Intermittent	572127	574169
AS008	AHU-03 - Supply Air	85	24/7 Intermittent	572131	574159
AS009	Cooling Tower	85	24/7 Intermittent	572074	574168
AS010	AC-01	78	24/7 Intermittent	572118	574156
AS011	EF-01 & EF-02	88	24/7 Intermittent	572132	574170
AS012	EF-03 & EF-04	91	24/7 Intermittent	572116	574172
AS013	RTO	82	24/7 Intermittent	572073	574160
AS014	Centrifugal Decanter	93	Operates 24/day 6 days/week	572030	574200
AS015	HRSB and Engine	93	24/7 Continuous	572093	574219
AS016	Containerised Waste Heat Boiler	93	24/7 Intermittent	572088	574211

7.5.3 Calculation Methodology

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed building. This section discusses the methodology behind the noise modelling process.

7.5.3.1 DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 2024*.

DGMR iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA}).
- the distance between the source and receiver.
- the presence of obstacles such as screens or barriers in the propagation path.
- the presence of reflecting surfaces.
- the hardness of the ground between the source and receiver.
- Attenuation due to atmospheric absorption.

- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

7.5.3.2 Brief Description of ISO 9613-2: 2024

ISO 9613-2:2024 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT(DW)}$, for the following conditions:

- wind direction at an angle of $\pm 45^\circ$ to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver.
- wind speed between approximately 1ms^{-1} and 5ms^{-1} , measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear calm nights. The basic formula for calculating $L_{AT(DW)}$ from any point source at any receiver location is given by:

$$L_{AT(DW)} = L_W + D_c - A \quad \text{Eqn. A}$$

Where:

$L_{AT(DW)}$ is an octave band centre frequency component of $L_{AT(DW)}$ in dB relative to $2 \times 10^{-5}\text{Pa}$;

L_W is the octave band sound power of the point source;

D_c is the directivity correction for the point source;

A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 7-11:

Table 7-11 Estimated accuracy for broadband noise of $L_{AT(DW)}$.

Height, h^*	Distance, $d^\dagger$	
	$0 < d < 100\text{m}$	$100\text{m} < d < 1,000\text{m}$
$0 < h < 5\text{m}$	$\pm 3\text{dB}$	$\pm 3\text{dB}$
$5\text{m} < h < 30\text{m}$	$\pm 1\text{dB}$	$\pm 3\text{dB}$

* h is the mean height of the source and receiver. $^\dagger d$ is the mean distance between the source and receiver. N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

7.5.3.3 Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings forwarded by Sustech Environmental Services.

<i>Local Area</i>	The location of noise sensitive locations has been obtained from a combination of site drawings provided by Sustech Environmental Services and others obtained from Ordnance Survey Ireland (OSI).
<i>Heights</i>	The heights of buildings on site have been obtained from site drawings forwarded by Sustech Environmental Services. Off-site buildings have been assumed to be 6m high and industrial buildings were assumed to be 15m high.
<i>Contours</i>	Site ground contours/heights have been obtained from site drawings forwarded by Sustech Environmental Services where available.

7.5.3.4 Predicted Noise Levels

This section presents the predicted noise levels at the nearest noise sensitive locations. Appendix 12.2 lists the co-ordinates of the various assessment locations.

Figure 7-4 presents the predicted noise contour plot for the process plant associated with the development.

The predicted noise levels from development at each NSL are tabulated in Table 7-12. Nearest commercial properties have been included in the model reference, however under EPA NG4, commercial properties are not considered as noise sensitive locations.

Table 7-12 Predicted operational noise levels at NSLs.

Name	Description	Predicted dB L _{Aeq,T}
C01	Commercial Property	27
C02	Commercial Property	28
C03	Commercial Property	32
C04	Commercial Property	30
C05	Commercial Property	31
C06	Commercial Property	24
C07	Commercial Property	26
C08	Commercial Property	28
C09	Commercial Property	31
C10	Commercial Property	33
C11	Commercial Property	28
C12	Commercial Property	30
C13	Commercial Property	29
C14	Commercial Property	43
C15	Commercial Property	47
C16	Commercial Property	45
C17	Commercial Property	35

Name	Description	Predicted dB LAeq,T
C18	Commercial Property	35
C19	Commercial Property	31
C20	Commercial Property	31
C21	Commercial Property	35
C22	Commercial Property	31
C23	Commercial Property	27
C24	Commercial Property	32
C25	Commercial Property	32
C26	Commercial Property	24
C27	Commercial Property	31
C28	Commercial Property	27
C29	Commercial Property	30
C30	Commercial Property	31
C31	Commercial Property	32
R01	Residential Property	27
R02	Residential Property	27
R03	Residential Property	31
R04	Residential Property	30
R05	Residential Property	31
R06	Residential Property	28
R07	Residential Property	29
R08	Residential Property	34
R09	Residential Property	33
R10	Residential Property	34
R11	Residential Property	33
R12	Residential Property	33
R13	Residential Property	30
R14	Residential Property	24
R15	Residential Property	28
R16	Residential Property	32
R17	Residential Property	29
R18	Residential Property	29
R19	Residential Property	29

Name	Description	Predicted dB LAeq,T
R20	Residential Property	29
R21	Residential Property	29
R22	Residential Property	28
R23	Residential Property	29
R24	Residential Property	28
R25	Residential Property	29
R26	Residential Property	26
R27	Residential Property	29
R28	Residential Property	29
R29	Residential Property	29
R30	Residential Property	29
R31	Residential Property	28
R32	Residential Property	29
R33	Residential Property	29
R34	Residential Property	27
R35	Residential Property	29
R36	Residential Property	26
R37	Residential Property	29
R38	Residential Property	29
R39	Residential Property	28
R40	Residential Property	29
R41	Residential Property	28
R42	Residential Property	29
R43	Residential Property	29
R44	St Lappans Place	31
R45	St Lappans Place	30
R46	St Lappans Place	30
R47	St Lappans Place	30
R48	St Lappans Place	30
R49	St Lappans Place	30
R50	St Lappans Place	30
R51	St Lappans Place	30
R52	St Lappans Place	31

Name	Description	Predicted dB LAeq,T
R53	St Lappans Place	30
R54	St Lappans Place	30
R55	St Lappans Place	31
R56	St Lappans Place	31
R57	St Lappans Place	30
R58	St Lappans Place	30
R59	St Lappans Place	30
R60	St Lappans Place	31
R61	St Lappans Place	30
R62	St Lappans Place	30
R63	St Lappans Place	31
R64	St Lappans Place	30
R65	St Lappans Place	31
R66	St Lappans Place	30
R67	St Lappans Place	30
R68	St Lappans Place	30
R69	St Lappans Place	30
R70	St Lappans Place	30
R71	St Lappans Place	30
R72	St Lappans Place	30
R73	St Lappans Place	30
R74	St Lappans Place	30
R75	St Lappans Place	30
R76	St Lappans Place	29
R77	St Lappans Place	29
R78	St Lappans Place	29
R79	St Lappans Place	29
R80	St Lappans Place	30
R81	St Lappans Place	29
R82	St Lappans Place	28
R83	St Lappans Place	29
R84	St Lappans Place	29
R85	St Lappans Place	29

Name	Description	Predicted dB LAeq,T
R86	St Lappans Place	29
R87	St Lappans Place	29
R88	St Lappans Place	28
R89	St Lappans Place	29
R90	St Lappans Place	29
R91	St Lappans Place	29
R92	St Lappans Place	29
R93	St Lappans Place	29
R94	St Lappans Place	29
R95	Residential Property	22
S01	School (Little Island NS)	28
S02	School (Gaelscoil Ui Drisceoil)	29

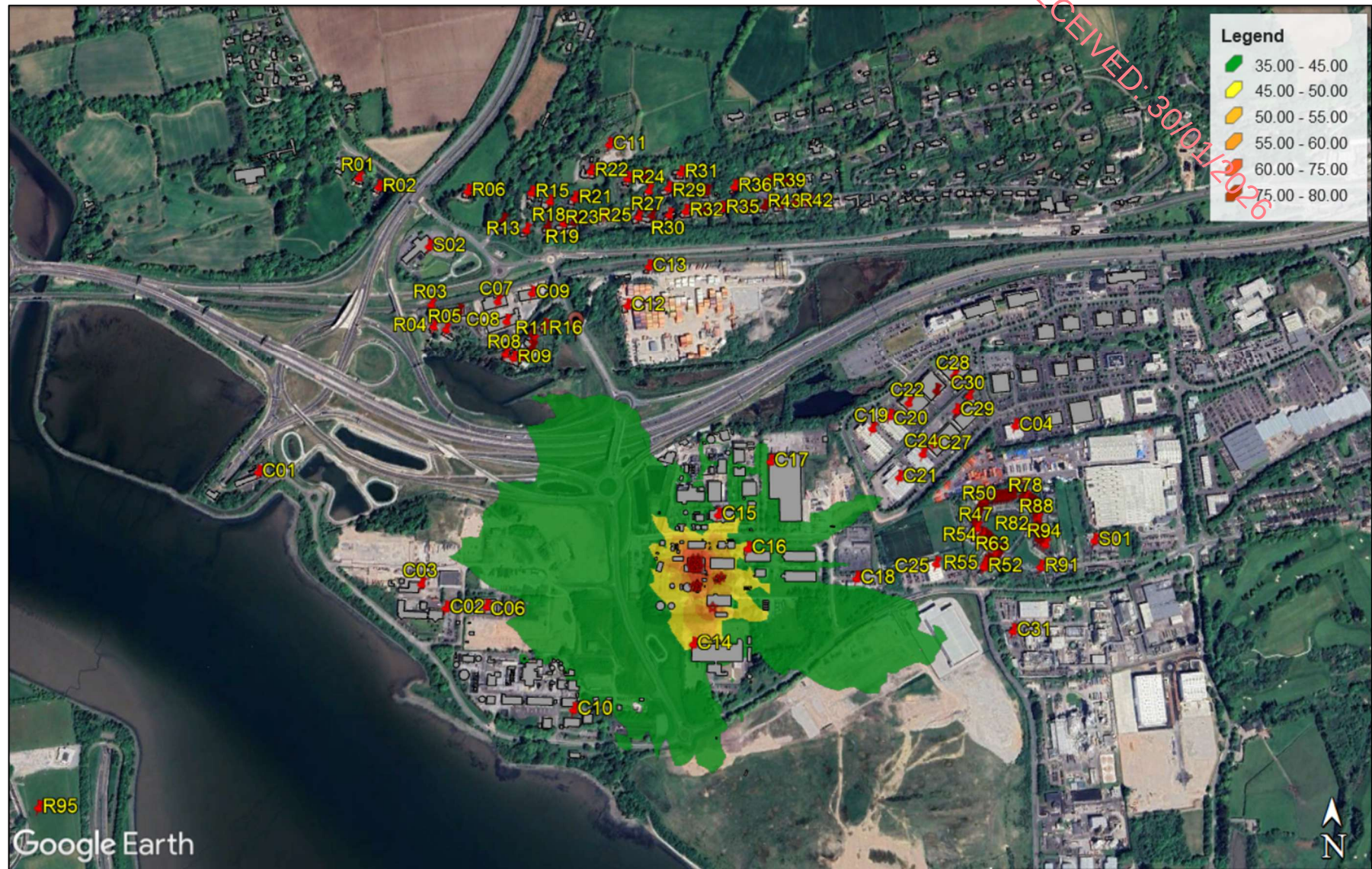


Figure 7-4 Predicted noise contour plot for fixed plant items.

7.5.4 Assessment of Predicted Noise Levels

The operational $L_{Aeq,30min}$ noise predictions at each of the closest assessment noise sensitive locations are presented in Table 7-13. The table also shows the comparison between the predicted operational $L_{Aeq,30min}$ noise level and the noise limit for 'not an area of low background noise' at each monitoring location during each time-period.

Table 7-13 Operational predicted noise levels.

Location		Period	Criterion	$L_{Aeq,30min}$ dB	Complies?	Difference (dB)
Assessment	Monitoring		$L_{Aeq,15min}$ dB			
R10	AT02	Daytime	55	34	✓	-21
		Evening	50		✓	-16
		Night-time	45		✓	-11
R52	AT01	Daytime	55	31	✓	-24
		Evening	50		✓	-19
		Night-time	45		✓	-14
S01	AT01	Daytime	55	28	✓	-27
		Evening	50		✓	-22
		Night-time	45		✓	-17
S02	AT02	Daytime	55	29	✓	-26
		Evening	50		✓	-21
		Night-time	45		✓	-16

It can be seen from the above figures that the NG4 noise criterion limits as prescribed for daytime, evening, and night-time are comfortably met at all NSL's assessed here.

7.6 Mitigation Measures

7.6.1 Construction Phase Mitigation

The assessment of construction noise has shown that the adopted criterion will not be exceeded at the residential, educational and commercial locations. However, several safeguards exist to minimise the effects of construction noise, and these will be incorporated into the Construction Environmental Management Plan (CEMP).

The safeguards include:

- All plant items used during the construction phase will comply with standards outlined in European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1998.
- Guidance set out in BS5228-1:2009+A1, that covers noise control on construction sites.

The adoption of Best Practicable Means is usually the most effective approach to controlling noise from construction sites. Impacts will be mitigated by keeping within the outlined within construction noise criteria in section 7.2.1.

The following are examples of possible noise reductions measures:

- phasing the works to maximise the benefit from perimeter structures.
- reduction of compressor noise through the use of silencers or by use of sound reduced models fitted with acoustic enclosures, if necessary.
- fitted with silencers or mufflers to pneumatic tools, where necessary.
- any deliveries will be programmed to arrive during daytime hours only. Care will be taken when unloading vehicles to minimise disturbance to local residents. Delivery vehicles will be prohibited from waiting within the site with their engines running.
- all plant items will be properly maintained and operated according to the manufacturers' recommendations in such a manner as to avoid causing excessive noise. All plant will be sited so that the noise effect at nearest noise-sensitive properties is minimised.
- erection of local hoarding, screens or barriers to shield particularly noisy activities, where necessary.
- problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach to relations with local residents. Works will not be undertaken outside of the hours agreed with the local authority.

Experience from other sites has shown that by implementing these measures, typical noise levels from construction works can be reduced by 5 dB(A) or more.

As construction works are temporary and noise levels have been calculated for a worst-case situation and demonstrate no significant effect at the locations assessed, it is considered that no further mitigation measures are necessary.

7.6.2 Operational Phase Mitigation

The worst-case construction noise assessment has shown that in accordance with the scale presented in the *'Guidelines on the Information to be contained in Environmental Impact Statements'* there will be an imperceptible effect at residential locations and nearby schools in terms of ambient noise levels.

At nearby commercial locations, noise levels will be below the relevant EPA licence conditions that will be applicable to the development.

The robust operational noise assessment of fixed plant associated with the proposed plant has shown that in accordance with the scale in the *'Guidelines on the Information to be contained in Environmental Impact Statements'* there will be an imperceptible effect at all the nearby residences and schools.

In terms of the nearest commercial properties the character of the noise environment in the vicinity of this location will not be altered.

7.7 Residual Impacts

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

7.7.1 Construction Phase

7.7.1.1 Noise

The use of best practice noise control measures, hours of operation, scheduling of works within appropriate time periods, and noise monitoring during this phase will be implemented. With the inclusion of the various noise and vibration control measures on site discussed in section 7.6.1, it is expected that calculated noise levels in Table 7-9 can be reduced by 5 dB(A) or more.

After the implementation of mitigation measures, residual construction noise levels at the closest NSLs within are expected to be below the CNT of 65 dB $L_{Aeq,T}$. Referring to Table 7-2, residual effects are predicted to be short term and not significant, at these NSLs during the construction phase.

It is important to note that construction activities are inherently transient, meaning noise intrusive works will only affect the nearest NSLs for brief periods. The construction noise calculations are highly conservative, representing a worst-case scenario. In practice, it is likely that the actual noise levels and associated residual effects will be lower than predicted.

7.7.1.2 Vibration

No residual vibration effects are predicted at the nearest NSLs.

7.7.2 Operational Phase

7.7.2.1 Noise

The worst-case construction noise assessment has shown that in accordance with the scale presented in the *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* there will be an imperceptible effect at residential locations and nearby schools in terms of ambient noise levels.

The robust operational noise assessment of fixed plant associated with the proposed plant has shown that in accordance with the scale in the *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* there will be an imperceptible effect at all the nearby residences and schools as identified in Table 7-1.

In terms of the nearest commercial properties, the character of the noise environment in the vicinity of this location will not be altered.

The operational noise assessment of HGV movements associated with the site has shown accordance with the scale in the *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* there will be an imperceptible effect at off-site noise sensitive locations.

The operational noise assessment of car parking movements associated with the site has shown accordance with the scale in the *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* there will be an imperceptible effect at off-site noise sensitive locations.

7.8 References

- British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1 2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise.
- BS 5228-2:2009+A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration.
- BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting.
- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.
- BS 4142: 2014 +A1 2019 Methods for Rating and Assessing Industrial and Commercial Sound.
- Environmental Protection Agency (EPA) Guidelines the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022).
- Environmental Protection Agencies Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (2016).
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2, 2020.
- S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018 (hereafter referred to as the Noise Regulations).
- S.I. No. 241/2006 - European Communities Noise Emission by Equipment for Use Outdoors (Amendment) Regulations 2006.
- International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation.
- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (2014).
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures.
- ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels.
- The UK Department of Transport Calculation of Road Traffic Noise (hereafter referred to as the CRTN) (UK Department of Transport 1988).

Appendix 7-A

Glossary of Acoustic Terms

ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
broadband	Sounds that contain energy distributed across a wide range of frequencies.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μ Pa).
dB L_{pA}	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).
$L_{Ar,T}$	The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features

	of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.
L_{AT}(DW)	equivalent continuous downwind sound pressure level.
L_{fr}(DW)	equivalent continuous downwind octave-band sound pressure level.
L_{day}	L _{day} is the average noise level during the day time period of 07:00hrs to 19:00hrs
L_{night}	L _{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.
low frequency noise	LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.
noise sensitive location	NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
rating level	See L _{A,r,T} .
sound power level	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m ² where: $L_w = 10 \log \frac{P}{P_0} \text{ dB}$ Where: p is the rms value of sound power in pascals; and P₀ is 1 pW.
sound pressure level	The sound pressure level at a point is defined as: $L_p = 20 \log \frac{P}{P_0} \text{ dB}$
specific noise level	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval (L _{Aeq, T})'.

tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.
$1/3$ octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one-third of an octave each.

This page is intentionally blank.

RECEIVED: 30/01/2026

Appendix 7-B

Modelled receiver locations

Name	Description	ITM Coordinates	
		N	E
C01	Commercial Property	573217.21	572307.2
C02	Commercial Property	573627.09	572015.63
C03	Commercial Property	573573.89	572066.98
C04	Commercial Property	574853.34	572399.34
C05	Commercial Property	573644.83	572660.18
C06	Commercial Property	573713.13	572018.51
C07	Commercial Property	573729.01	572680.46
C08	Commercial Property	573749.03	572636.22
C09	Commercial Property	573803.93	572698.58
C10	Commercial Property	573900.12	571800.7
C11	Commercial Property	573975.28	573018.25
C12	Commercial Property	574013.11	572669.48
C13	Commercial Property	574060.32	572756.55
C14	Commercial Property	574153.75	571937.31
C15	Commercial Property	574208.43	572210.12
C16	Commercial Property	574271.58	572138.37
C17	Commercial Property	574322.08	572324.3
C18	Commercial Property	574503.03	572073.72
C19	Commercial Property	574544.17	572395.02
C20	Commercial Property	574582.05	572422.01
C21	Commercial Property	574599.16	572288.75
C22	Commercial Property	574624	572450.46
C23	Commercial Property	574641.68	571337.95
C24	Commercial Property	574650.89	572338.8
C25	Commercial Property	574672.97	572104.26
C26	Commercial Property	574685.22	572476.87
C27	Commercial Property	574675.12	572359.69
C28	Commercial Property	574724.44	572508.89
C29	Commercial Property	574726.78	572432.8
C30	Commercial Property	574755.49	572464.77
C31	Commercial Property	574832.18	571961.75
R01	Residential Property	573423.85	572954.04
R02	Residential Property	573467.28	572932.96
R03	Residential Property	573583.98	572674
R04	Residential Property	573589.36	572625.43
R05	Residential Property	573616.59	572619.12
R06	Residential Property	573663.98	572921.09
R07	Residential Property	573740.94	572858.96
R08	Residential Property	573747.17	572562.06
R09	Residential Property	573764.49	572554.09
R10	Residential Property	573781.73	572555.69
R11	Residential Property	573808.23	572592.21

Name	Description	ITM Coordinates	
		N	E
R12	Residential Property	573805.63	572578.87
R13	Residential Property	573792.5	572836.1
R14	Residential Property	573805.2	572607.07
R15	Residential Property	573804.55	572915.76
R16	Residential Property	573832.59	572626.15
R17	Residential Property	573839.45	572843.5
R18	Residential Property	573845.24	572895.74
R19	Residential Property	573873.93	572849.08
R20	Residential Property	573897.58	572852.04
R21	Residential Property	573899.16	572901.75
R22	Residential Property	573934.68	572959.31
R23	Residential Property	573966.57	572865.76
R24	Residential Property	574014.76	572944.83
R25	Residential Property	574038.18	572863.14
R26	Residential Property	574051.77	572953.52
R27	Residential Property	574061.61	572918.88
R28	Residential Property	574067.5	572865.66
R29	Residential Property	574103.98	572923.95
R30	Residential Property	574105.37	572867.06
R31	Residential Property	574131.38	572956.83
R32	Residential Property	574141.76	572874.4
R33	Residential Property	574185.05	572877.77
R34	Residential Property	574188.41	572917.3
R35	Residential Property	574220.99	572881.02
R36	Residential Property	574248.63	572926.64
R37	Residential Property	574281.98	572883.09
R38	Residential Property	574314.77	572886.04
R39	Residential Property	574323.03	572936.9
R40	Residential Property	574348.77	572888.49
R41	Residential Property	574364.9	572940.79
R42	Residential Property	574382.92	572894.23
R43	Residential Property	574410.35	572896.72
R44	St Lappans Place	574759.94	572192.26
R45	St Lappans Place	574760.69	572187.03
R46	St Lappans Place	574760.94	572199.97
R47	St Lappans Place	574761.92	572179.82
R48	St Lappans Place	574764.47	572214.94
R49	St Lappans Place	574767.5	572220.22
R50	St Lappans Place	574770.52	572224.76
R51	St Lappans Place	574772.13	572166.63
R52	St Lappans Place	574773.63	572096.72
R53	St Lappans Place	574774.67	572228.91
R54	St Lappans Place	574775.86	572161.65
R55	St Lappans Place	574776.11	572102.44
R56	St Lappans Place	574778.59	572106.68

Name	Description	ITM Coordinates	
		N	E
R57	St Lappans Place	574779.97	572233.82
R58	St Lappans Place	574781.52	572159.69
R59	St Lappans Place	574782.98	572237.6
R60	St Lappans Place	574783.33	572110.9
R61	St Lappans Place	574784.81	572154.69
R62	St Lappans Place	574791.53	572149.96
R63	St Lappans Place	574795.52	572117.62
R64	St Lappans Place	574796.5	572145.23
R65	St Lappans Place	574799.48	572122.35
R66	St Lappans Place	574800.73	572243.26
R67	St Lappans Place	574804.72	572125.83
R68	St Lappans Place	574806.78	572244.34
R69	St Lappans Place	574808.2	572131.05
R70	St Lappans Place	574811.75	572245.23
R71	St Lappans Place	574818.98	572245.23
R72	St Lappans Place	574825.41	572247.01
R73	St Lappans Place	574831.2	572247.32
R74	St Lappans Place	574836.27	572249.11
R75	St Lappans Place	574841.92	572249.4
R76	St Lappans Place	574861.58	572247.62
R77	St Lappans Place	574866.34	572244.64
R78	St Lappans Place	574870.14	572241.58
R79	St Lappans Place	574875.55	572236.65
R80	St Lappans Place	574880.85	572234.56
R81	St Lappans Place	574885.17	572230.66
R82	St Lappans Place	574888.34	572184.97
R83	St Lappans Place	574889.33	572172.67
R84	St Lappans Place	574889.33	572178.08
R85	St Lappans Place	574889.83	572216.97
R86	St Lappans Place	574890.81	572203.19
R87	St Lappans Place	574890.81	572210.57
R88	St Lappans Place	574892.28	572196.79
R89	St Lappans Place	574892.49	572167.02
R90	St Lappans Place	574893.2	572154.5
R91	St Lappans Place	574894.88	572096.15
R92	St Lappans Place	574899.6	572152.53
R93	St Lappans Place	574903.49	572147.44
R94	St Lappans Place	574907.22	572144.15
R95	Residential Property	572778.78	571604.65
S01	School (Little Island NS)	575012.38	572151.59
S02	School (Gaelscoil Ui Drisceoil)	573577.63	572802.17

This page is intentionally blank.

RECEIVED: 30/01/2026

Appendix 7-C

Predicted Operational Noise Levels at NSLs

Location	Description	Period	Criterion	Predicted dB L _{Aeq,T}	Excess?
R01	Residential	Day	55	27	-28
		Evening	50	27	-23
		Night	45	27	-18
R02	Residential	Day	55	27	-28
		Evening	50	27	-23
		Night	45	27	-18
R03	Residential	Day	55	31	-24
		Evening	50	31	-19
		Night	45	31	-14
R04	Residential	Day	55	30	-25
		Evening	50	30	-20
		Night	45	30	-15
R05	Residential	Day	55	31	-24
		Evening	50	31	-19
		Night	45	31	-14
R06	Residential	Day	55	28	-27
		Evening	50	28	-22
		Night	45	28	-17
R07	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R08	Residential	Day	55	34	-21
		Evening	50	34	-16
		Night	45	34	-11
R09	Residential	Day	55	33	-22
		Evening	50	33	-17
		Night	45	33	-12
R10	Residential	Day	55	34	-21
		Evening	50	34	-16
		Night	45	34	-11
R11	Residential	Day	55	33	-22
		Evening	50	33	-17
		Night	45	33	-12
R12	Residential	Day	55	33	-22
		Evening	50	33	-17
		Night	45	33	-12
R13	Residential	Day	55	30	-25
		Evening	50	30	-20
		Night	45	30	-15
R14	Residential	Day	55	24	-31
		Evening	50	24	-26
		Night	45	24	-21

Location	Description	Period	Criterion	Predicted dBAeq,T	Excess?
R15	Residential	Day	55	28	-27
		Evening	50	28	-22
		Night	45	28	-17
R16	Residential	Day	55	32	-23
		Evening	50	32	-18
		Night	45	32	-13
R17	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R18	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R19	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R20	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R21	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R22	Residential	Day	55	28	-27
		Evening	50	28	-22
		Night	45	28	-17
R23	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R24	Residential	Day	55	28	-27
		Evening	50	28	-22
		Night	45	28	-17
R25	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R26	Residential	Day	55	26	-29
		Evening	50	26	-24
		Night	45	26	-19
R27	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R28	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R29	Residential	Day	55	29	-26
		Evening	50	29	-21
		Night	45	29	-16
R30	Residential	Day	55	29	-26

Location	Description	Period	Criterion	Predicted dBP L _{Aeq,T}	Excess?
		Evening	50	29	-21
		Night	45	29	-16
		Day	55	28	-27
R31	Residential	Evening	50	28	-22
		Night	45	28	-17
		Day	55	29	-26
R32	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R33	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R34	Residential	Evening	50	27	-23
		Night	45	27	-18
		Day	55	27	-28
R35	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R36	Residential	Evening	50	26	-24
		Night	45	26	-19
		Day	55	26	-29
R37	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R38	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R39	Residential	Evening	50	28	-22
		Night	45	28	-17
		Day	55	28	-27
R40	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R41	Residential	Evening	50	28	-22
		Night	45	28	-17
		Day	55	28	-27
R42	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R43	Residential	Evening	50	29	-21
		Night	45	29	-16
		Day	55	29	-26
R44	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R45	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20

Location	Description	Period	Criterion	Predicted dBAeq,T	Excess?
		Night	45	30	-15
R46	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R47	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R48	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R49	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R50	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R51	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R52	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R53	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R54	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R55	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R56	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R57	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R58	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R59	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R60	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14

Location	Description	Period	Criterion	Predicted dBP L _{Aeq,T}	Excess?
R61	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R62	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R63	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R64	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R65	St Lappans	Day	55	31	-24
	Place	Evening	50	31	-19
		Night	45	31	-14
R66	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R67	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R68	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R69	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R70	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R71	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R72	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R73	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R74	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R75	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R76	St Lappans	Day	55	29	-26

Location	Description	Period	Criterion	Predicted dBP L _{Aeq,T}	Excess?
	Place	Evening	50	29	-21
		Night	45	29	-16
R77	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R78	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R79	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R80	St Lappans	Day	55	30	-25
	Place	Evening	50	30	-20
		Night	45	30	-15
R81	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R82	St Lappans	Day	55	28	-27
	Place	Evening	50	28	-22
		Night	45	28	-17
R83	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R84	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R85	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R86	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R87	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R88	St Lappans	Day	55	28	-27
	Place	Evening	50	28	-22
		Night	45	28	-17
R89	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R90	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R91	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21

Location	Description	Period	Criterion	Predicted dBP L _{Aeq,T}	Excess?
		Night	45	29	-16
R92	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R93	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R94	St Lappans	Day	55	29	-26
	Place	Evening	50	29	-21
		Night	45	29	-16
R95	Residential	Day	55	22	-33
		Evening	50	22	-28
		Night	45	22	-23
S01	School	Day	55	28	-27
	(Little Island NS)	Evening	50	28	-22
		Night	45	28	-17
S02	School	Day	55	29	-26
	(Gaelscoil Ui Drisceoil)	Evening	50	29	-21
		Night	45	29	-16

This page is intentionally blank.

RECEIVED: 30/01/2026

8.0 WATER QUALITY AND AQUEOUS EMISSIONS

8.1 Introduction

This chapter has been prepared by Sustech and describes the likely impact of the proposed development on the hydrological environment during the construction and operational phases.

The hydrogeological aspects are addressed in Chapter 9 – Soils, Geology and Hydrogeology.

In addition, mitigation measures have been recommended, where required, for each phase of the proposed development in to minimise identified impacts on the surrounding environment.

The treated process effluent and stormwater discharged from the site are controlled and managed by the existing Industrial Emissions Licence (Reg. No. P0017-02).

An Appropriate Assessment (including a Natura Impact Statement) has also been submitted with the Planning Application.

During the operational phase, the site generates three distinct aqueous streams. These streams are:

- Surface water/stormwater runoff
- Sanitary/foul wastewater
- Process effluent

Details of these aqueous streams are provided in the following sections.

The Engineering Report (prepared by DJF Engineering) should also be consulted in the context of this chapter.

8.2 Study Methodology

The assessment of the potential impact of the proposed development on the hydrological environment was carried out according to the methodology specified by the EPA^{1,2,3}.

Various site visits were conducted as necessary in the preparation of this Chapter.

Detailed discussions were held with Cara Partners, WEW Engineering and the project technical engineering groups led by DJF Engineering.

Where appropriate, this assessment has also had regard to the following non-exhaustive list of guidance:

- WSTG (2011) *Discharges to Surface Waters – Guidance to the Applicant* (Rev. B)
- EPA (2015) *Advice Notes for Preparing Environmental Impact Statements – Draft September 2015*

¹ EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)*

² EPA (2003) *Advice notes on current practice in the preparation of Environmental Impact Statements*

³ EPA (September 2015) *Advice Notes for Preparing Environmental Impact Statements – DRAFT*

- UK PI (2017) *Guidance Nationally Significant Infrastructure Projects - Advice Note Eighteen: the Water Framework Directive*
- DoHPLG (2018) *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*
- IFI (2018) *Introduction to the Environmental Assessment Process*
- CIEEM (2024) *Guidelines for Ecological Impact Assessment in the UK and Ireland* (Ver. 1.3 – September 2024)
- UKEA & UKDEFRA (2022) *Guidance - Surface water pollution risk assessment for your environmental permit*
- EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports*
- UKEA (2023) *Clearing the Waters for All*

8.3 Existing Aqueous Emissions

As mentioned previously, the geological and hydrogeological (i.e. groundwater) features of the receiving environment are dealt with in Chapter 9 – Soils, Geology and Hydrogeology. Ecological and biodiversity considerations are dealt with in Chapter 10 – Biodiversity.

This section describes the receiving environment in the context of:

- The currently applicable surface water legislation;
- The surface water, foul wastewater and treated process effluent emissions from the site; and
- The quality of the local receiving surface waters (i.e. Lough Mahon).

8.3.1 Legislative Context

8.3.1.1 Water Framework Directive

Under the Water Framework Directive⁴ (WFD) Ireland has largely consolidated the pre-existing River Basin Districts (RBDs) into a single national RBD in a catchment-based framework (i.e. the RBD is subdivided into catchments and subsequently divided further into subcatchments).

Accordingly, the site is located in the Lee, Cork Harbour and Youghal Bay catchment (Catchment Code: 19). The site is located within Subcatchment 19_2 (Subcatchment code: Tibbotstown_SC_010). This subcatchment is approximately 77.38 km².

The WFD Cycle 2 assessment for the subcatchment is included in Appendix 8-A.

There is no process effluent discharge from the site to surface water.

⁴ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (as amended).

8.3.1.2 *European Communities Environmental Objectives (Surface Waters) Regulations 2009*

In terms of surface water, the applicable legislation is contained European Communities Environmental Objectives (Surface Waters) Regulations 2009, S.I. 272 of 2009 (as amended) which transpose relevant provisions of the WFD as they relate to surface waters. These regulations also establish Environmental Quality Standards (EQS) for the purpose of assessing the status of surface waters. These Surface Waters Regulations apply to all surface waters including lakes, rivers, canals, transitional waters, and coastal waters and supersede all previous water quality regulations.

8.3.1.3 *Other Designations*

The details of Cork Harbour SPA, Dunkettle Shore pNHA, Douglas River Estuary pNHA and other designated sites within the vicinity of the proposed development site are provided in Chapter 10 – Biodiversity.

The existing site lies within the 'Industrial Facility (EU_CD: IE_SW_G_089)' groundwater body that is designated for drinking water under Article 7.

There are no known designated bathing water areas in the vicinity of the proposed development.

There are no known designated shellfish areas within the vicinity of the proposed development.

Lee Estuary/Lough Mahon is a designated UWWTD Nutrient Sensitive Area.

8.3.2 *Surface Water Features at the Proposed Development Site*

There are no surface water features located within the application site boundary.

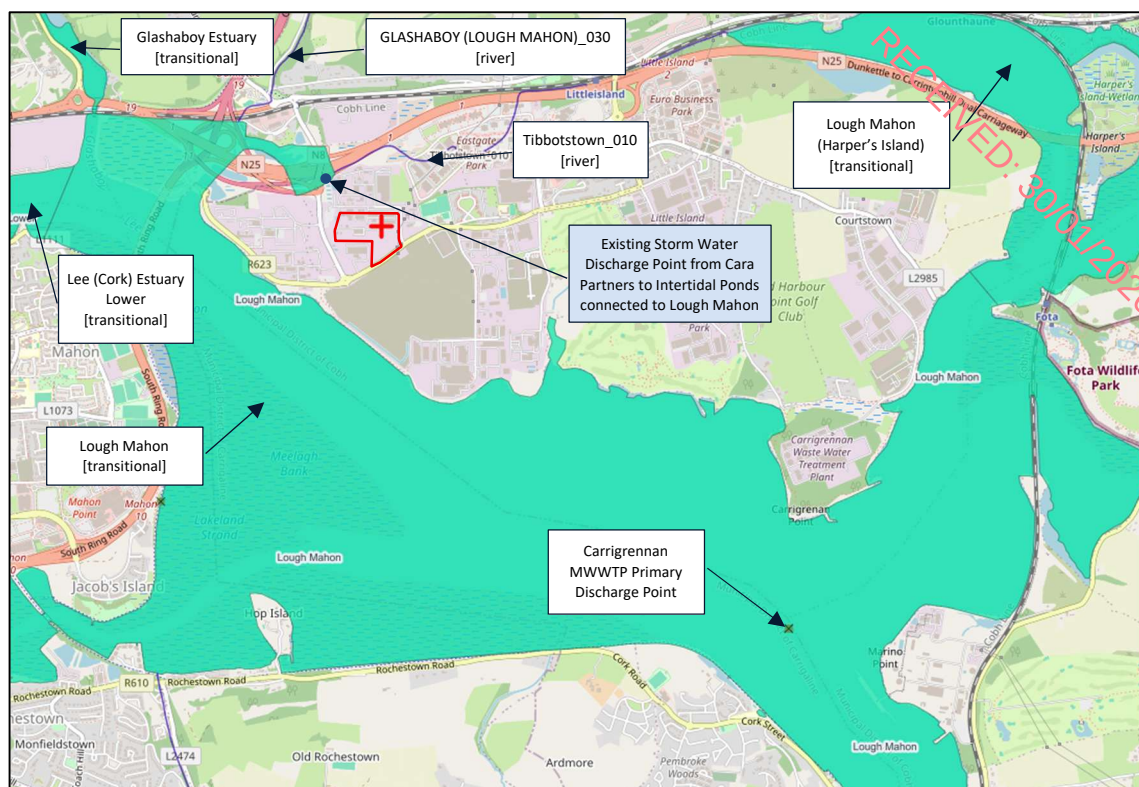


Figure 8-1 Existing surface water environment at Little Island (indicative site boundary shown in red) (extract from gis.epa.ie). Transitional waters are indicated in turquoise.

As per Figure 8-1, the Lough Mahon transitional waterbody (EU_CD code: IE_SW_060_0750) is located to the west of the proposed development site. There is a small river waterbody 'Tibbotstown_010' (EU_CD code: IE_SW_19T250870) also discharging into the same intertidal pond network to the northwest of the site.

Lough Mahon ultimately then connects to then Cork Harbour (EU_CD code: IE_SW_060_0000) coastal waterbody.

Stormwater discharges from the existing site via an existing surface water outfall (Emission Point Ref. No. SW 001) to the intertidal pond network to the northwest of the site adjacent to the Dunkettle interchange. Historically these have been referred to as the 'Pfizer Intertidal Areas' or 'Ellis Basin' which are ultimately connected to Lough Mahon (Figure 8-2).

Under the latest Water Frame Directive (WFD) cycle (2019-2024), Lough Mahon has been designated as being of 'Moderate' status and is designated under the WFD 3rd cycle risk assessment of being 'At Risk' of not achieving 'Good' status.

The Tibbotstown_010 river has been designated as being of 'Good' status and is designated under the WFD 3rd cycle risk assessment of being 'Review' with respect to its risk of not achieving 'Good' status.

The Cork Harbour coastal waterbody has been designated as being of 'Good' status and is designated under the WFD 3rd cycle risk assessment of being 'At Risk' of not achieving 'Good' status.

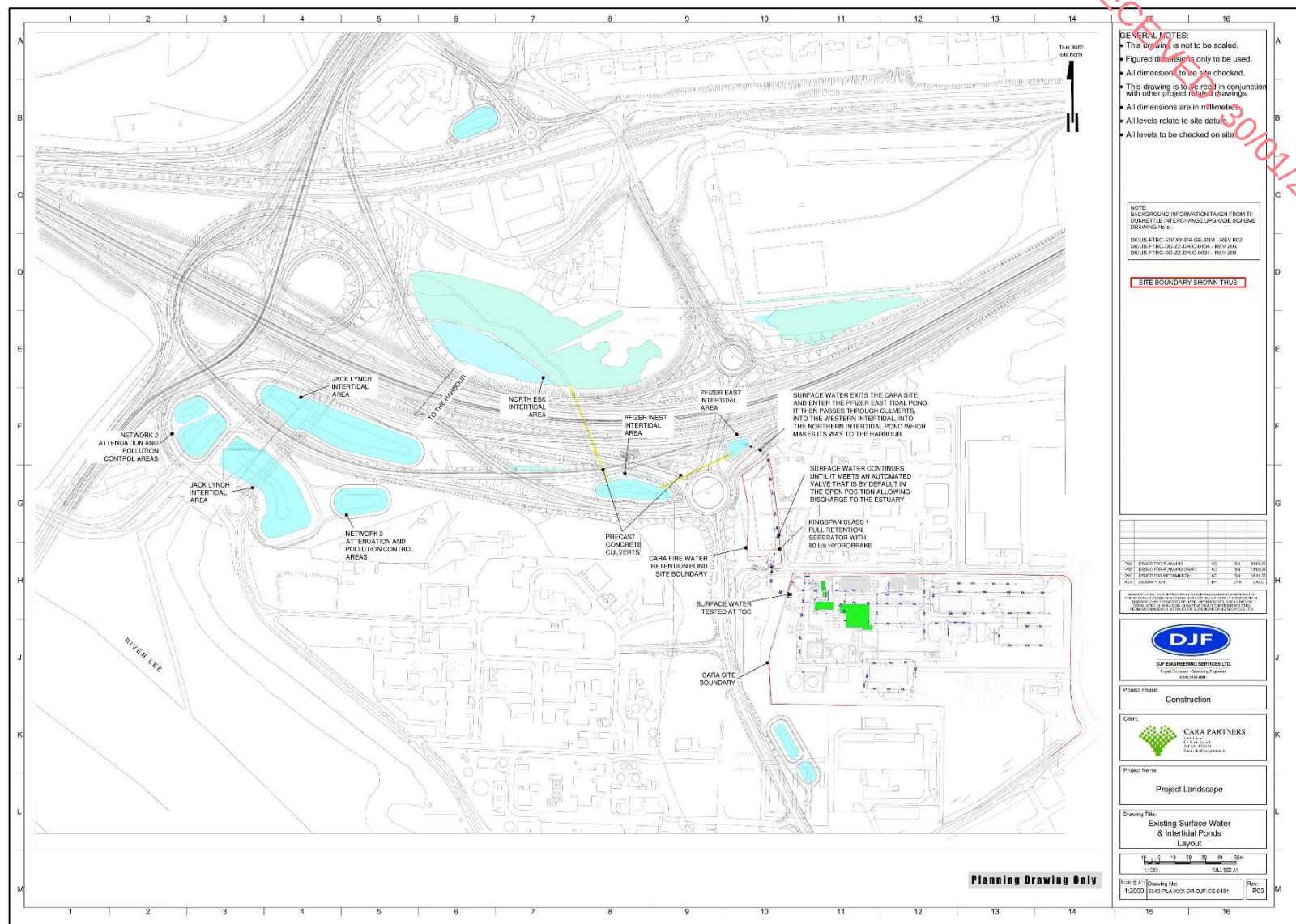


Figure 8-2 Existing stormwater discharge and outfall arrangement from Cara Partners site (Drg. No. 5340-PLA-XXX-DJF-DR-CE-0151).

8.3.3 Stormwater Management

The existing surface water drainage system consists primarily of an underground network of gravity fed pipes serviced by downpipes and surface gullies.

The system collects rainwater run-off from internal access roads, carparking areas, hardstanding areas and roof areas not designated as 'at-risk'.

There are some temporary car parking/compound areas and access roads which are gravelled and are percolating to ground.

Parts of the existing site are natural ground covered by grassland, soft landscaping and/or spoil/bare ground and has no surface water drainage features in place. Rainwater falling on this portion of the site would be expected to lodge on the surface and then drain away by a combination of infiltration and surface flow.

The stormwater system drains to the firewater retention area to the northeast of the main site whereupon the stormwater passes through an existing Class 1 Full Retention Separator prior to discharge to the tidal areas via the SW 001 emission point proximal to the Dunkettle Interchange (Figure 8-2 and Figure 8-4).

In normal operation the stormwater network conveys clean, uncontaminated stormwater to the discharge point (SW 001) via an attenuation hydrobrake and through the existing Kingspan NSFA080 Class 1 Full Retention Separator (Figure 8-3). The separator removes both hydrocarbons and silt passively. The separator is periodically emptied, and the waste material is removed via an appropriately permitted contractor to and appropriately permitted facility for further treatment.

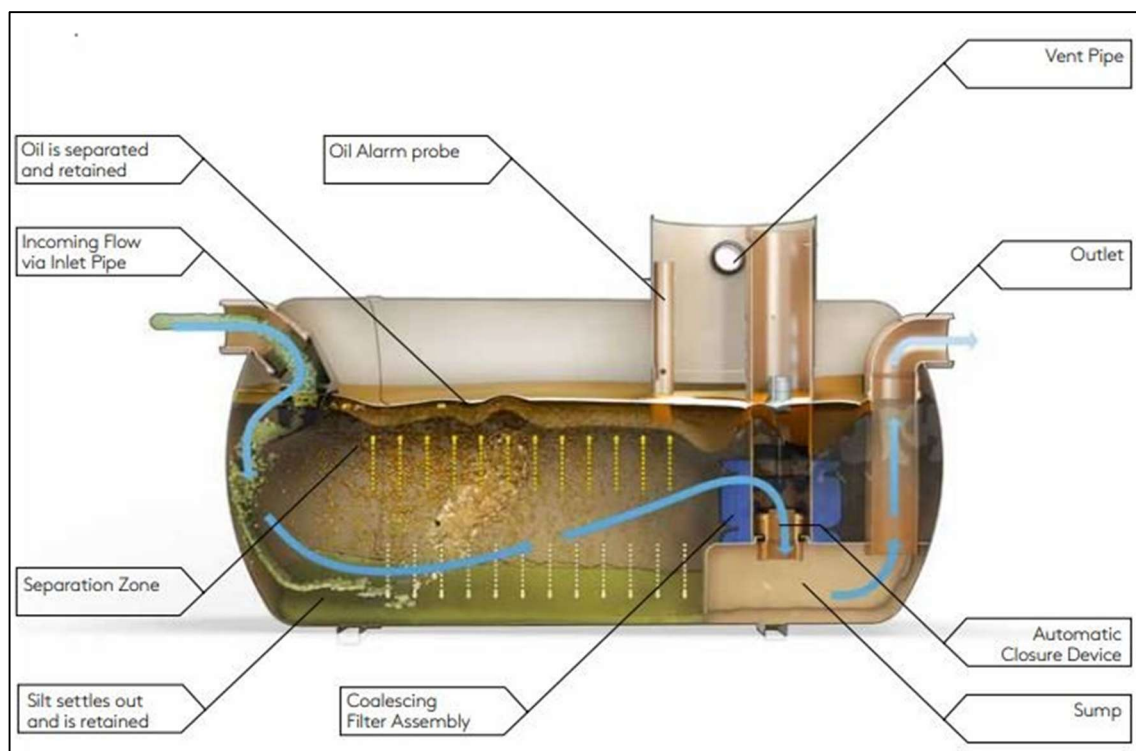


Figure 8-3 Principle of operation of Kingspan NSFA Class 1 Full Retention Separators (© Kingspan Klargester).

The stormwater is analysed by a continuous online Total Organic Carbon (TOC) and pH monitoring system.

In addition to the continuous analyser referenced above, the stormwater is also sampled weekly for the following parameters:

- COD
- Ammonia
- pH
- Visual inspection

In the event of a fire or spillage, the stormwater discharge from the site will cease and all runoff will be diverted to the purpose-built firewater retention pond.

Diversion to the retention pond is triggered by the following conditions:

- High TOC
- High pH
- Low pH
- Instrument Failure
- Low Chemical
- High Level BT1
- Fire alarms

In the event of an incident requiring the retention and isolation of contaminated material, no such material will be removed offsite until appropriate engagement with relevant stakeholders has been completed such as CCC, EPA, Uisce Éireann etc. as per the IEL requirements.

Rainwater collected in bunded areas is subject to an operational procedure which includes a sampling and monitoring inspection for contamination prior to pumping of clean uncontaminated rainwater to the stormwater network.

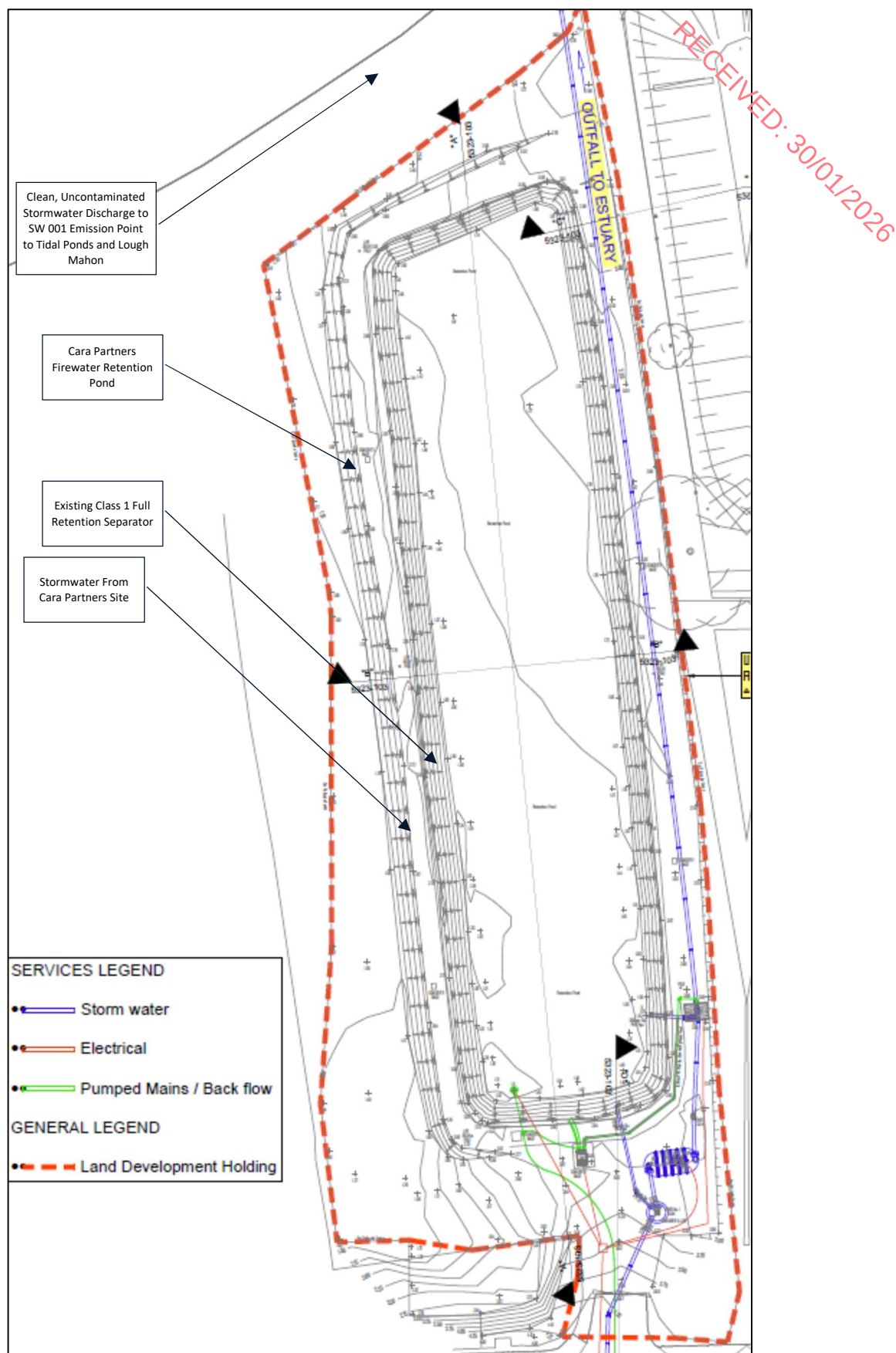


Figure 8-4 Arrangement of existing stormwater management infrastructure proximal to Cara Partners firewater retention pond.

8.3.4 Wastewater Management

Process wastewater arising from manufacturing activities are collected by gravity via a segregated drainage network and directed to the onsite wastewater treatment plant (WWTP). The WWTP provides biological and physico-chemical treatment prior to discharge to the municipal Uisce Éireann network for ultimate treatment at Carrigrennan Municipal WWTP (MWWTP).

The onsite WWTP comprises the following principal unit processes:

- Balancing (via 2no. balance tanks c. 240 m³ total balancing capacity) and neutralisation
- Activated sludge plant (c. 720 m³) with both surface aeration and local venturi aeration
- Traditional clarifier (6.5m diameter) for solids separation
- Sludge dewatering via a dedicated belt press

An indicative process flow diagram (PFD) of the existing onsite WWTP is shown in (Figure 8-5).

The general principle of operation is that the wastewater is collected in a balance tank where it is mixed and balanced for hydraulic and load purposes. Thereafter the equalised flow is pumped forward to the aeration tank where the activated sludge flocs, comprising a mixed multitrophic microorganism ecology, mixes with the incoming effluent and treats it via carbonaceous oxidation and nitrification processes.

The sludge is then pumped to a surface overflow clarifier where the solids are separated from the treated supernatant.

The solids are returned to the aeration tank to maintain the necessary concentration of sludge for optimum treatment. Excess activated sludge is directed to an onsite sludge dewatering system (belt press) where they are further dewatered and sent offsite as waste.

The treated effluent is then discharged to the municipal Uisce Éireann network for further treatment at Carrigrennan municipal WWTP (MWWTP).

The Basis of Design Report for the proposed upgrades to the existing WWTP is provided in Appendix 8-B. This also includes further details on the design parameters of the existing WWTP insofar as the information is available.

Detailed SOPs are in place for the operation, monitoring and management of the onsite WWTP.

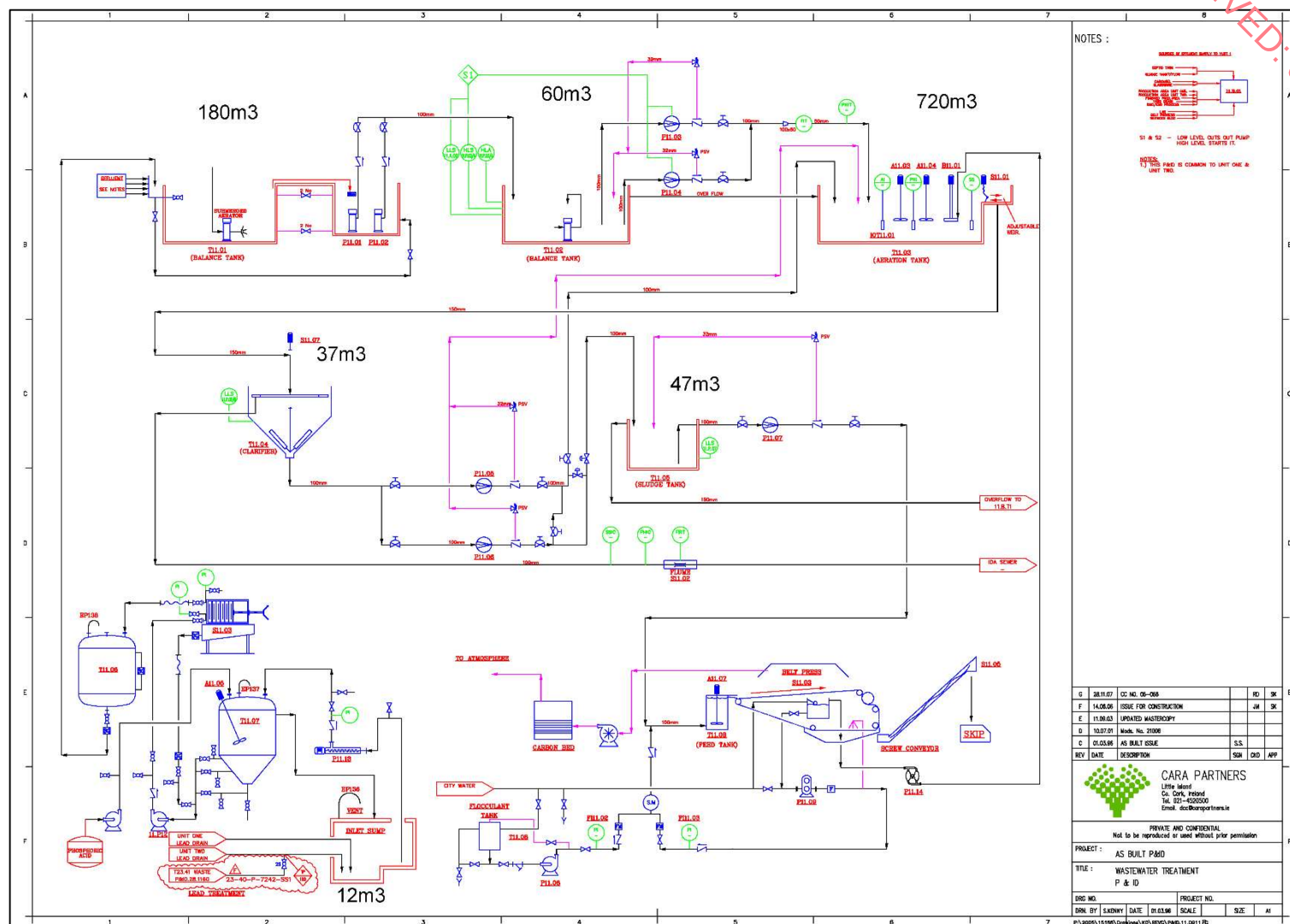


Figure 8-5 Process flow diagram of existing WWTP plant onsite.

Foul/sanitary wastewater related to the c. 100-120 employees onsite is also managed at the WWTP and is ultimately discharged to the municipal network.

Treated wastewater is controlled via the existing site IEL and associated Emission Limit Values (ELVs), see Figure 8-6 below.

The proposed development includes significant upgrades to the infrastructure at the WWTP but it is noted that it is not proposed to amend the existing IEL ELVs.

B.3 Emission to Sewer		
Emission Point Reference No.:	DP 001	
Name of Receiving Waters:	Lough Mahon following treatment in Carrigrennan WWTP	
Location:		
Volume to be emitted:	Maximum in any one day:	240 m ³
	Maximum rate per hour:	17 m ³
Parameter	Emission Limit Value	
Temperature	30°C (max.)	
pH	6.0 – 9.0	
	mg/l	kg/day
BOD	400	66
COD	800	130
Suspended Solids	600	60
Sulphate (as SO ₄)	1000	--
Total Nitrogen (as N)	200	--
Ammonia (as N)	40	--
Total Phosphorus (as P)	50	--
Detergents (as MBAS)	10	--
Lead (as Pb)	0.5	0.1
Zinc (as Zn)	0.5	0.1
Fats, Oils & Grease	20	--

Figure 8-6 Cara Partners wastewater discharge ELVs (as per Schedule B.3 of P0017-02 as amended).

8.3.4.1 Lead Acetate Process

There is currently a specific process stream (which operates infrequently) which includes the use of lead compounds. Accordingly, there is specific process infrastructure in place to manage and segregate process wastewater which has significant lead material. This segregated lead waste is removed offsite by an appropriate permitted contractor to an appropriately permitted facility.

It is noted that the proposed development includes the decommissioning of this lead process from site operations.

8.3.4.2 Process Effluent Characterisation

A detailed analysis of the influent characteristics of the existing site wastewater are included in sections 2.2-2.4 of the Basis of Design Report presented in Appendix 8-B.

In summary, the existing raw effluent discharged to the WWTP and treated effluent from the WWTP can be summarised as follows (period 2024-2025):

- **Influent Characterisation Summary**
 - Flow
 - Average Daily Flow: c. 115 m³/d
 - Max Flow: 280.8 m³/d
 - COD
 - Average COD load: c. 704 kg COD/d
 - Max COD load: 1,992 kg COD/d
- **Treated Effluent Characterisation Summary**
 - Flow
 - Average Daily Flow: c. 111.28 m³/d
 - pH
 - Average pH: 7.8
 - Total Suspended Solids (TSS)
 - Average TSS concentration: c. 140.5 mg TSS/L
 - Average TSS load: c. 15.6 kg TSS/d
 - Chemical Oxygen Demand (COD)
 - Average COD concentration: c. 330 mg COD/L
 - Average COD load: c. 36.7 kg COD/d
 - Total Nitrogen (TN)
 - Average TN concentration: c. 11.9 mg N/L
 - Average TN load: c. 1.3 kg N/d
 - Ammonia
 - Average Ammonia concentration: c. 3.6 mg N/L
 - Average Ammonia load: c. 0.4 kg N/d
 - Nitrate
 - Average Nitrate concentration: c. 2.2 mg N/L
 - Average Nitrate load: c. 0.24 kg N/d
 - Total Phosphorus (TP)
 - Average TP concentration: c. 0.6 mg P/L
 - Average TP load: c. 0.067 kg P/d
 - Ortho Phosphorus (oP)
 - Average oP concentration: c. 0.1 mg P/L
 - Average oP load: c. 0.012 kg P/d

8.3.4.3 Wastewater Discharge

The wastewater is conveyed through a flow meter and 24-hour flow proportionate composite sampler and monitored in line with EPA requirements (Figure 8-7) prior to discharge to the municipal sewer network at emission point DP 001.

Emission Point Reference No.: DP 001		
Parameter	Monitoring Frequency ^{Note 1}	Analysis Method/Technique
Flow	Continuous Daily ^{Note 2}	On-line flow meter with recorder
Temperature	Continuous	On-line temperature probe with recorder
pH	Daily	pH electrode/meter and recorder
Chemical Oxygen Demand	Weekly	Standard Method
Biochemical Oxygen Demand	Monthly	Standard Method
Suspended Solids	Weekly	Gravimetric
Total Nitrogen (as N)	Monthly	Standard Method
Ammonia (as N)	Weekly	Ion selective electrode/colorimetric
Total Phosphorus (as P)	Monthly	Standard Method
Lead (as Pb)	Monthly	Standard Method
Zinc (as Zn)	Monthly	Standard Method
Detergents (as MBAS)	Annually	Standard Method
Organic compounds ^{Note 3}	Monthly	GC/MS
Fats, oils & grease	Quarterly	Standard Method
Respirometry Test	Annually	Standard method using Cork City Council WWTP sludge
Sulphates (as SO ₄)	Monthly	Standard Method

Note 1: All samples (where monitoring is not continuous) shall be collected on a 24 hour flow proportional composite sampling basis.

Note 2: Total effluent volume discharged over the 24 hour period in which the composite sample is collected shall be recorded.

Note 3: This analysis shall include those organic solvents in use in the process, which are likely through normal process operations to be diverted to the waste water streams.

Figure 8-7 Cara Partners wastewater discharge monitoring requirements (as per Schedule C.3.2 of P0017-02 as amended).

There is no direct discharge of wastewater from the site to Lough Mahon, nor is any proposed.

8.3.5 Cork City MWWTP (Carrigrennan)

Following further biological treatment at Cork City municipal wastewater treatment plant (MWWTP) at Carrigrennan under Wastewater Discharge Licence D0033-01, the treated effluent from the MWWTP is discharged to Lough Mahon via a sea outfall located c. 3.2 km southeast of the site and c. 900 m south from the MWWTP (see Figure 8-1).

The MWWTP is designed to treat 413,000 Population Equivalents (PE) and is reported as servicing an equivalent load of c. 298,001 PE in 2024 leaving remaining capacity in the MWWTP of c. 115,199 PE.

Based on the 2024 Annual Environmental Report (AER) for the MWWTP (latest available at time of writing), all relevant parameters were noted as 'Pass' for 'Overall Compliance' other than Total Nitrogen which indicated 'Fail'.

Section 2.1.3 of the AER concluded the following in relation to ambient monitoring of the discharge:

"The discharge from the wastewater treatment plant does not have an observable impact on the water quality.

The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status."

8.4 Characteristics of the Proposed Development

8.4.1 General Characteristics of the Proposed Development

The proposed development comprises various elements to be developed on a phased basis over a period of ten years. A proposed site layout drawing is presented in Drg. Ref. 5340-PLA-XXX-DR-DJF-AR-0010.

- 1) **Unit 1 Production Building** – Construction of a replacement, multi-storey Unit 1 Production building approx. 34m L x 23m W x 26m H (approx. 3,000m²).
- 2) **In Process Tank Farm Bund** – Modifications to the existing 'In Process Tank Farm' bund and ancillary plant and services related to same including pipe racks.
- 3) **Laboratory Gas Bottle Store** – Construction of a new Laboratory Gas Bottle Store approx. 4m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
- 4) **Regenerative Thermal Oxidiser** – Provision of a new Regenerative Thermal Oxidiser, associated exhaust stack (approx. 10mAGL) and ancillary plant and services related to same including pipe racks.
- 5) **Process Cooling** – Provision of 1no. process cooling tower (approx. 5mAGL) to be installed to provide additional cooling for manufacturing processes and ancillary plant and services related to same including pipe racks.
- 6) **Combined Heat and Power Plant and Heat Recovery System** – addition of a new natural-gas fired containerised combined heat and power (CHP) plant (approx. 6 MW_{TH} Total Rated Thermal Input) and associated containerised waste heat boiler system with exhaust stack approx. 13mAGL and ancillary plant, kiosks and services related to same including pipe racks.
- 7) **Ethanol Storage Tank** – addition of a new ethanol storage tank (2.4m diameter x 7m H) in existing solvent tank farm bund and ancillary plant and services related to same including pipe racks.
- 8) **Car Park** – extension to existing car park including associated lighting to provide a net increase of additional 67no. permanent car parking spaces.
- 9) **Wastewater Treatment Plant (WWTP) Control and Blower Building** - Single storey building associated with WWTP expansion, approx. 11m L x 10m W x 4m H (approx. 90m²); and ancillary plant and services related to same including pipe racks.
- 10) **WWTP Chemical storage tanks and bund** – new concrete base and bund (approx. 45m²) with tanks approx. 3.5m H and ancillary plant and services related to same including pipe racks.
- 11) **WWTP Inlet works** – new screens, tanks up to approx. 9m H and ancillary plant and services related to same including pipe racks
- 12) **WWTP Dissolved Air Flotation tank** – new tank approx. 5m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.

- 13) **Site Works** – All associated site services, site development works and landscaping to facilitate the proposed development.

8.4.2 Specific Characteristics of the Proposed Development

The Drainage Impact Assessment contained within the Engineering and Infrastructure Report (ref. 5340-PA-DJF-ZZ-0007 ENG) should also be considered with this Chapter.

Detailed drawings have been prepared in support of the planning application and should be consulted in conjunction with this chapter.

Relevant drawings include but are not limited to:

Drg. No.	Drg. Title
5340-PLA-XXX-DR-DJF-AR-0010	Proposed Site Layout
5340-PLA-XXX-DR-DJF-CE-0150	Proposed Services Layout - Area A
5340-PLA-XXX-DR-DJF-CE-0151	Existing Stormwater Discharge and Intertidal Pond Layout
5340-PLA-XXX-DR-DJF-CE-0152	Proposed Services Layout - Area B
5340-PLA-XXX-DR-DJF-CE-0153	Proposed Services Layout - Area C
5340-PLA-XXX-DR-DJF-AR-0082	WWTP Inlet Works: Proposed Plan and Elevation
5340-PLA-XXX-DR-DJF-AR-0085	WWTP Control and Blower Building: Proposed Plan, Section and Elevations
5340-PLA-XXX-DR-DJF-CE-0091	Car Park Extension: Existing & Proposed Layouts

8.4.2.1 Flood Risk Assessment

A flood risk assessment has been completed and is included in the Engineering and Infrastructure Report (ref. 5340-PA-DJF-ZZ-0007 ENG).

The conclusion of the Stage 1 Flood Risk Assessment is as follows:

“The conclusion of the flood risk identification stage of the flood risk assessment is that the proposed development is not at risk of flooding and will not increase the risk of flooding to other sites. Therefore, in accordance with the FRM guidelines, there is no requirement to assess the risk of flooding further for this development.”.

8.4.2.2 Stormwater Management

The existing site drainage networks will continue to be utilised as described previously in section 8.3.3. The existing site drainage networks have capacity to accommodate the proposed development.

Other than the extension to the existing car park (see comment re. permeable paving below), there is a small addition of new impermeable site area being introduced as part of the proposed development which is considered insignificant in the context of the overall site.

No changes to the existing stormwater monitoring, interception, attenuation and diversion system are proposed.

No changes to the existing outfall arrangements are proposed and as the existing outfall is limited by an existing hydrobrake, there are no changes to maximum stormwater discharge flow rates proposed.

There is no change to the existing emission point proposed (Emission Point Ref. SW 001).

The existing attenuation system has capacity to incorporate the proposed development.

Where necessary, tie-ins to these existing networks will be completed in accordance with building and regulatory requirements. Details of the proposed tie-ins to the existing networks are shown in Figure 8-8.

In line with Sustainable Drainage Systems (SuDS) design requirements and as per the Cork County Development Plan, where appropriate, a permeable pavement system is proposed for the car park extension. This permeable paving design will incorporate a geotextile membrane to mitigate the impact of hydrocarbon pollutants on the subsurface environment (see Figure 8-9).

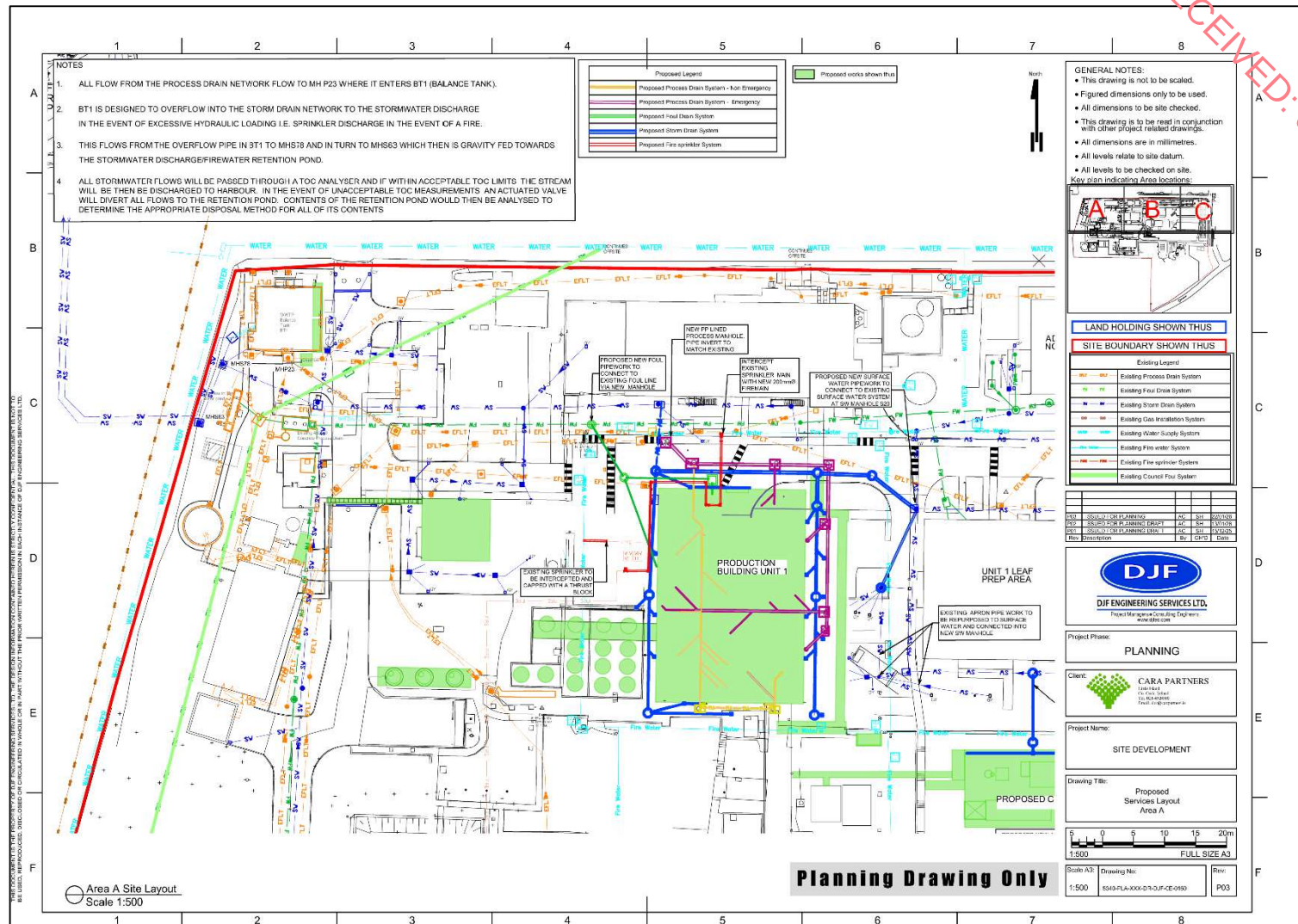


Figure 8-8 Details of proposed drainage arrangements (excerpt from Drg. No. 5340-PLA-XXX-DR-DJF-CE-0150).

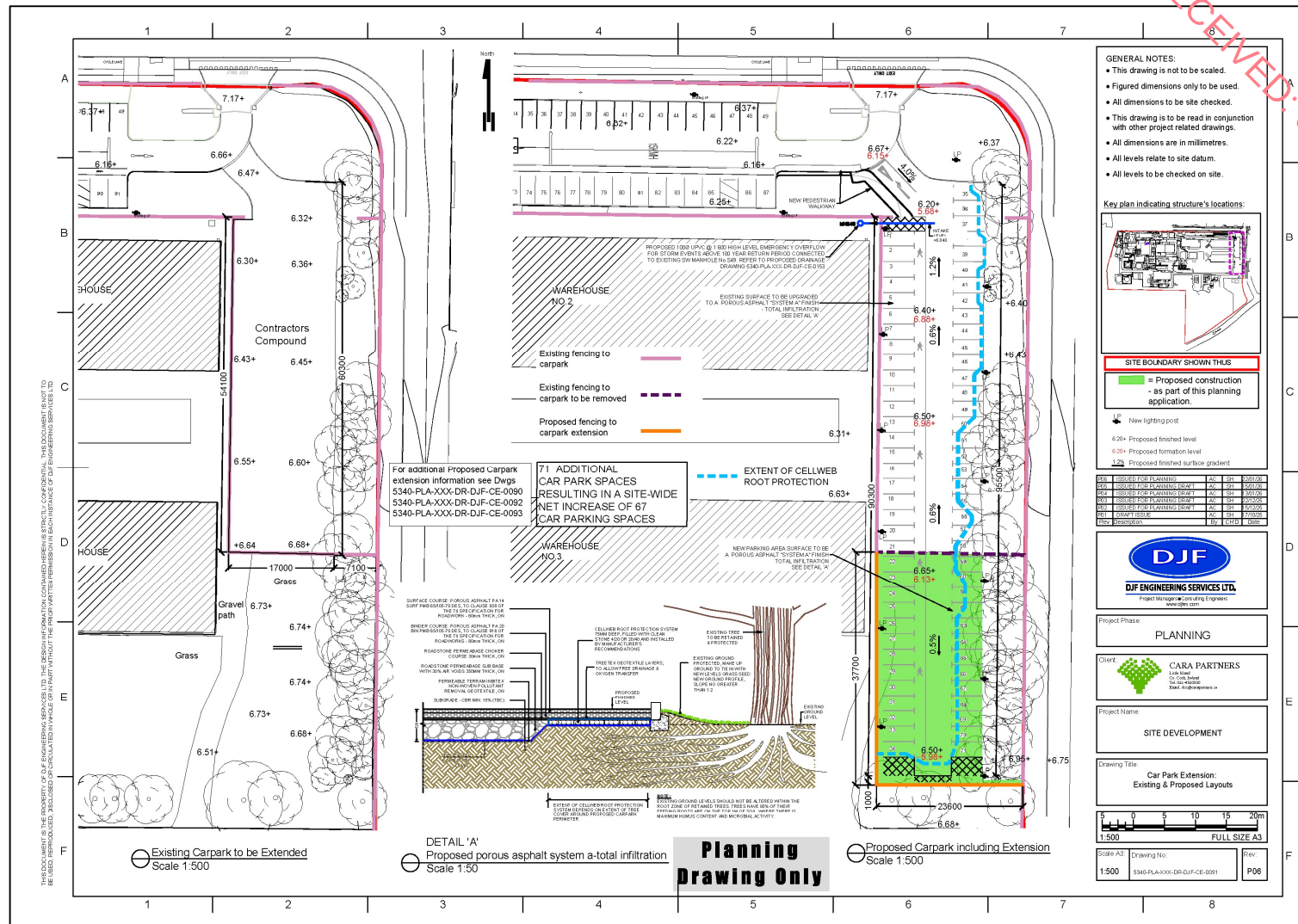


Figure 8-9 Details of proposed drainage arrangements at carpark (excerpt from Drg. No. 5340-PLA-XXX-DR-DJF-CE-0091).

8.4.2.3 Wastewater Management

As detailed in section 8.3.4, there is an existing WWTP onsite performing within the current IEL discharge envelope (see Figure 8-6).

The main design principles adopted for the proposed development were:

- To focus on leveraging existing assets onsite and reuse/repurpose them where possible so as to utilise existing infrastructure as sustainably as possible.
- To increase biological treatment capacity within the existing site asset footprint.
- To increase the efficiencies of the existing aeration system and in the sludge management system.
- To mitigate against a requirement for increasing the current licensed discharge envelope from the site.

Influent Changes

The proposed design will facilitate an increase from max. daily influent to WWTP from c. 300 m³/d to 400 m³/d. The addition of the new balancing system will mean that the site will be able to remain within the existing max. daily discharge flow ELV of 240 m³/d.

The proposed design also facilitates an increase in the max. weekly Chemical Oxygen Demand (COD) influent load from c. 1,600 kg COD/d to c. 2,000 kg/d. This increased COD load will then be treated in the upgraded onsite WWTP to remain within the existing max. daily discharge COD load of 130 kg COD/d.

Infrastructure Upgrades

The proposed development can be accommodated within the existing discharge envelope subject to a number of phased upgrades summarised as follows:

- New Inlet Works
 - Repurposing of existing Balance Tank to become combination inlet sump and balance tank.
 - Installation of new 2mm automatic screening unit.
 - Installation of new 0.2mm microscreen unit.
 - New duty/standby inlet forward feed pumps.
- Repurposed Main Balance Tank
 - Repurposing of spare tank onsite to become new converted balance tank (c. 430 m³).
 - New chemical dosing/neutralisation.
 - New duty/standby jet mixer for balance tank.
 - New duty/standby balance tank forward feed pumps.
- Reconfiguration Biological Treatment
 - Replace existing inefficient surface aerators with fine bubble diffusion system (FBD) and high efficiency blowers.

- New Solids Separation
 - Replacement of existing traditional clarifier with new Dissolved Air Flotation (DAF) unit permitting a higher concentration of MLSS in the system.
 - New duty/standby forward feed pumps.
 - New duty/standby sludge pumps.
- New Sludge Management
 - Replacement of existing belt press with more efficient screw press.
- New Blower Building
 - New blower building to house new duty/assist/standby blowers, MCC and facilitate an upgrade of the PLC and SCADA.
- Ancillary
 - Reconfiguration of foul/sanitary wastewater management at WWTP.
 - All necessary pipework, racks etc. to support the above.

An outline process flow diagram of the proposed upgrades to the onsite WWTP is presented in Figure 8-10.

Further details related to the proposed WWTP upgrades are provided in Appendix 8-B.

The discharge will be continuously monitored for flow, temperature and pH and the ELVs stipulated in Figure 8-6 will continue to apply.

The monitoring provisions in the existing IEL will continue to apply unless otherwise revised by the EPA.

BAT Compliance

It is noted that the proposed treatment approach is fully compliant with relevant Best Available Technique (BAT) requirements⁵.

Licensing and Connection Agreement

The existing IEL will be reviewed and where necessary relevant monitoring and control provisions will be updated as necessary.

Where necessary, the existing Connection Agreement with Uisce Éireann will be updated to reflect the proposed development.

Discharge Point

There is no change to the existing discharge point (Emission Point Ref. DP 001) to the municipal sewer network proposed.

⁵ e.g. Commission Implementing Decision (EU) 2016/902 of 30 May 2016 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for common waste water and waste gas treatment/management systems in the chemical sector.

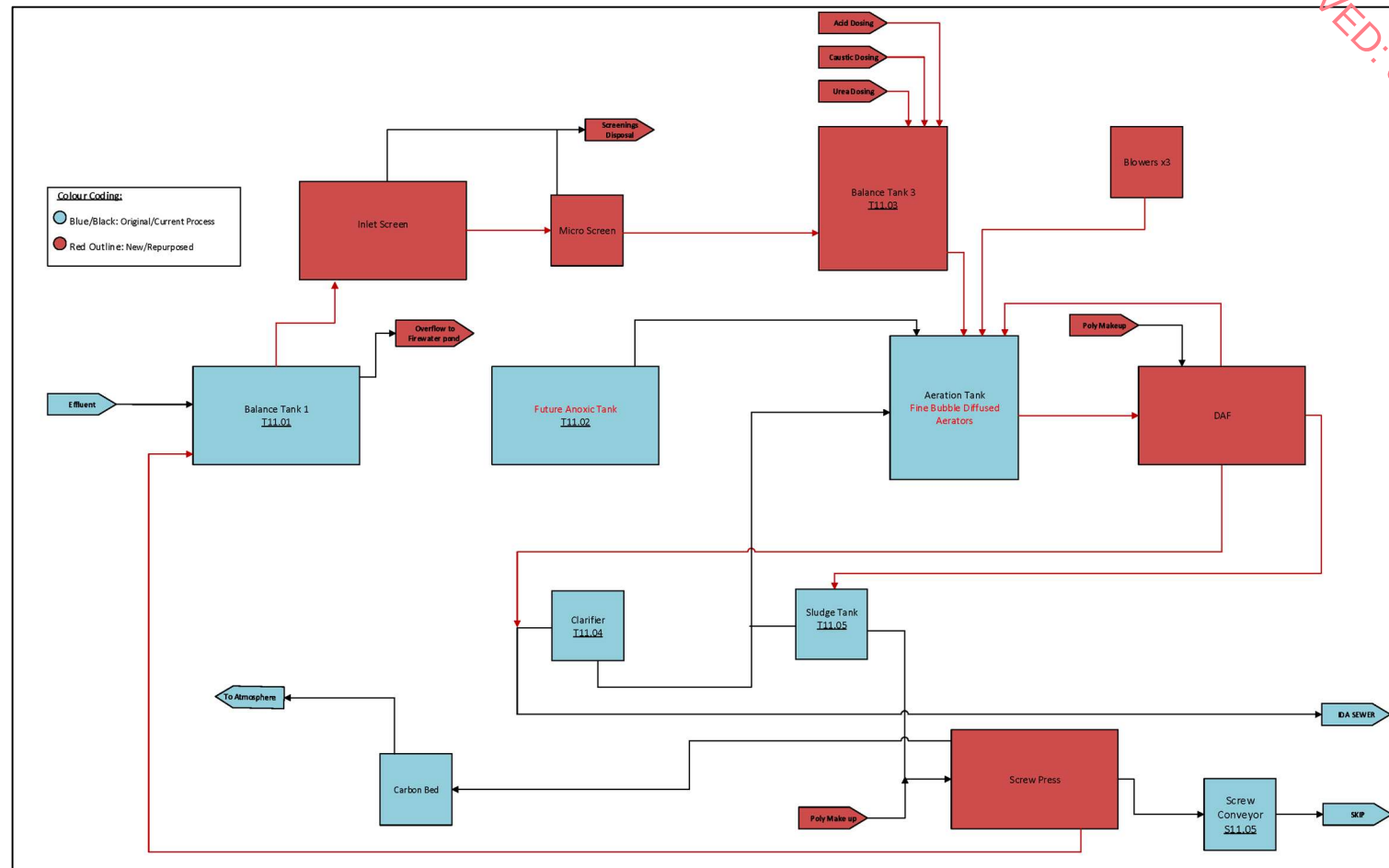


Figure 8-10 Outline process flow diagram (PFD) of proposed upgrades to onsite WWTP.

8.4.3 Construction Phase

8.4.3.1 Sanitary/Foul Drainage

Welfare facilities will be provided for onsite personnel throughout the construction phase. These facilities will be connected to the existing onsite foul drainage system or will be independently collected via dedicated systems with contained storage (e.g. Portaloo's etc.).

8.4.3.2 Stormwater

The likelihood of surface water collecting in excavations is low, however some small degree of ponding may occur in localised areas where significant soil compaction may have taken place due to regular trafficking of heavy machinery.

Where surface water run-off collects in excavations, this will be redirected to temporary settlement sumps. The size, quantity and number of settlement sumps required will be reviewed prior to commencement of development based on determining factors such as volume of water requiring treatment, silt load, topography and access constraints. Water collected in settlement sumps will be discharged to existing surface water drainage system or process effluent system as appropriate.

8.4.3.3 Process Wastewater

It is not anticipated that the construction phase will have any impact on the process effluent. Where possible, normal production operations will proceed during the construction phase. Where the construction phase involves works to the existing process effluent management system, appropriate measures will be taken to ensure the integrity of the existing system is not compromised.

8.4.4 Operational Phase

8.4.4.1 Sanitary/Foul Drainage

It is proposed to continue to use current arrangements for discharge of sanitary/foul wastewater from the proposed development. Sanitary/foul wastewater is collected in a separate foul drainage system which is connected to the local municipal drainage network for ultimate treatment in Cork City MWWTP which has adequate capacity to treat the total headcount from the site.

8.4.4.2 *Process Wastewater*

The proposed development will result in an increase in process effluent volumes as detailed in section 8.4.2.3 but will remain within the existing permitted discharge envelope under the current IEL.

The operation of the enduring process and foul effluent management system will be subject to appropriate SOPs and associated training. All operators will be appropriately trained in the operation of the relevant infrastructure.

Monitoring and Maintenance

All instrumentation, alarms and telemetry will be incorporated into the existing site control system where relevant.

Relevant SOPs, Site Emergency Plan and all other material will be updated to incorporate the proposed development.

Monitoring and maintenance will be as per EPA licensing requirements.

Where contaminated firewater or other retained liquid material has been contained and retained by the firewater retention system, it may be discharged to the onsite WWTP and thereafter to the municipal sewer network for further treatment. However, such a discharge will only be permitted with the approval of relevant authorities such as Cork County Council, EPA and Uisce Éireann and would be subject to any associated testing and characterisation of the material as required.

8.4.4.3 *Stormwater*

Subject to the alterations to the existing drainage system as described previously, the stormwater system will continue to operate as per the existing system.

Monitoring and Maintenance

Relevant SOPs, Emergency Response Plans and all other material will be updated to incorporate the proposed development.

Monitoring and maintenance will be as per EPA licensing requirements.

8.5 Potential and Predicted Impacts of the Proposed Development

Impacts on the ecological aspects of the proposed development are considered in Chapter 10 – Biodiversity.

8.5.1 Construction Phase

There will be no uncontrolled discharge permitted to any watercourse during the construction phase of the proposed development.

8.5.1.1 Sanitary/Foul Drainage

Welfare facilities will be provided for onsite personnel throughout the construction phase. These facilities will be connected to the existing onsite foul drainage system.

The overall predicted impact on the surrounding foul drainage system, during the construction phase of the proposed development, is considered to be short-term and neutral.

8.5.1.2 Stormwater

The possible outlets for stormwater from the site are via the existing defined emission point to Lough Mahon and via uncontrolled surface runoff to ground.

Construction works will entail the excavation, handling, movement and storage of materials, which have the potential to cause contamination both onsite and offsite, via surface runoff.

Mitigation measures put in place will ensure that the risk of contamination of any surface waters is kept to a minimum and that the impact of the construction phase on surface waters is short-term and neutral.

8.5.1.3 Process Wastewater

There is no proposed impact of the construction phase on process wastewater and therefore its impact is considered long-term and neutral.

8.5.2 Operational Phase

8.5.2.1 Sanitary/Foul Drainage

The production of foul wastewater during the operational stage of the development is considered to have an imperceptible, long-term and negative impact on the water environment as there is an increase in overall headcount onsite.

8.5.2.2 Stormwater

The site will be continue to be covered by impermeable areas either in the form of buildings or hardstand areas during the operation of the proposed development and therefore all of collected stormwater will be treated in the stormwater system prior to discharge to Lough Mahon via the existing Class 1 Full Retention Separator.

Where permeable paving solutions are implemented, a specialist water-permeable geotextile layer (e.g. Terram Inbitex™ Geotextile or similar) which is designed to attract and trap hydrocarbons and filter silt will be installed.

All stormwater will be monitored according to the requirements of the current and revised IEL.

Therefore, the predicted impact is not-significant, positive and long-term.

8.5.2.3 Process Wastewater

The predicted impact of the discharge of treated process effluent to the municipal network from the proposed development within the existing discharge envelope on the receiving environment is predicted to be not significant, negative and long-term.

8.6 Do Nothing Scenario

Were this development not to proceed there would be no change in the current water environment scenarios.

8.7 Mitigation Measures

In order to minimise the potential impacts from the proposed development on the water environment, the specific mitigation measures detailed in this section will be implemented. These measures will ensure that contamination of groundwater and/or surface water does not occur during normal, and/or emergency conditions. The combined application of these mitigation measures will help ensure that potential inputs to, and subsequent contamination of, the soil, groundwater and hydrological environment do not occur at the site during either the construction or operational phase of the proposed development.

The mitigation measures detailed in Chapter 09 'Soils, Geology and Hydrogeology' and Chapter 10 'Biodiversity' should also be considered in the context of this chapter.

8.7.1 Construction Phase

- Stockpiles of excavated materials will be stored appropriately in order to minimise the risk of runoff from wet excavated materials or from rainwater falling on the material, entering surrounding water bodies.
- The control of runoff, which is likely to contain increased loads of suspended solids, will be controlled by the use of mitigation measures such as bunds, silt fences or by covering the stockpiles with plastic sheeting, for example.
- Where stormwater run-off collects in excavations, this will be redirected to temporary settlement sumps as required. The size, quantity and number of settlement sumps required will be reviewed prior to commencement of development based on determining factors such as volume of water requiring treatment, silt load, topography and access constraints. Stormwater collected in settlement sumps will be discharged to existing stormwater drainage system or process wastewater network as appropriate.
- The provision of wheel wash or road cleaning facilities close to the site entrance shall reduce the deposition of mud, soils and other substances on the surrounding road network.
- In order to minimise any impact on the underlying subsurface strata, surface water and groundwater from material spillages, all oils, solvents and paints used during construction will be stored within specially constructed dedicated, temporary, bunded areas or suitable bunded lockable storage containers. Oil and fuel storage tanks shall be stored in designated bunded areas. These areas shall be bunded to a volume of 110% of the capacity of the largest tank/container present or 25% of the total tank capacity within the bund (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.
- All grout/concrete washout facilities will be established away from exposed excavations and surface waters and into dedicated skips on site. There will be no washout of concrete trucks onsite. Such activities will be monitored, and the skips will be appropriately located and secured.

- In the event of a major spillage the contractor's Construction Stage Construction Environmental Management Plan will be followed. The first action is to stop the source of pollution and contain the spillage.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area of the site either within a bunded area or over a drip tray. Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.
- If vehicles cannot be moved to the dedicated refuelling area, a mobile bowser (comprising a double skinned tank) will be used by trained personnel to deliver fuel to the vehicle. Spill kits and drip trays will be used to contain any spillages, should they occur.
- Waste fuels and materials shall be stored in designated areas that are isolated from surface water drains or open waters (e.g. excavations). Skips shall be closed or covered to prevent materials being blown or washed away and to reduce the likelihood of contaminated water leakage. Hazardous wastes such as waste oil, chemicals and preservatives, shall be stored in sealed containers and kept separate from other waste materials while awaiting collection by a registered waste carrier. Where possible, fuelling, lubrication and storage areas shall not be located within 25m of drainage ditches, surface waters or open excavations. Fuel interceptor tanks shall be installed on the site to treat any runoff if required.
- All potentially hazardous materials shall be securely stored on site.
- All associated hazardous waste residuals, such as oil, solvent, glue and solvent based paint containers will be stored within appropriately covered skips prior to removal by a suitable Local Authority or EPA approved waste management contractor for offsite treatment, recycling and/or disposal. Any other building waste will be disposed of to designated skips for removal by a duly approved waste management contractor to an appropriately licensed facility.

8.7.2 Operational Phase

- The site will continue to operate under the current (or revised) Industrial Emissions Licence and will aim to adhere to all relevant limits, conditions and provisions contained therein.
- Sanitary/foul wastewater will be discharged via the municipal sewerage network subject to any conditions set by the Local Authority and/or Uisce Eireann.
- Stormwater will be managed in accordance with the systems described in this chapter.
- Contaminated stormwater will be isolated, collected and disposed of as appropriate (e.g. via the onsite process effluent network or for offsite disposal).
- Process wastewater will continue to undergo treatment in the onsite WWTP prior to discharge to the municipal sewer network for further treatment.

8.8 Residual Impacts

The proposed development is considered to have a not significant, neutral and long-term residual impact on the water environment subject to compliance with the requirements of the future IEL and by the implementation of the mitigation measures outlined in Section 8.7 above.

8.9 Monitoring

Regular monitoring of stormwater and process wastewater discharge will be conducted during the construction and operational phases of the proposed development as per the future requirements of the IEL and any additional monitoring proposed by Cork County Council.

This page is intentionally blank.

RECEIVED: 30/01/2026

Appendix 8-A

Subcatchment Assessment WFD Cycle 2 – Tibbotstown SC 010

[accessed online 04/12/25: <https://www.catchments.ie>]

RECEIVED: 30/01/2026

This page is intentionally blank.

RECEIVED: 30/01/2026

RECEIVED: 30/01/2026

WFD Cycle 2

Catchment Lee, Cork Harbour and Youghal Bay

Subcatchment Tibbotstown_SC_010

Code 19_2



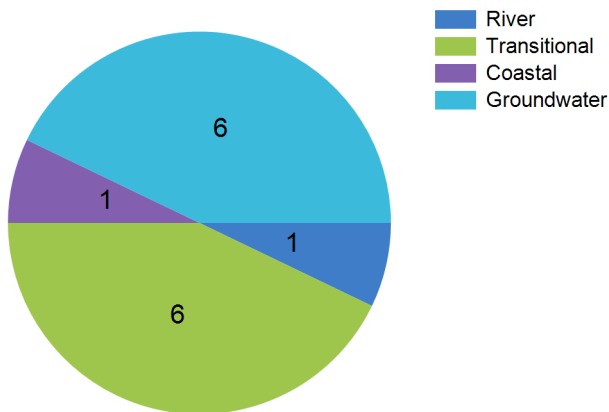
© Ordnance Survey Ireland. All rights reserved. Licence Number EN 0059208

Assessment Purpose

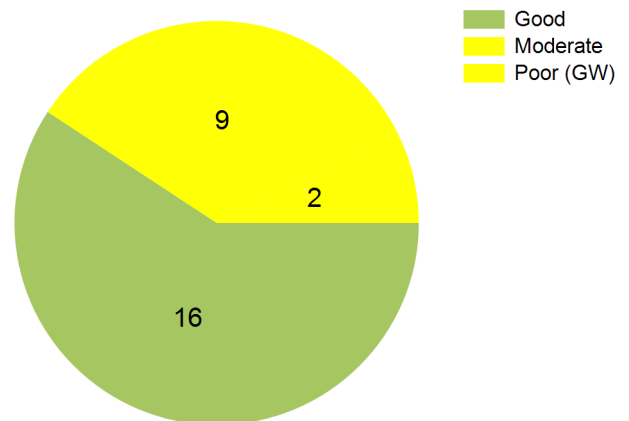
This assessment has been produced as part of the national characterisation programme undertaken for the second cycle of Water Framework Directive river basin management planning. It has been led by the EPA, with input from Local Authorities and other public bodies, and with support from RPS consultants.

The characterisation assessments are automatically generated from the information stored in the WFD Application. They are based on information available to the end of 2015 but may be subject to change until the final 2018-21 river basin management plan is published. Users should ensure that they have the most up to date information by downloading the latest assessment before use.

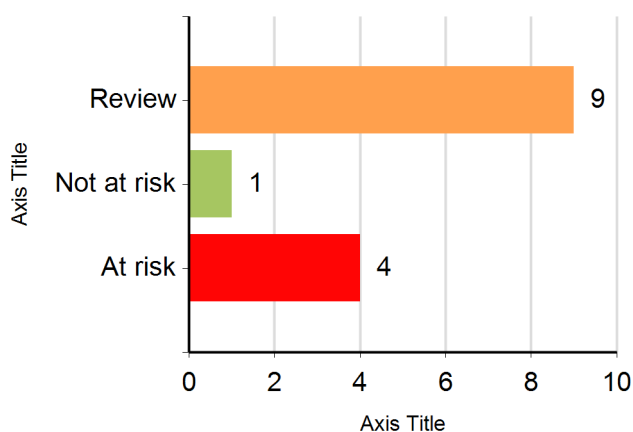
Waterbodies



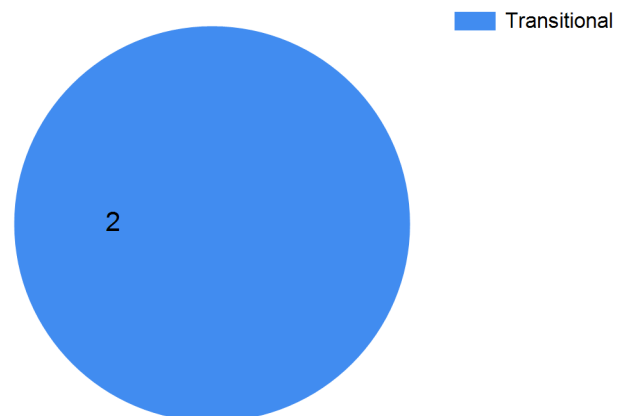
Water Quality Status (Monitored)



WFD Risk



Water Quality - High Ecological Status



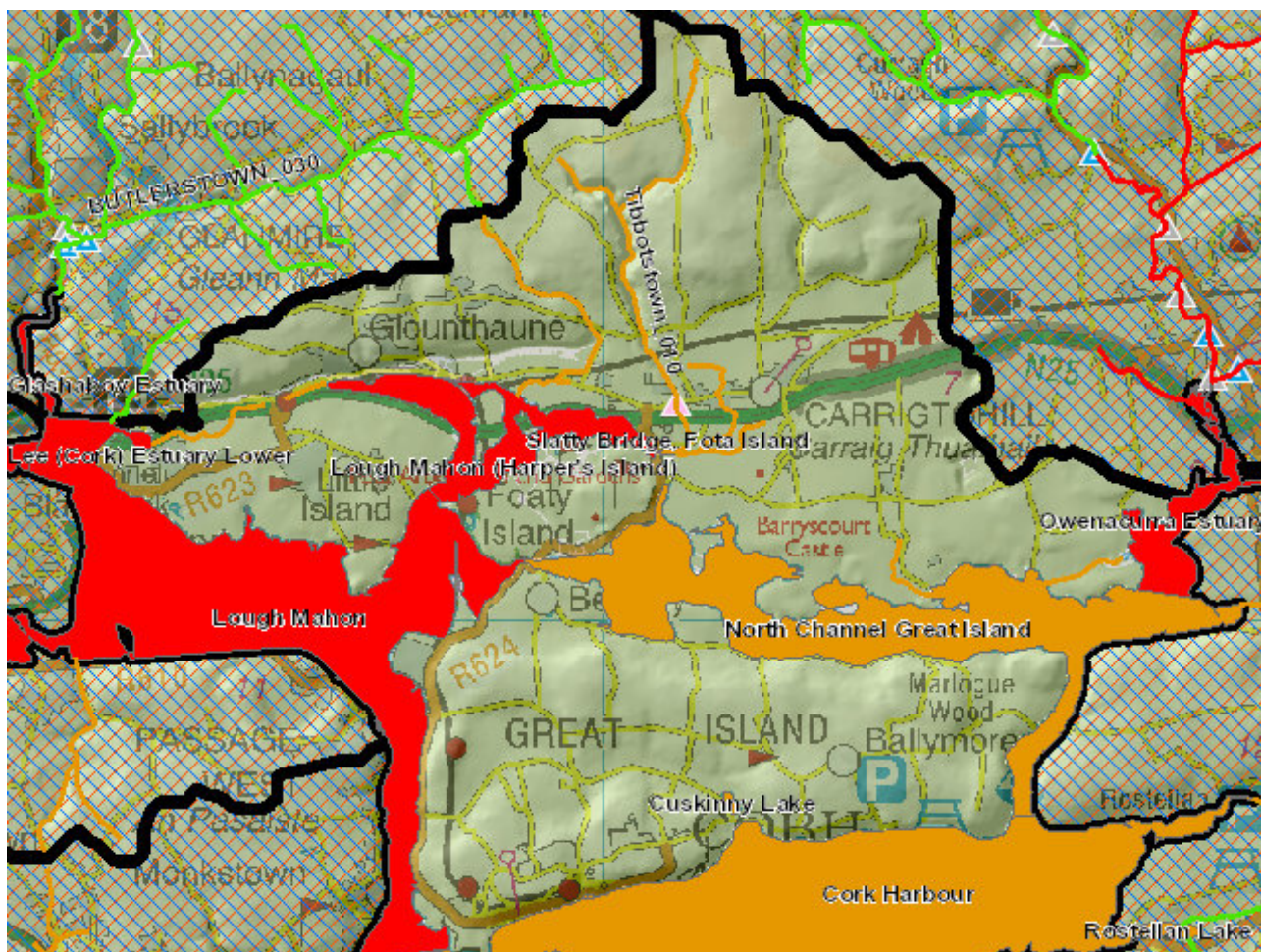
Evaluation of Priority Subcatchment Issues

There is just one river water body in this subcatchment which is under REVIEW due to its unassigned status, Tibbotstown_010.

Further investigation is required so as to determine whether any issues exist within this water body.

RECEIVED: 30/01/2026

Map Subcatchment Risk Map

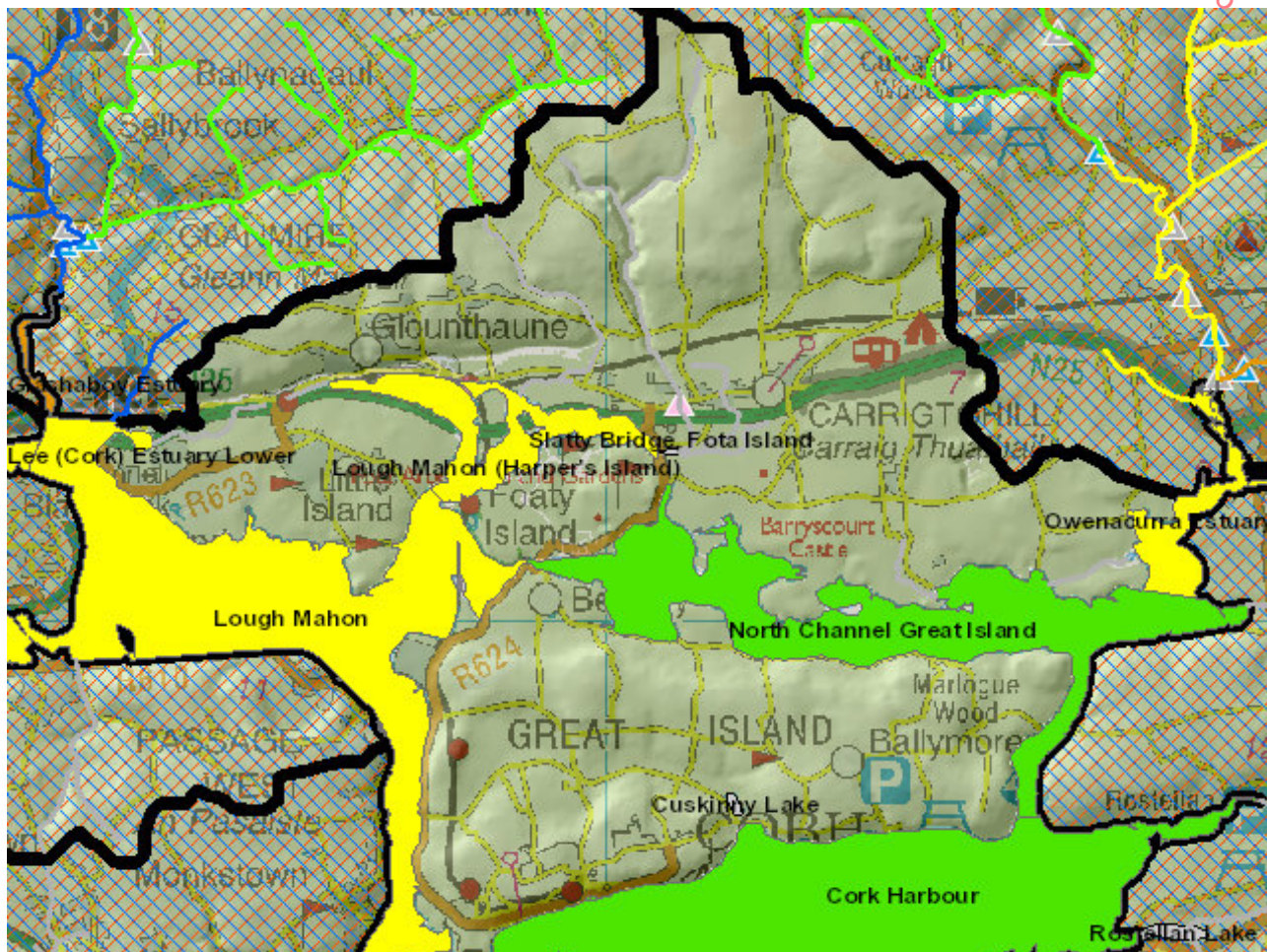


River And Lake Waterbodies: WFD Risk

The following river and lake waterbodies are in the subcatchment.

Code	Name	Type	WFD Risk	Significant Pressure
IE_SW_19T250870	Tibbotstown_010	River	Review	Yes

Map Subcatchment Water Quality Status Map



River And Lake Waterbodies: Water Quality Status

The water quality status of river and lake waterbodies in the subcatchment is as follows.

Code	Name	Type	2007-09	2010-12	2010-15
IE_SW_19T250870	Tibbotstown_010	River	Unassigned	Unassigned	Unassigned

Potentially Dependent Transitional and Coastal Waterbodies

The Transitional and Coastal waterbodies listed below intersect spatially with river and lake waterbodies in the subcatchment ...

Code	Name	Type	Local Authority	WFD Risk
IE_SW_060_0000	Cork Harbour	Coastal	Cork County Council	Review
IE_SW_060_0200	Cuskinny Lake	Transitional	Cork County Council	Review
IE_SW_060_0300	North Channel Great Island	Transitional	Cork County Council	Review
IE_SW_060_0400	Owenacurra Estuary	Transitional	Cork County Council	At risk
IE_SW_060_0600	Slatty Bridge, Fota Island	Transitional	Cork County Council	Review
IE_SW_060_0700	Lough Mahon (Harper's Island)	Transitional	Cork County Council	At risk
IE_SW_060_0750	Lough Mahon	Transitional	Cork County Council	At risk

Potentially Dependent Groundwater Waterbodies

The groundwaters listed below intersect spatially with river and lake waterbodies in the subcatchment ...

Code	Name	Type	Local Authority	WFD Risk
IE_SW_G_004	Ballinhassig East	Groundwater	Cork County Council	Review
IE_SW_G_046	Knockadoon West	Groundwater	Cork County Council	Review
IE_SW_G_058	Midleton	Groundwater	Cork County Council	Review
IE_SW_G_089	Industrial Facility (P0016-02)	Groundwater	Cork County Council	Not at risk
IE_SW_G_090	Little Island	Groundwater	Cork County Council	Review
IE_SW_G_092	Industrial Facility (P0028-01)	Groundwater	Cork County Council	At risk

Protected Areas intersecting River and Lake Waterbodies

The Protected Areas listed below intersect spatially with river and lake waterbodies in the subcatchment ...

Code	Name	Type	Waterbody Name	Association Type
IE0001058	Great Island Channel SAC	SAC	Tibbotstown_010	Overlapping / partly within Protected Area
IE0004030	Cork Harbour SPA	SPA	Tibbotstown_010	Overlapping / partly within Protected Area
IEPA2_0049	Cork Great Island North Channel	Shellfish Area	Tibbotstown_010	Overlapping / partly within Protected Area
IETW_SW_2004_0041	Lee Estuary / Lough Mahon	Nutrient Sensitive Area	Tibbotstown_010	Overlapping / partly within Protected Area
IETW_SW_2004_0042	Owennacurra Estuary / North Channel	Nutrient Sensitive Area	Tibbotstown_010	Overlapping / partly within Protected Area

Pressures

Below is a list of all significant pressures identified in the subcatchment.

Code	Name	WFD Risk	Pressure Category	Pressure Sub Category
IE_SW_060_0400	Owenacurra Estuary	At risk	Industry	IE
IE_SW_060_0400	Owenacurra Estuary	At risk	Urban Run-off	Diffuse Sources Run-Off
IE_SW_060_0400	Owenacurra Estuary	At risk	Urban Waste Water	Combined Sewer Overflows
IE_SW_060_0700	Lough Mahon (Harper's Island)	At risk	Urban Run-off	Diffuse Sources Run-Off
IE_SW_060_0700	Lough Mahon (Harper's Island)	At risk	Urban Waste Water	Agglomeration PE > 10,000
IE_SW_060_0750	Lough Mahon	At risk	Urban Waste Water	Agglomeration PE > 10,000
IE_SW_060_0750	Lough Mahon	At risk	Urban Waste Water	Combined Sewer Overflows
IE_SW_060_0750	Lough Mahon	At risk	Urban Waste Water	Agglomeration PE of 2,001 to 10,000
IE_SW_G_092	Industrial Facility (P0028-01)	At risk	Industry	IPC
IE_SW_060_0000	Cork Harbour	Review	Anthropogenic Pressures	Unknown
IE_SW_060_0200	Cuskinny Lake	Review	Anthropogenic Pressures	Unknown
IE_SW_060_0300	North Channel Great Island	Review	Anthropogenic Pressures	Unknown
IE_SW_060_0600	Slatty Bridge, Fota Island	Review	Anthropogenic Pressures	Unknown
IE_SW_19T250870	Tibbotstown_010	Review	Urban Run-off	Diffuse Sources Run-Off
IE_SW_19T250870	Tibbotstown_010	Review	Urban Waste Water	Agglomeration PE > 10,000
IE_SW_G_004	Ballinhassig East	Review	Anthropogenic Pressures	Unknown
IE_SW_G_046	Knockadoon West	Review	Anthropogenic Pressures	Unknown
IE_SW_G_058	Midleton	Review	Anthropogenic Pressures	Unknown
IE_SW_G_090	Little Island	Review	Anthropogenic Pressures	Unknown

Further Characterisation Actions

The following further characterisation actions have been identified. These are necessary to help understand more fully issues in the subcatchment and their likely cause.

Code	Name	Action	Responsible Organisation
IE_SW_19T250870	Tibbotstown_010	IA6 Multiple Sources in Large Urban Area	Cork County Council
IE_SW_19T250870	Tibbotstown_010	IA3 Determination of Water Quality (unassigned waterbody)	Cork County Council

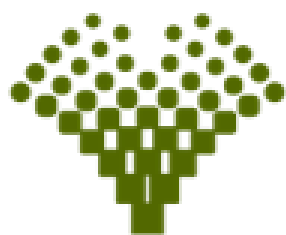
Appendix 8-B

**WEW Engineering (18/12/25) Cara Partners WWTP Wastewater Basis of Design Report
(Rev 1)**

RECEIVED: 30/01/2026

This page is intentionally blank.

RECEIVED: 30/01/2026



CARA PARTNERS

RECEIVED: 30/01/2026

CARA PARTNERS WWTP WASTEWATER BASIS OF DESIGN REPORT

Prepared by:



Issue Record:

Revision	Status	Prepared by	Approved by	Date
0	Draft	Pia O'Grady	JB	24/10/2025
1	Issue	Pia O'Grady	JB	18/12/2025

Fingleton White & Co. Ltd
Unit 7C, Cillin hill, Dublin road,
Leggettsrath, Kilkenny,
R95RYC1, Ireland
T : 056 7763932
Email : info@weweng.ie
www.weweng.ie

Project Reference No. 2345

RECEIVED: 30/01/2026

Contents

1. INTRODUCTION.....	3
1.1. BACKGROUND	3
2. DATA RECEIVED.....	3
2.1. LICENCE	4
2.2. REVIEW.....	5
2.3. SELECTED DESIGN PARAMETERS.....	9
3. DESIGN CONSIDERATIONS	10
3.1. SITE LOCATION	10
3.2. INLET WORKS.....	11
3.2.1. Existing Design.....	11
3.2.2. Proposed Design	11
3.3. BALANCING.....	12
3.3.1. Existing Design.....	13
3.3.2. Proposed Design	13
3.4. BIOLOGICAL WASTEWATER TREATMENT	14
3.4.1. Existing Design.....	14
3.4.2. Proposed Design	15
3.5. SOLIDS SEPARATION	17
3.5.1. Existing Design.....	17
3.5.2. Proposed Design	17
3.6. SLUDGE DEWATERING.....	18
3.6.1. Existing Design.....	18
3.6.2. Proposed Design	19
3.7. CHEMICAL DOSING.....	19
3.7.1. Existing Design.....	19
3.7.2. Proposed Design	19
4. CONCLUSION	22
4.1. PROPOSED APPROACH SUMMARY	22
4.2. PHASED IMPLEMENTATION / UPGRADE APPROACH.....	23

1. Introduction

This Basis of Design report forms part of an overall scope of work for Cara Partners WWTP including:

- Control Philosophy
- P&IDs
- Equipment and Instrumentation list
- Layout drawings
- Load Schedule
- Mass Balance
- High level phasing schedule
- CAPEX Estimate
- OPEX Estimate

The objective of this report is to assess the existing WWTP infrastructure and configuration and to propose a technological solution to facilitate the proposed development.

1.1. Background

Cara Partners, located in Little Island Cork, is a pharmaceutical manufacturing company that specialises in the production of active pharmaceutical ingredient (API) derived from Ginkgo Biloba. The facility is currently developing new plant extract manufacturing capacity onsite which will increase the overall total volume of production, and they have asked WEW Engineering, part of the Fingleton White Group, to design an upgrade for the existing WWTP to allow Cara Partners to apply for planning permission and to cater for the increase in WWTP capacity due to this development.

2. Data Received

Cara Partners WWTP shared the following documents with Fingleton White - WEW under an NDA.

- Operating Process & Procedure Documents
 - CP-ENV-054 (Rev 1) WWTP Beltpress Operation
 - CP-ENV-042 (Rev 1) SOP for Sludge Floc Microscopy
 - CP-ENV-029 (Rev 2) Procedure of Treatment of Lead Waste Liquid Form
 - CP-ENV-020 (Rev 1) Procedure for Monitoring of Emissions to Sewer at DP001 and WWTP Samples
 - CP-ENV-012 (Rev 1) Procedure for Control of Surface Water Discharge
 - CP-ENV-001 (Rev 1) Procedure for Wastewater Treatment Plant1
 - CP-ENV-001 (Rev 1) Procedure for Wastewater Treatment Plant
- Drawings
 - WWTP P&ID (02.04.25)
 - IPPC-06-004 Drains Drawing
 - 5337-FES-ZZ-X-ZZZ-SK-DJF-CE-7002-P01

RECEIVED: 30/01/2026

- 5337-FES-ZZ-X-ZZZ-M2-DJF-CE-7001-P01
- 5300-DJF-FES-XX-DR-C-7002-P01
- 5300-DJF-FES-XX-DR-C-7001 -P01
- Site Images
- WWTP Data Loadings v2
- Flow Data
- User Requirements Document for Design-Build Contract
 - 5337-TD-DJF-ZZ-0001-P01 DRAFT
- Clerical Amendment A to Integrated Pollution Prevention & control Licence
 - 02 - IEL - P0017-02 - Clerical Amendment A (28.02.08)
- Site Visit
 1. 16th July 2025
 2. 4th December 2025

2.1. Licence

The WWTP is licenced to discharge to sewer by IEL licence P0017-02 final effluent is monitored for the parameters in schedule B.3 which are outlined below in Table 1.

Table 1 Summary of WWTP Monitoring parameters

Parameters	Emission Limit Value	
Temperature	30 °C (max)	
pH	6.0 – 9.0	
Volume to be emitted	Maximum in any one-day	240m ³
	Maximum rate per hour	17m ³
	mg/L	kg/day
BOD	400	66
COD	800	130
Suspended Solids	600	60
Sulphate (as SO ₄)	1000	--
Total Nitrogen (as N)	200	--
Ammonia (as N)	40	--
Total Phosphorus (as P)	50	--
Detergent (as MBAS)	10	--
Lead (as Pb)	0.5	0.1
Zinc (as Zn)	0.5	0.1
FOG (Fat, Oils & Grease)	20	--

2.2. Review

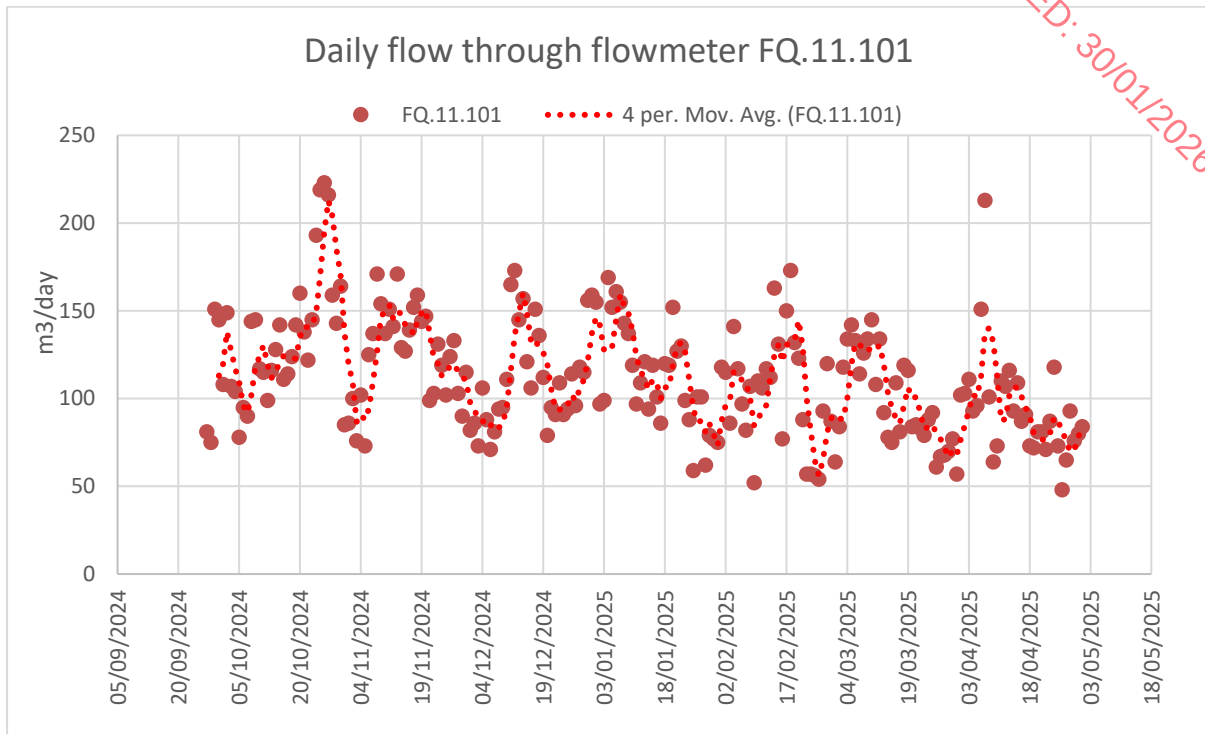
Cara Partners are planning to move an extraction process from a German site to their site in Cork. In the excel files provided there are details of previous extortion campaigns and the wastewater data recorded, also provided is an expected future state. This design aim to use as much existing infrastructure as possible and to use the existing trade effluent licence. The future state is summarised as:

- Average Daily Flow: 115m³/day
- Max flow: 280.8m³/day
- Average COD load: 704 kgCOD/day
- Max COD load: 1992 kgCOD/day

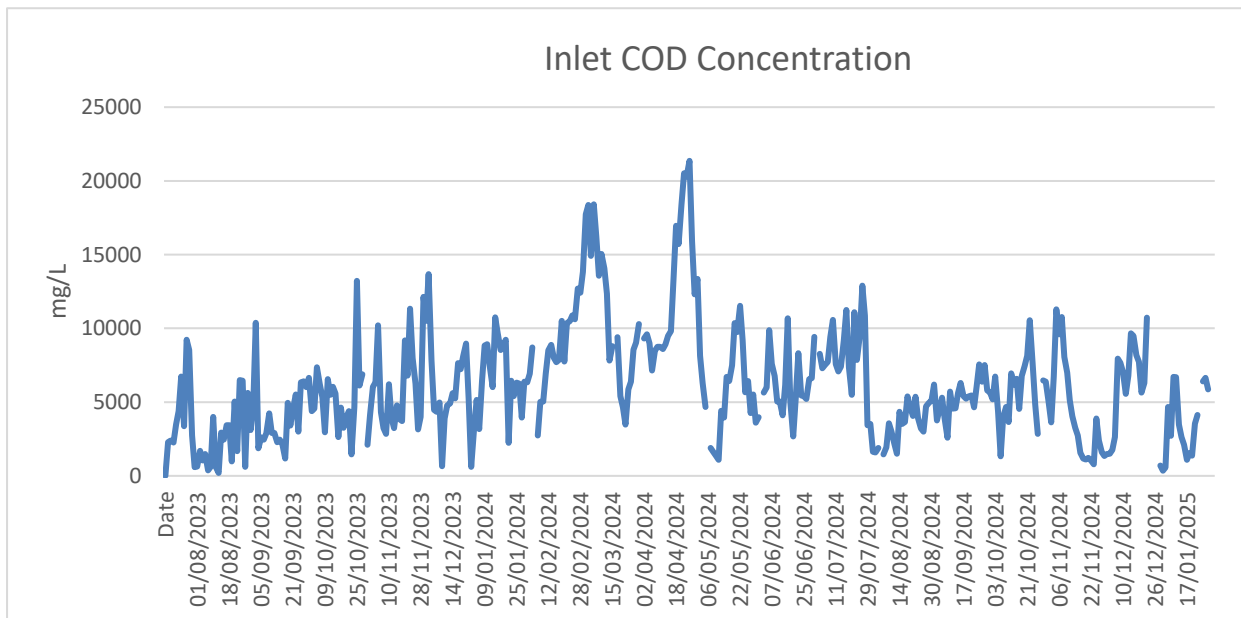
The historical data presented below is meant to investigate and validated this assertion while expanding on it to all the selection of the design parameters in section 2.3.

RECEIVED: 30/01/2026

➤ Daily Flow



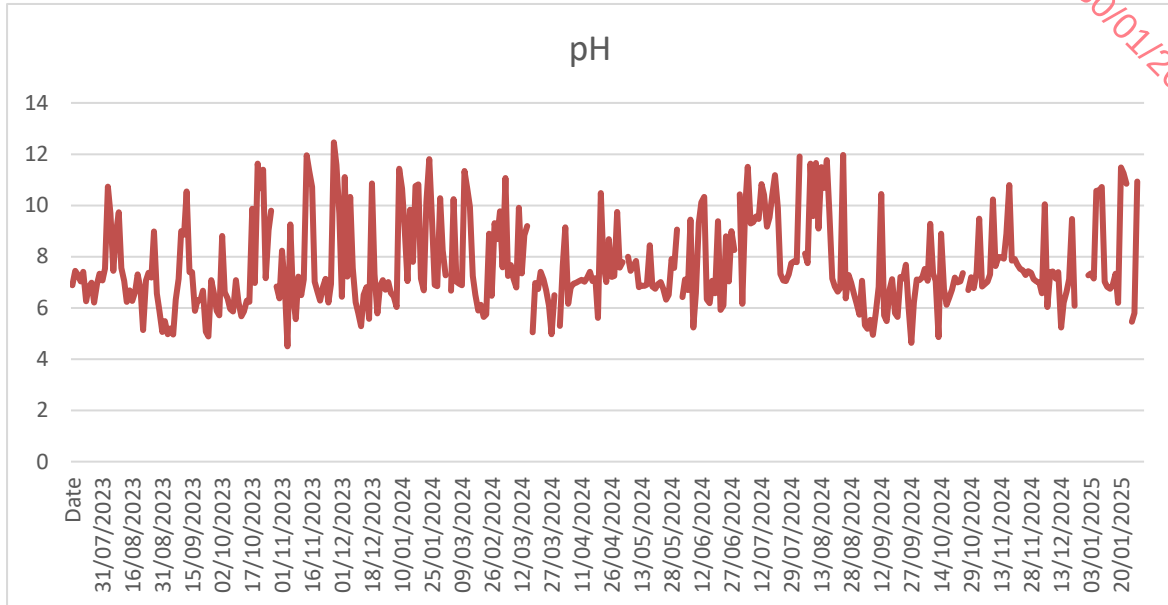
➤ COD Load mg/L vs Time COD Concentration



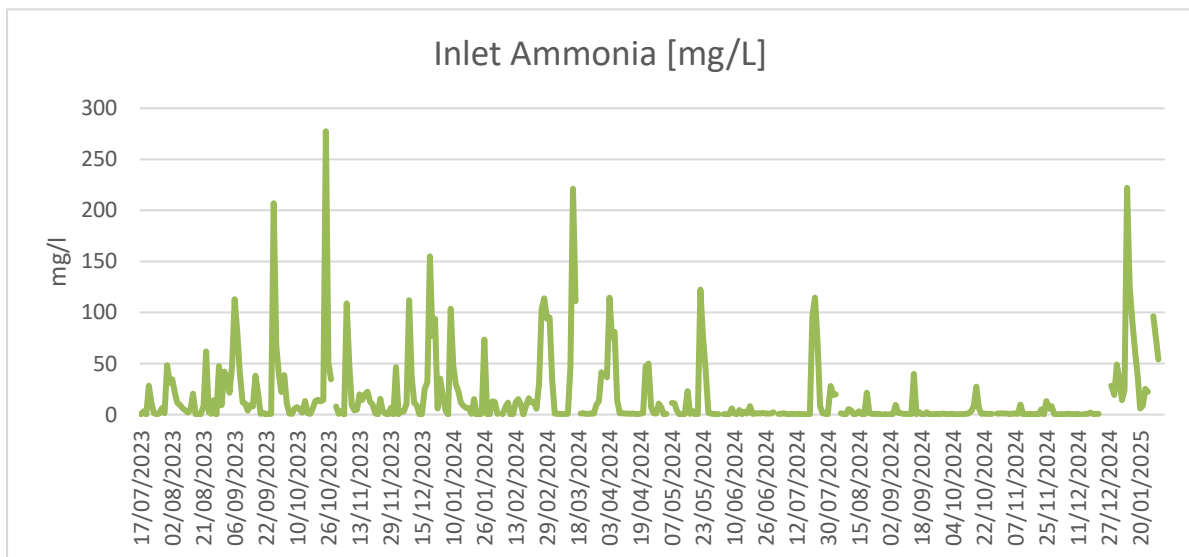
The data was measured at the Cara Partners WWTP, Little Island Cork, and comes from the *Cara Existing Loading* displaying the COD Concentration throughout the years of 2023 to 2025.

RECEIVED: 30/01/2026

➤ pH



➤ Ammonia (mg/L)



			COD (mg/l)	pH	Ammonia (mg/l)
2024	average		6723.9	7.8	15.0
2024	95th percentile		14012.0	11.0	94.2
2024	Max		21360.0	12.0	222.0
2024	Min			4.6	

In the table below, you will find the max weekly flow, of the weeks per month. 7 days of flow are summed together to give a weekly flow and the largest weekly flow for each month is presented below.

Max Weekly Flow per Month	[m ³ / week]
October 2024	937
November 2024	913
December 2024	824
January 2025	1021
February 2025	1209
March 2025	967
April 2025	1016
May 2025	833
June 2025	949
July 2025	791
August 2025	583

Some site considerations include:

- Rainfall from certain parts of the existing stormwater network designated as 'at risk' is a significant variable contributory factor to the total WWTP influent flows.
- Surface aerators do not have sufficient capacity for future loadings
- Major Slope across some areas. Which may affect placement and bunding, in areas such as behind the T11.09 balance tank.

RECEIVED: 30/01/2026

2.3. Selected Design Parameters

Table 4 Summary of WWTP Design Influent Parameters

Parameter	Unit	Current Design	Proposed Max Design	Comment
Max instantaneous flow	m ³ /hr	360	360	Gravity flow to the Balance tank through a half full 400 mm pipe on a 1% gradient
Daily Flow	m ³ /day	300 (approx.)	400	Maximum flow through inlet works to new balance tank in one day
Weekly Flow	m ³ /week	1200 (approx.)	2000	Maximum flow through inlet works in one week
7-day Forward Flow	m ³ /day	200	280	Pumped from new balance tank to aeration tank
Recycle Flow	m ³ /day		40	Dewatering return liquors
Water usage	m ³ /day		20	Wash water and Polymer makeup water
Flow to sewer	m ³ /day		240	
COD	mg/l	<8,000	9,000	
BOD ₅	mg/l	4,000	4,500	Ratio 2:1 – COD : BOD
COD 7 day	kg/day	1600	2000	Averaged/balanced over 7 days
SS	mg/l	<200	<300	Limited current Data
FOGs	mg/l		<250	Limited current Data
pH		4-11	4-12	10-15%
Temperature	°C	20-25	15-30	Limited current Data
PO ₄	mg/l	50	50	Limited current Data
TN	mg/l	170	250	Ammonia assumed to be 60% of TN

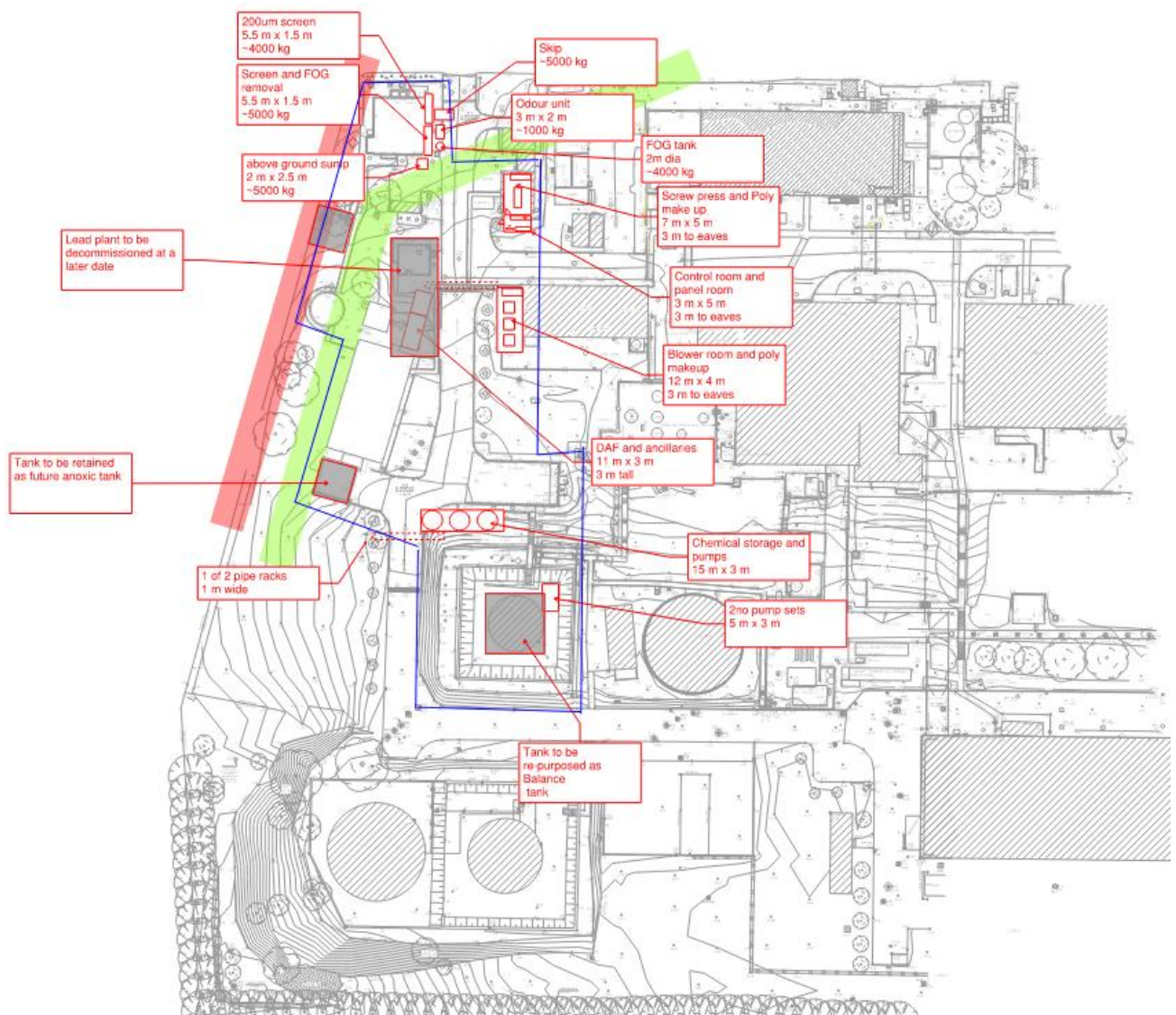
RECEIVED: 30/01/2016

3. Design Considerations

3.1. Site Location

The existing Cara Partners WWTP site is located in the northwest corner of the site. Some wayleaves and other site constraints have restricted space available for any future upgrades but the repurposing of the bundled ammonium sulphate tank has provided a valuable asset to be included in the new WWTP design. The white filled boxes below are the proposed areas for use as part of the upgrade.

Figure 1: Cara Partners WWTP Site



3.2. Inlet Works

3.2.1. Existing Design

Currently Wastewater flows by gravity to Balance tank T11.01 via a combined drainage system with surface water and process water.

Balance tank T11.01

- Capacity: 180m³
- Dimensions : 6.3m x 6.3m x 5m
- Type: Square concrete below ground

The inlet pipe is DN400, and the maximum instantaneous flow is expected to be 360m³/hr. Under normal circumstances the flow coming into the balance tank is not expected to exceed 40m³/hr

Balance tank T11.01 is fitted with a submerged aerator for mixing and flows into a pump sump for forward pumping via duty standby pumps P11.01 and P11.02.

In the current design, The FOGs are caught before entering the balance tank and it self-clogs meaning it must be cleaned every 2 to 3 weeks.

3.2.2. Proposed Design

It is proposed that Balance Tank T11.01 is repurposed and the inlet sump and that it is lined with a HDPE liner.

The proposed design will include a new inlet works consisting of a combined screening, grit and Fats, Oils and Grease (FOGs) removal, microscreen and pump sump which will be the first stage of the upgraded treatment process and protect the rest of the system from damage and blockages. The micro screen and above-ground sump will remove coarse and fine solids from the wastewater. The removal of plant material will improve the downstream ratio of volatile to inert solids.

Parameter	Unit	Max Design	Comment
Raw Wastewater	m ³ /day	400	Maximum gravity
Flow to Inlet Works	m ³ /hr	180	flow to inlet sump
WW Inlet Sump	No.	1	T11.01
	m ³	180	
Inlet Pumps	No.	2	Duty/standby
	m ³ /hr	40	Variable speed

RECEIVED: 30/01/2026

Inlet screen	No.	1	Combined screen, grit and OFG removal.
	m ³ /hr	40	
Bypass Inlet screen	No.	1	Run down screen
	m ³ /hr	40	
Screenings and grit removal	kg/day	60	
OFG removal	l/day	55	

1No. Automatic Screening unit.

- Type: Combined Screen, Grit and OFG removal with automatic cleaning
- Screen size: 2mm
- Material: 316L SS
- Max flow: 40 m³/h
- Max SS: 300mg/l
- Max OFG: 250mg/l
- Make/model: Definitive Ecology Combined Treatment unit or equal
- Screenings removal: Auger to skip
- Grit removal: Auger to skip
- OFG removal: Piped to OFG tank

Air requirements

- Connection size: 1"
- Air consumption: 20 Nm³/hr
- Air Pressure: 0,2 bar

An overflow to the manual bypass screen will be included so that in the event of screen failure or power outage once the screen blocks and flow backs up, raw wastewater will overflow to the manual bypass screen.

Downstream of the screening unit a micro screen is proposed

- Type: Microscreen with automatic cleaning
- Screen size: 0.2mm
- Max flow: 40 m³/h
- Max SS: 100mg/l

A bench scale solids classification and filtration study would be required to accurately estimate the solids generation and COD removal across the microscreen without operational data from the site in Germany.

3.3. Balancing

3.3.1. Existing Design

The existing balancing system at Cara Partners comprises 2No balance tanks for flow equalisation and chemical conditioning functions.

Balance Tank T11.01

- Capacity 180m³
- Dimensions 6.3m x 6.3m x 5m
- Type Square concrete below ground

Balance Tank T11.02

- Capacity 60m³
- Dimensions 6m x 6m x 2m
- Type Square concrete below ground

Each balance tank is equipped with submersible mixers to maintain homogeneity within the tanks.

3.3.2. Proposed Design

As part of the proposed upgrade, an existing tank will be repurposed as a third balance tank (BT3), which will be used to increase the overall capacity and improve operations during peak or highly variable loading events. BT3 is also designed to allow for chemical dosing with urea, acid, and caustic to adjust pH and nutrient balance before aeration.

Parameter	Unit	Max Design	Comment
Balance Tanks	No.	1	Existing Tank
Tank Dimensions		Dia 10.24m x 5.63m	
Balance Tank Capacity	m ³	430	Plus, 180m ³ in T11.01
Tank Inflows	m ³ /day	400	Assumed
Minimum equalising volume each tank	m ³	100	
Balancing Capacity	hrs	25.8	Minimum
Total Balancing Capacity	m ³	430	Net volume after equalising volume

The existing balance tank T11.02 can also be repurposed as further balancing if required or a better use may be as a potential future anoxic tank if needed. Sufficient balancing volume helps keep the treatment process stable and reliable. The enhanced tank arrangement provides both immediate improvements and long-term adaptability.

New Converted Balance tank

- Capacity: 430m³
- Dimensions: Dia 10.24m x 5.63m
- Type: Round glass lined steel panel tank (above ground and bunded)

The system is designed to recirculate wastewater as required for pH correction and to maintain uniform hydraulic loading to the downstream biological processing. A duty/ standby arrangement for both recirculation pumps and forward feed pumps is proposed.

Mixing and aeration are provided by 2No Duty/standby jet mixers

- Type Centrifugal Pump with venturi nozzle
- Flowrate 60 m³/hr
- Head 8m
- Rated Power 5.5 kW

Forward pumping provided by 2No Duty/standby variable speed pumps

- Type Centrifugal Pump
- Flowrate 10 - 20 m³/hr
- Head 2m – 8m
- Rated Power 3 kW

3.4. Biological Wastewater Treatment

3.4.1. Existing Design

The existing Activated Sludge Process (ASP) at Cara Partners is currently designed to remove BOD mainly and utilises surface aerators to introduce oxygen into the wastewater. These aerators operate by agitating the water surface to enhance oxygen transfer; however, they are energy intensive and provide uneven oxygen distribution, which can lead to inconsistent biological activity and reduced treatment efficiency. As part of the system upgrade, the surface aerators are being decommissioned and replaced with a Fine Bubble Diffused Aeration System.

Aeration tank T11.03

- Capacity: 720m³
- Dimensions : 10m x 20m x 3.6m deep
- Type: Rectangle concrete below ground

Surface Aerators A11.03, A11.04, and B11.01

- Type: Mounted
- Motor: 18.5 kW

Air is also provided by 2 No Venturi Jet Aerators

3.4.2. Proposed Design

It is proposed to replace the existing surface aerators with fine bubble diffused aeration and high efficiency blowers.

	Unit	Max Design	Comment
Flow to Secondary Treatment	m ³ /day	280	240m ³ to sewer plus 40m ³ WAS (4m ³ cake and 36m ³ return liquors)
BOD Loading Removal	kg/day	1,000	
F/M ratio	kg BOD/ kgMLSS	0.17	
Required Biomass	kg MLSS	5900	Assumes >80% MLVSS after microscreen
Volume	m ³	720	
MLSS	mg/l	8,200	
Sludge Retention Time	days	14.8	
Return Activated Sludge	m ³ day	280	1Q
SOR	kg O ² /h	123	

RECEIVED: 30/01/2026

Oxygen Transfer Rate	$\text{g O}_2/\text{Nm}^3 \cdot \text{m}$	16	
	SOTE %/m	5.5	
Grid Depth	m	3.3	
Air flow	m^3/h	2400	
Temperature	$^{\circ}\text{C}$	15-26	
Waste Biological Sludge	kg DS/day	600	0.6 kg SS / kg BOD TBC

The Fine Bubble Diffused Aeration System will replace the current system of surface and jet aerators to supply oxygen through evenly distributed diffusers that generate fine air bubbles, promoting efficient oxygen utilisation, enhanced microbial activity, and uniform mixing throughout the aeration tank. This design ensures effective removal of organic pollutants, including BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), and ammonia, resulting in improved overall treatment performance and reduced operational energy demand. Typical standard aeration efficiencies (SAE) are around $2.0 \text{ kg O}_2/\text{kWh}$ for surface aerators and about $3\text{--}4 \text{ kg O}_2/\text{kWh}$ for fine bubble diffused air, so diffused systems usually need roughly half the kW per kg O_2 transferred.

Aeration and mixing will be provided by 3 No new Duty/Assist/standby variable speed drive blowers and fine bubble diffused aeration system.

- Blower Type: Rotary Screw
- Flowrate: $1200 \text{ m}^3/\text{hr}$
- Pressure: 500 mbar
- Rated power: 22 kW

Diffusers will be mounted on liftable frames so that any future maintenance does not require draining of the tanks

- Type: Liftable fine bubble diffused aeration grids
- Flowrate: $2400 \text{ m}^3/\text{hr}$
- Liquid depth: 3.6 m
- SOR: $123 \text{ kg O}_2/\text{h}$
- Oxygen Transfer Rate: $>5.55 \text{ \%}/\text{m}$

3.5. Solids Separation

The Solids separation process is crucial for the selection of the MLSS concentration and therefore the BOD loading. The three main process types are outlined below to demonstrate the impact on max daily loadings to the WWTP. A clarifier uses gravity sedimentation to settle heavier solids from wastewater in a tank, producing clearer effluent on top while sludge collects at the bottom for removal. Dissolved Air Flotation (DAF) injects pressurised air into water to form micro-bubbles that attach to lighter contaminants like oils, greases, and fine solids, floating them to the surface for skimming. Heavier solids are also collected at the bottom. A Membrane Bioreactor (MBR) uses micro- or ultrafiltration membranes to retain biomass and remove suspended solids, yielding high-quality effluent in a compact footprint.

	Clarifier	DAF	MBR
Max MLSS (mg/l)	6000	9000	12000
MLSS @720m ³ (kg)	4320	6480	8640
Max BOD @ F:M 0.17 (kg/day)	734	1102	1469

3.5.1. Existing Design

The existing design uses a 6.5m diameter circular clarifier.

Operation parameters for the WWTP suggest a max flowrate to the aeration tank of 10m³/hr, assuming 20% of this is removed as waste activated sludge, gives a surface loading rate of > 5m³/m²/hr.

3.5.2. Proposed Design

For the new proposed upgrade, the Dissolved Air Flotation (DAF) unit will be used. It works by introducing fine air bubbles that attach to remaining suspended solids and residual sludge, causing them to float for removal.

A polymer dosing system will be included to further increase the solids removal capacity of the DAF as needed. Coagulant dosing point on a pipe flocculator will be included to all for future chemical treatment if needed. A polymer flocculant helps colloidal solids to form into flocs using ionic chages so they can be easily removed whereas a coagulant will convert soluble compounds into solids which can be precipitated out of solution, eg orthophosphate to aluminium phosphate salt.

RECEIVED: 30/01/2026

The DAF unit proposed:

- Type: Dissolved Air Flotation unit with pipe flocculator
- Flowrate: 24 m³/hr
- Solids loading rate 220kg SS/hr

2No new VSD Duty/Standby DAF feed pumps will be required to pump the flow through the pipe flocculator

- Type: Progressive cavity
- Flowrate: 12 -30 m³/hr

2No new VSD Duty/Standby Sludge pumps will be required

- Type: Progressive Cavity
- Flowrate: 12 -30 m³/hr

Recycle activated sludge (RAS) flowrate is proposed to be up to 20m³/hr

Waste activated sludge (WAS) flowrate is proposed to be up to 20m³/hr

Actuated valves will direct flow to RAS or WAS on timers, with WAS being pumped approximately 5 minutes every hour.

3.6.Sludge Dewatering

In general Sludge dewatering takes sludge solids at 1-2% Dry solids (DS) and removes water, referred to as return liquors, the sludge cakes is typically 15 to 25% DS. Three main technologies are available.

- A Belt press is currently used on the site and Dry solids results from lab analysis range from 9% to 22%. A belt press will typically use about 30–50 kWh/t DS.
- A centrifuge uses centrifugal force to separate the liquid from the solid, and would usually produce a dry sludge cake and has a high output, although usually requires supervision. A centrifuge will typically use about 40 kWh/t DS
- A screw press uses a rotating screw to squeeze water out of the sludge through progressively smaller apertures, with slow moving parts it can be left unattended. A screw press will typically use about 5–10 kWh/t DS.

3.6.1. Existing Design

The exact capacity of the existing sludge belt press is not available.

Sludge tank T11.5

- Capacity: 47m³
- Dimensions : 4.5m x 4.5m x 2.5m
- Type: Square concrete below ground

3.6.2. Proposed Design

It is proposed to retain the current sludge tank and add 2No new duty/standby pumps to feed a sludge dewatering system.

- Type: Progressive Cavity
- Flowrate: 1 -5 m³/hr

With a capacity of 30 kg SS/hr, a new screw press is proposed for the WWTP and associated polymer dosing system. Replacing a belt press with a screw press increase dewatering output in line with increased loadings and will offer energy efficient operation that produces a drier cake with less operator attention. The screw press also handling a wider range of sludge types and reduces wastewater use, making it cleaner and more reliable long-term solution.

3.7. Chemical Dosing

3.7.1. Existing Design

The current Chemical Dosing system uses:

- Nitrogen & phosphorous is required to maintain a healthy biomass; these nutrients are dosed manually as required.
- On occasion Ethanol to ensure a constant supply of organic waste is maintained
- Sodium hydroxide (NaOH) is dosed to the balance tanks for pH control purposed as required.
- In many manufacturing facilities where caustic Clean in place systems are used the inlet pH is regularly high rather than low and needs acid dosing with Hydrochloric acid or other acid.

3.7.2. Proposed Design

The new design proposes the use of

- 11% Hydrochloric acid
- 30% sodium Hydroxide

The larger balancing volume will help to naturally equalise the incoming pH to close to 7 meaning that WWTPs with larger balance tanks will usually use less acid and caustic compared to the same wastewater with a a smaller balance tank

RECEIVED: 30/01/2026

- Urea or other nutrient for biomass health
- Polymer for:
 - DAF: Polymers, which are long-chain organic molecules, are added to a DAF system to bind fine suspended solids and fats into larger, stronger flocs that micro-air bubbles can easily attach to and float to the surface. This improves separation efficiency, producing clearer effluent and a thicker, more stable sludge for skimming.
 - Dewatering: In dewater, polymers are used to gather fine solids into dense, drainable flocs that release water more readily under mechanical pressure. This improves cake dryness, increases throughput and reduces energy and hauling costs for the sludge handling.

Parameter	Unit	Max Design	Comment
pH range	unit	4-12	
Corrected pH range	unit	6-8	
Acid Addition pH Reduction pumps	No.	2	1 duty/ 1 standby
Acid Type		11 % HCl	TBC
Acid pump capacity	l/hr	60	
Acid Tank capacity	m ³	10	Self-Bunded
Caustic Addition pH Raising pumps	No.	2	1 duty/ 1 standby
Caustic Type		30 % NaOH	
Caustic pump capacity	l/hr	50	
Caustic Tank capacity	m ³	10	Self-Bunded
Nutrient pumps	No.	2	1 duty/ 1 standby
Type		Urea	Or other
Caustic pump capacity	l/hr	100	
Nutrient Tank capacity	m ³	10	Self-Bunded

RECEIVED: 30/01/2026

Poly Type		Liquid	
Raw poly pumps	l/hr	2-10	
Dilute poly pumps	l/hr	500 -2000	
Poly make up units	No	2	DAF and dewatering

4. Conclusion

4.1. Proposed Approach Summary

The proposal includes the following standalone elements:

- Inlet works
 - Screening to 2mm to remove some larger plant material and debris.
 - Fats Oils and Grease Removal
- Microscreen
 - Screening to 0.2 or 0.02 mm

The removal of solids and FOGs will reduce the BOD concentration of the incoming wastewater. It is almost impossible to accurately predict the level of BOD reduction without bench scale testing.

- Additional Balancing Capacity
 - Increasing balancing capacity to ensure more than 24hrs balancing capacity
 - Retaining 100m³ of equalisation volume to reduce the need for pH correction
- Bulk chemical storage and dosing
 - pH correction and nutrient balancing to ensure optimum biological activity in the aeration tank.

Balancing is considered the cheapest form of treatment will help with the hydraulic capacity of the WWTP.

- High efficiency Air blowers
 - Provides more oxygen, more efficiently than surface aerators
- Liftable Fine Bubble Diffused Aeration system
 - Highly efficient system to transfer oxygen to the aeration tank. Liftable diffusers allows for maintenance without having to drain the aeration tank.

Providing more oxygen is necessary for increasing the BOD/organic loading.

- Dissolved air floatation unit
 - To increase the MLSS in the aeration tank and therefore the BOD loading

Increasing the MLSS concentration maximises the BOD loading from the available tankage.

- New sludge dewatering screw press.
 - Increase sludge handling capacity required for increased BOD loading

The new sludge press will be too large for the existing dewatering room but removal of the internal wall in the building will provide sufficient space. This requires relocation of the MCC, a new building is proposed for the blowers and the new MCC. This will facilitate an upgrade of the PLC and SCADA to improve data logging and automation.

RECEIVED 30/01/2026

Overall, the new design proposes a balanced and robust solution that utilises existing assets while incorporating modern treatment solutions. The approach improves treatment performance, operational flexibility, site capacity, and long-term sustainability, and provides a sound basis for detailed design and subsequent implementation of the WWTP upgrades.

4.2. Phased Implementation / Upgrade Approach

The increase in production across the Cork site will be phased and all changes are not expected to be fully implemented until 2030. The phasing of the WWTP upgrade can be carried out in a similar sequence to how it was described in section 4.1.

The inlet works and balance tank works will offer the most short term benefit and take pressure off of other unit operations on the WWTP.

The aeration upgrades would be next phase followed by dewatering or DAF upgrades.

The most cost effective approach would likely to be to complete the inlet tank and balance tank works and then confirm the expected future loadings onto the aeration tank so that the risk of under sizing or over sizing the aeration systems, solids separation and sludge handling is minimised.

This page is intentionally blank.

RECEIVED: 30/01/2026

9.0 SOILS, GEOLOGY AND HYDROGEOLOGY

9.1 Introduction

The following section presents an assessment of the impacts of the proposed development in terms of soils, geology and hydrogeology of the local environment as defined in the EPA 'Advice Notes on Current Practice in the Preparation of EIS', 2003 and EPA 'Guidelines on the information to be contained in Environmental Impact Assessment Reports', 2022.

In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

9.1.1 Assessment Structure

This section follows a grouped format structure. It presents the assessment of potential impacts on soils, geology, and hydrogeology, following the framework prescribed by the Planning and Development Regulations 2001 (as amended) and relevant EPA guidance.

The structure of this chapter is organised under the following headings:

- the assessment methodology;
- the general characteristics of the proposed development;
- the receiving environment;
- the assessment of potential effects;
- mitigation measures;
- residual effects;
- cumulative effects; and
- monitoring.

Interactions with other environmental topics are considered within the relevant sections, and mitigation is treated as an iterative process. Further refinements may be made in accordance with planning conditions or best practice to ensure optimal environmental protection.

9.1.2 Statement of Authority

This section was prepared by Graham Webb, who is a Principal Consultant at Geosyntec Consultants Ltd. Graham has over 30 years of experience in environmental consulting in Ireland and the UK, specialising in the assessment and management of contaminated land and groundwater issues at industrial sites and landfills. He has provided specialist input to land and soil and waters chapters of several EIA projects.

9.2 Assessment Methodology

9.2.1 Objective Led Approach

The objective of this chapter is to assess the potential impacts of the proposed development on the soils, geology, and hydrogeology of the site and surrounding area, and to identify appropriate measures to avoid, reduce, or remedy any likely significant effects. The assessment has been carried out in accordance with relevant legislation and guidance, and forms part of the wider Environmental Impact Assessment (EIA) process.

This chapter aims to inform the Planning Authority, statutory consultees, and other interested parties about the existing conditions of the receiving environment and the potential changes that may arise as a result of the proposed development. It provides a structured evaluation of the baseline environment, identifies potential impacts and pressures, and outlines mitigation and monitoring measures to ensure environmental protection.

9.2.2 Relevant Legislation and Guidance

This assessment has been carried out in accordance with the Planning and Development Regulations 2001 (as amended) and Directive 2014/52/EU. It follows the Environmental Protection Agency's *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022) and *Advice Notes for Preparing Environmental Impact Statements* (EPA, 2015). Guidance from the Institute of Geologists of Ireland (IGI, 2013 and 2022) has been used to inform the approach to assessing soils, geology and hydrogeology. These documents provide the framework for evaluating environmental sensitivity, predicting potential impacts, and identifying appropriate mitigation and monitoring measures.

9.2.3 Study Area

The study area includes the footprint of the proposed development site (see Chapter 02 – Description of the Proposed Development and description at section 9.4.1) and its immediate surroundings, extending to a wider zone where relevant to groundwater flow, aquifer connectivity, and potential receptors. The site is located within an established industrial estate and comprises production buildings, warehouses, utilities, and a wastewater treatment plant. The study area includes many industrial facilities, rail and road transport infrastructure, and natural features, including Lough Mahon (which lies generally to the west and southwest, c. 400 m to the southwest of the site at its nearest point) and a number of smaller surface waterbodies.

9.2.4 Desk Study

A desk-based study was undertaken to establish baseline soils, geological and hydrogeological conditions. This included a review of available historical land use records, Soils (which includes topsoil, made ground and subsoils for the purposes of this chapter), geological (including

bedrock) and hydrogeological maps and data (including groundwater vulnerability classifications, aquifer types). Previous site investigations and groundwater monitoring data were also reviewed to identify potential contamination sources, flow directions, and aquifer characteristics. The desk study informed the development of the Conceptual Site Model (CSM) and supported the identification of potential impacts of the proposed development.

9.2.5 Evaluation of Potential Effects

An evaluation of potential effects has been carried out in accordance with EPA guidance, using a structured approach that considers the sensitivity (including importance) of environmental attributes, the magnitude and probability of potential impacts, and the overall significance of effects. This methodology ensures that the assessment is transparent, consistent, and capable of identifying potential impact effects that require mitigation. Impacts are assessed for both the construction and operational phases of the proposed development, with consideration given to direct, indirect, cumulative, and residual effects of the proposed development.

9.2.5.1 Sensitivity of Attributes

Sensitivity is determined based on the value, vulnerability, and ecological or resource importance of the geological and hydrogeological receptors. This includes aquifer classification (e.g. regionally or locally important), groundwater vulnerability ratings, proximity to groundwater abstractions, and the presence of groundwater-dependent ecosystems or designated conservation sites. The classification system used is consistent with IGI and EPA guidance and helps to prioritise receptors that may be more susceptible to adverse impacts.

9.2.5.2 Probability of Potential Effects

The probability of potential effects occurring is assessed based on the nature of the proposed development activities, site-specific conditions, and available baseline data. Examples of factors considered include the likelihood of Soil disturbance, contamination, groundwater ingress, or changes to flow regimes. Previous site investigations and historical land use data are used to inform this assessment, along with professional judgement and relevant guidance.

9.2.5.1 Magnitude of Potential Effects

Magnitude refers to the scale and intensity of the potential effect on the identified receptors. It is rated using criteria adapted from EPA guidance, ranging from negligible to major adverse or beneficial. Examples include the removal of subsoil or aquifer material, changes in groundwater levels, or potential contamination of soil or groundwater. The magnitude rating helps to quantify the extent of environmental change that may result from the proposed development.

9.2.5.2 *The Significance of Potential Effects*

Significance of effect is determined by combining the sensitivity of the receptor with the magnitude and probability of effect. The classification system used follows EPA terminology, including imperceptible, slight, moderate, significant, and profound. This assessment informs the need for mitigation measures and helps to identify whether residual or cumulative effects may arise. The significance ratings are used throughout the chapter to clearly communicate the potential environmental effects associated with the development.

9.3 General Characteristics of the Proposed Development

The proposed development comprises various elements to be developed on a phased basis over a period of ten years. A proposed site layout drawing is presented in Drg. Ref. 5340-PLA-XXX-DR-DJF-AR-0010.

1. **Unit 1 Production Building** – Construction of a replacement, multi-storey Unit 1 Production building approx. 34m L x 23m W x 26m H (approx. 3,000m²).
2. **In Process Tank Farm Bund** – Modifications to the existing 'In Process Tank Farm' bund and ancillary plant and services related to same including pipe racks.
3. **Laboratory Gas Bottle Store** – Construction of a new Laboratory Gas Bottle Store approx. 4m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
4. **Regenerative Thermal Oxidiser** – Provision of a new Regenerative Thermal Oxidiser, associated exhaust stack (approx. 10mAGL) and ancillary plant and services related to same including pipe racks.
5. **Process Cooling** – Provision of 1no. process cooling tower (approx. 5mAGL) to be installed to provide additional cooling for manufacturing processes and ancillary plant and services related to same including pipe racks.
6. **Combined Heat and Power Plant and Heat Recovery System** – addition of a new natural-gas fired containerised combined heat and power (CHP) plant (approx. 6 MW_{TH} Total Rated Thermal Input) and associated containerised waste heat boiler system with exhaust stack approx. 13mAGL and ancillary plant, kiosks and services related to same including pipe racks.
7. **Ethanol Storage Tank** – addition of a new ethanol storage tank (2.4m diameter x 7m H) in existing solvent tank farm bund and ancillary plant and services related to same including pipe racks.
8. **Car Park** – extension to existing car park including associated lighting to provide a net increase of additional 67no. permanent car parking spaces.
9. **Wastewater Treatment Plant (WWTP) Control and Blower Building** - Single storey building associated with WWTP expansion, approx. 11m L x 10m W x 4m H (approx. 90m²); and ancillary plant and services related to same including pipe racks.
10. **WWTP Chemical storage tanks and bund** – new concrete base and bund (approx. 45m²) with tanks approx. 3.5m H and ancillary plant and services related to same including pipe racks.
11. **WWTP Inlet works** – new screens, tanks up to approx. 9m H and ancillary plant and services related to same including pipe racks

12. **WWTP Dissolved Air Flotation tank** – new tank approx. 5m L x 2m W x 4m H and ancillary plant and services related to same including pipe racks.
13. **Site Works** – All associated site services, site development works and landscaping to facilitate the proposed development.

9.3.1 Specific Characteristics of the Proposed Development

Insofar as geological environment is concerned, the proposed development includes the following principal elements:

- Limited site clearance and bulk excavation works estimated to be c. 3,736 m³ excavated comprising:
 - c. 224 m³ rock (via rock breaking)
 - c. 120 m³ topsoil
 - c. 3,392 m³ other soils/material
- Site clearance typical bulk excavation depth of <1 m bgl (CHP compound to be slightly greater than this due to local topography).
- Local underground services with trenching max. 3 m bgl.
- Local excavations for foundations and services under the new Unit 1 building to be c. 2.5 m bgl.
- New SUDS-compliant permeable parking to be installed in new car park extension.

9.4 Receiving Environment

9.4.1 Site Location and History

The c. 8.6 ha site, comprising the area shown within the site boundary in Figure 2-2, is located in Little Island Industrial Estate, Little Island, Co. Cork.

A review of publicly available historical maps on the OSI Irish Townland and Historical Map Viewer, shows that the site was within the grounds of Little Island House in the 19th Century (ref. OSI 6-inch map and 25-inch map) and had a church, graveyard and part of a large pond within its eastern boundary.

Construction of an industrial facility began at the site in 1978 and the first available OSI aerial imagery (OSI, 1995) shows the site laid out as a light industrial, manufacturing facility. The site has operated as a pharmaceutical manufacturing facility since 1978 and carries out bulk pharmaceutical manufacturing involving the standardised extract from *Ginkgo biloba*, an Active Pharmaceutical Ingredient (API). The final product, which is a bulk powder, is shipped offsite for final formulation.

9.4.2 Land Use

The site is in industrial and commercial land use. Land use in the immediate surroundings of the site is light industrial including:

- **North:** Viatris pharmaceutical facility and DPD distribution centre, beyond which there is road and rail infrastructure.
- **East:** EHS International and associated industrial units.
- **South:** DOSCO Engineering.
- **West:** Metabolomic Diagnostics.

Historical uses, based on review of the OSI 6-inch and 25-inch historical maps, include residential (Little Island House), religious use (Church and Graveyard) and likely agricultural use within the grounds of the Little Island House estate.

9.4.3 Topography

The site exhibits gently undulating topography, with elevations ranging from c. 6 to 11 m ODM. The land rises gradually toward the west before gently descending again in the same direction, indicating a probable low crest within the western portion of the site.

9.4.4 Bedrock Geology

Review of the GSI database indicates that the site is underlain by Waulsortian limestone bedrock (Figure 9-1). Waulsortian limestones are composed of massive, unbedded limestone mud-mounds.

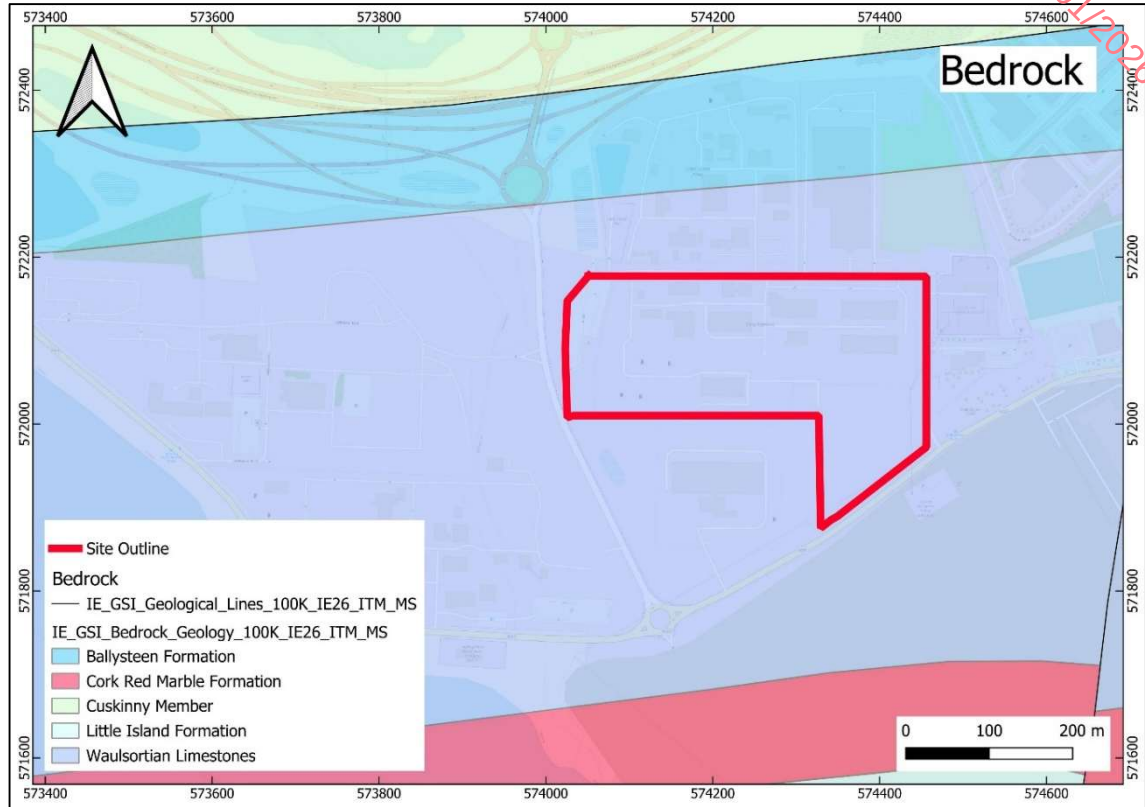


Figure 9-1 Bedrock geology (GSI, 2025).

The depth to bedrock at the site varies between c. 1 to 18 m bgl according to reviewed borehole logs dated 1997 by Glovers Site Investigation and 2017 by JS Drilling Ltd). No faults are mapped beneath the site.

9.4.5 Soils and Subsoils

The quaternary sediment at the site is mapped predominantly as Urban (made ground) (Figure 9-2) by the GSI (GSI, 2025), with the western edge of the site underlain by gravel derived from Devonian sandstone.

Borehole logs from the site carried out in 1997 by Glovers Site Investigation record a sequence of made ground of light brown, damp, sandy gravel and loose red clays with rounded cobbles, overlying natural clays, which in turn are underlain by weathered limestone bedrock.

A geotechnical site investigation was carried out by Priority Geotechnical in the west of the Site with report issued in October 2025. Investigations were carried out from August and September 2025.

Borehole records indicate c. 1 m of silty made ground over sand and gravel natural grounds at the site with limestone bedrock encountered between 1 and 7.4 m bgl. Shallowest bedrock occurs in the southwest of the site.

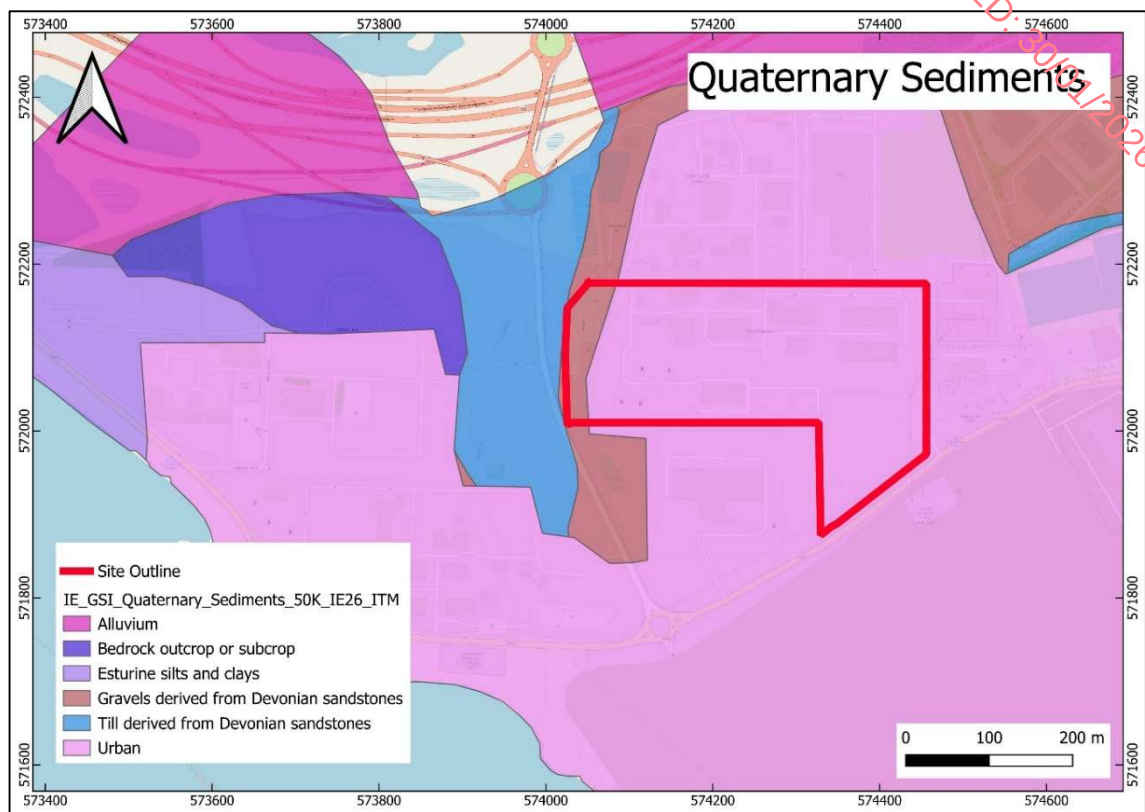


Figure 9-2 Quaternary sediment map (GSI, 2025).

9.4.6 Potentially Contaminated Land

The site is located in an area with a history of industrial activity. As such, there is the potential for localised, unknown soils contamination to be present at the site and neighbouring sites.

According to the EPA on-line mapping, there are multiple industrial sites in the area including up hydraulic gradient of the site to the east and southeast at historical licensed sites (now surrendered) operated by the shoe polish manufacturer Punch Industries (P0197) and the chemical manufacturer Mitsui Denman (P0389), which may influence the site's hydrogeological conditions.

Monitoring of on-site groundwater quality has been conducted at the site since 1997 to comply with a requirement of the site's Industrial Emissions Licence. On-site monitoring wells are sampled biannually for parameters including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pH, conductivity, Chemical Oxygen Demand (COD), and a range of inorganics including dissolved metals.

Recent monitoring data (May 2025) recorded elevated concentrations of ammoniacal nitrogen and sulphate in the northwest of the site, which may be related to historical industrial use. Trace detections of compounds such as MTBE and chlorinated solvents have also been recorded in site

groundwater, which are likely from nearby off-site industrial sources. While exceedances of Groundwater Threshold Values (GTVs) have been recorded in site groundwater with regard to ammoniacal nitrogen and sulphate, groundwater quality trends over time suggest stable or improving conditions.

9.4.7 EPA Licensed Sites

There are multiple EPA licensed sites close to the site. The closest currently active licensed sites are Viatris Little Island (Upjohn Manufacturing ULC – Licence Reg. No. P0136) directly to the north of the site and BASF Ireland Limited (Licence Reg. No. P0052) to the south-west.

- Viatris Little Island (Upjohn Manufacturing ULC - Located approximately 20m directly north of the site adjacent to the site boundary.
- BASF Ireland Limited - situated approximately 150m to the southwest of the site.

9.4.8 Geological Heritage

The GSI Public Viewer on-mapping (www.gsi.ie/mapping) was reviewed to identify geological heritage sites in the study area. A designated geological heritage site, Rock Farm Quarries, is located c. 800 m to the east of the site.

9.4.9 Economic Geology

The Extractive Industry Register (www.epa.ie) and the GSI on-line mineral database were consulted to determine whether there were any mineral sites of resource importance close to the study area. There are no recorded active localities located within the study area or 5 km of the site.

9.4.10 Geohazards

9.4.10.1 Landslides

According to the GSI web database, there are no records of geo-hazards, including landslides, within the study area within 5 km of the site.

9.4.10.2 Karst Features

The GSI on-line database records no recorded karst features in the study area. However, the bedrock aquifer beneath the site is recorded as a karstified bedrock aquifer.

9.4.10.3 Radon

The site is located in a high radon area with radon risk classified as c. 1 in 5 homes in this area being likely to have high radon levels.

9.4.11 Aquifer Classification

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. The potential of rock to store and transport water is governed by permeability of which there are two types, inter-granular and fissure permeability. Inter-granular permeability is found in sediments, sands, gravels and clays as are also present at the subject site, and fissure permeability, which is found in bedrock, where water moves through (and is stored in) cracks, fissures, fracture planes and solution openings for example.

Aquifers are generally classified as rocks or other matrices that contain sufficient void spaces, and which are permeable enough to allow water to flow through them in significant quantities.

The GSI currently maps a bedrock aquifer beneath the site, which it classifies as a Regionally Important Aquifer-Karstified (diffuse) (Rkd) (Figure 9-3).

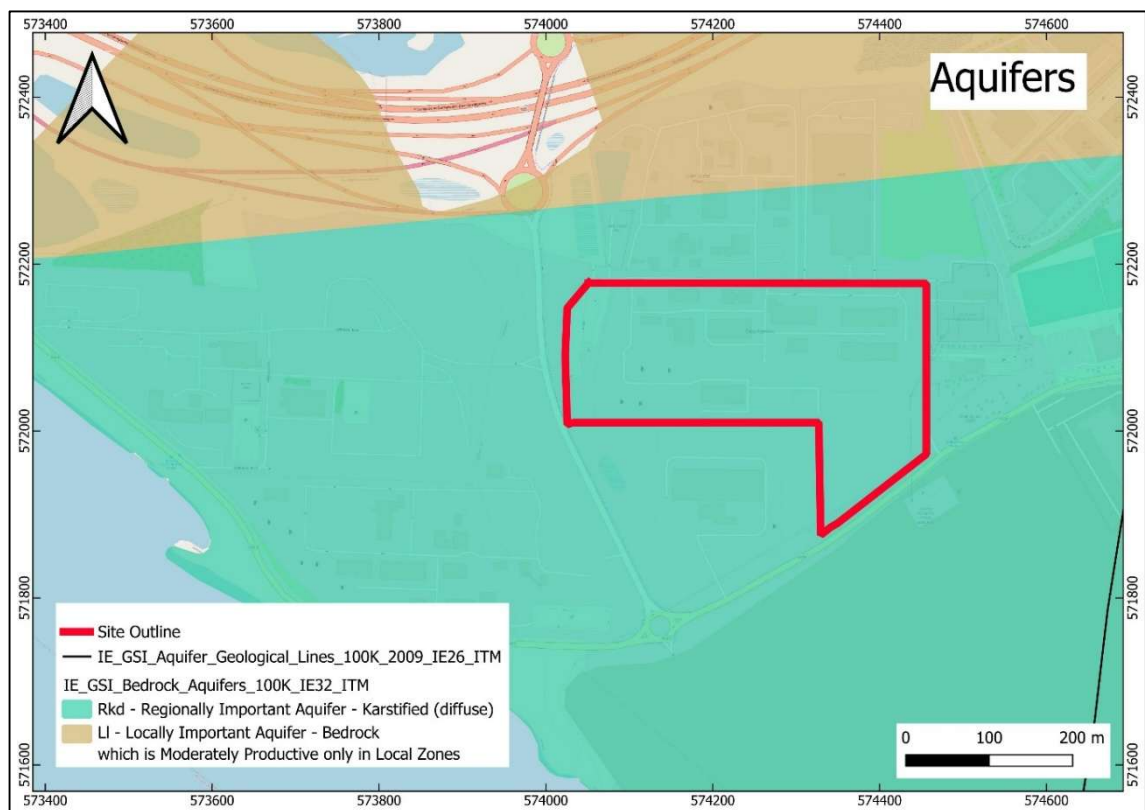


Figure 9-3 Aquifer classification map (GSI, 2025).

9.4.12 Water Framework Directive Groundwater Body Status and Risk

The European Communities Directive 2000/60/EC established a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]). The WFD requires 'Good Water Status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good Status' means both 'Good Ecological Status' and 'Good Chemical Status'.

The site is located within a Groundwater Body (GWB) recorded as Industrial Facility (P0016-02) (EU Groundwater Body Code: IE_SW_G_089) (Figure 9-4). The EPA classifies the Groundwater Body as having 'Good Status', with a WFD risk category of 'Not At Risk' in the most recent available WFD data (2019-2024) (Figure 9-5).

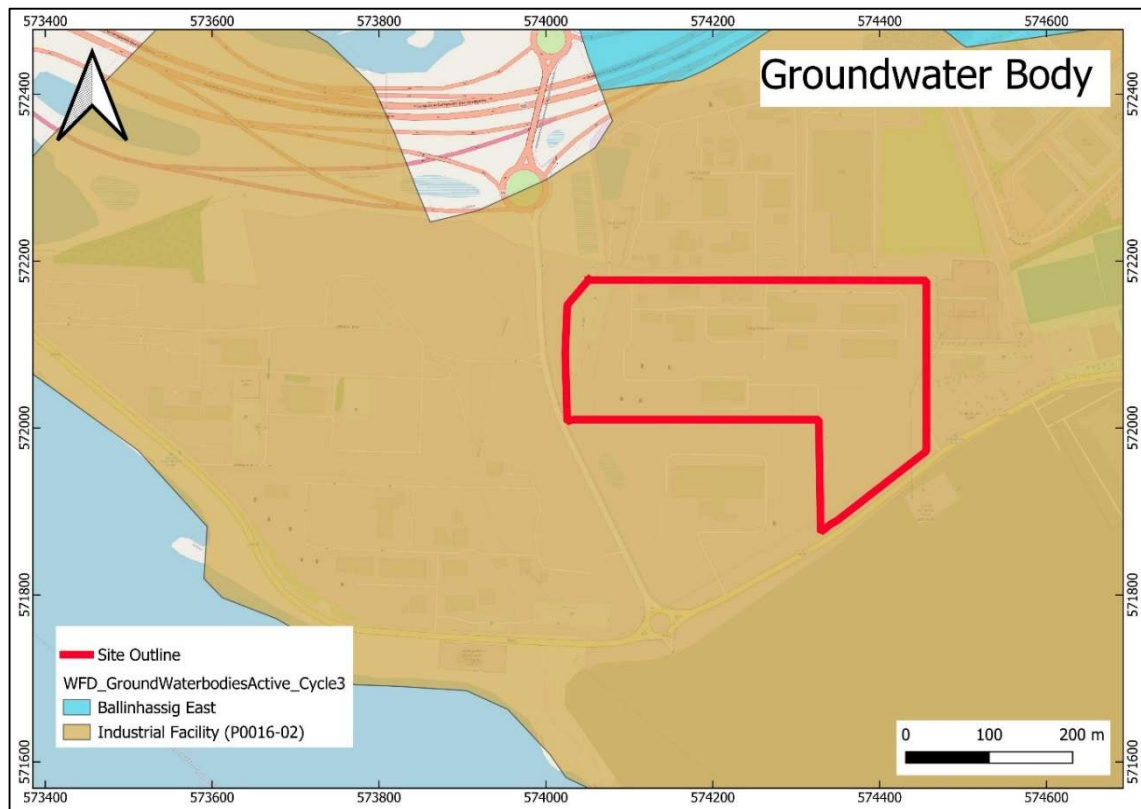


Figure 9-4 Groundwater body classification map (GSI, 2025).

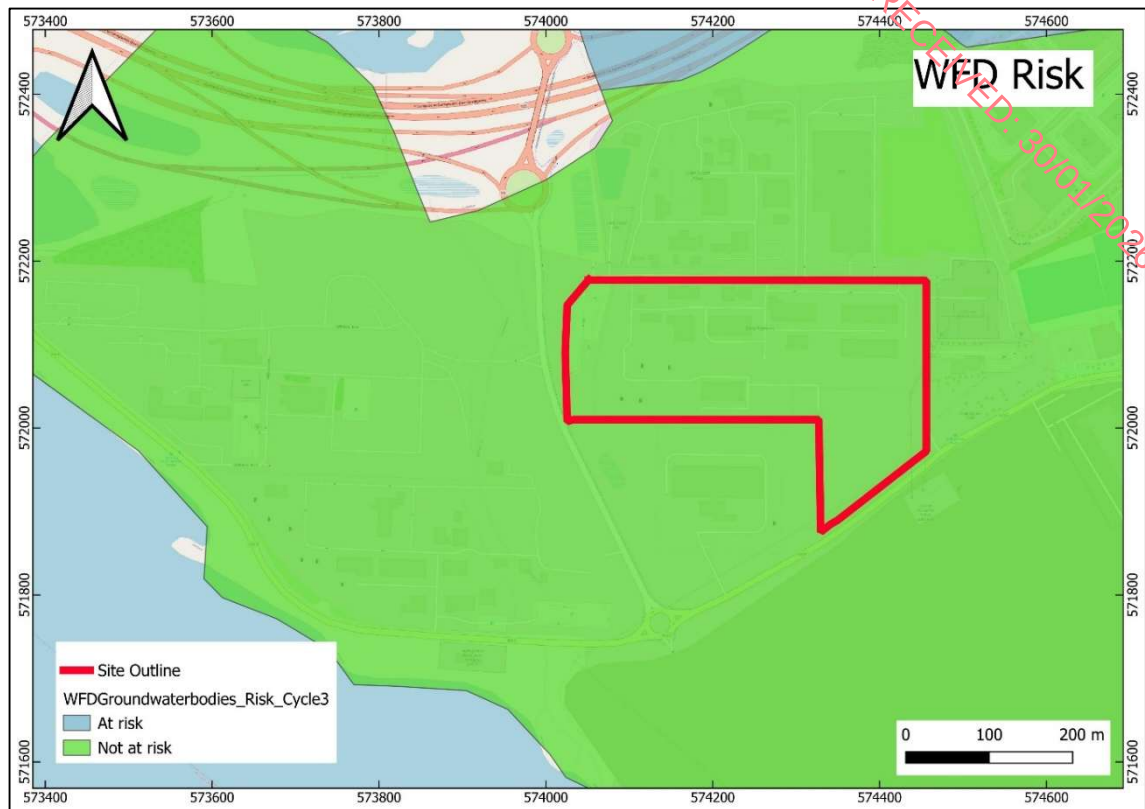


Figure 9-5 WFD groundwater body risk map (GSI, 2025).

9.4.13 Local Groundwater Levels and Flow Direction

Groundwater at on-site wells is typically recorded at depths in the range c. 4 to 8 m bgl during bi-annual monitoring conducted at the site.

The hydrogeological regime at the site has been characterised in studies aimed at better understanding groundwater flow. Static water levels (SWL) measured during site investigation work on the site, suggest that groundwater flow is generally north-westward, discharging into a drainage ditch, and then into Bury's Bridge Basin, which is tidal channel that flows into Lough Mahon (IE_SW_060_0750) close to the Dunkettle Interchange c. 700 m west north-west of the site. Water in the drainage ditch is close to stagnant, with flow into Bury's Bridge Basin only observed at very low tide. Lough Mahon is within the tidal section of the River Lee and is connected to Cork Harbour (IE_SW_060_0000) to the south-east.

A dye tracing test carried out on-site in July 1999 (KT Cullen & Co report October 1999) indicated interconnections between all but one of the licensed monitoring wells in the west of the site. Dye testing travel-time results implied an overall relatively slow groundwater flow on-site, via a restricted fracture network within the limestone aquifer. Hydraulic permeability of the karstic limestone is believed to vary by up to five orders of magnitude. A zone of higher hydraulic permeability in the limestone runs approximately north-south through a series of monitoring wells in the southeast of the Site and may extend off-site to the former location of the Mitsui Denman facility.

9.4.14 Groundwater Vulnerability

Groundwater vulnerability refers to the intrinsic soils, geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. In areas dominated by fracture-flow, groundwater vulnerability is typically determined by permeability and thickness of the overburden (including made ground, topsoil and subsoil).

The GSI classifies the bedrock aquifer's vulnerability beneath the site as predominantly "High Vulnerability (H)", with an area within the southeastern corner of the Site classified as "Extreme (E)" (Figure 9-6).

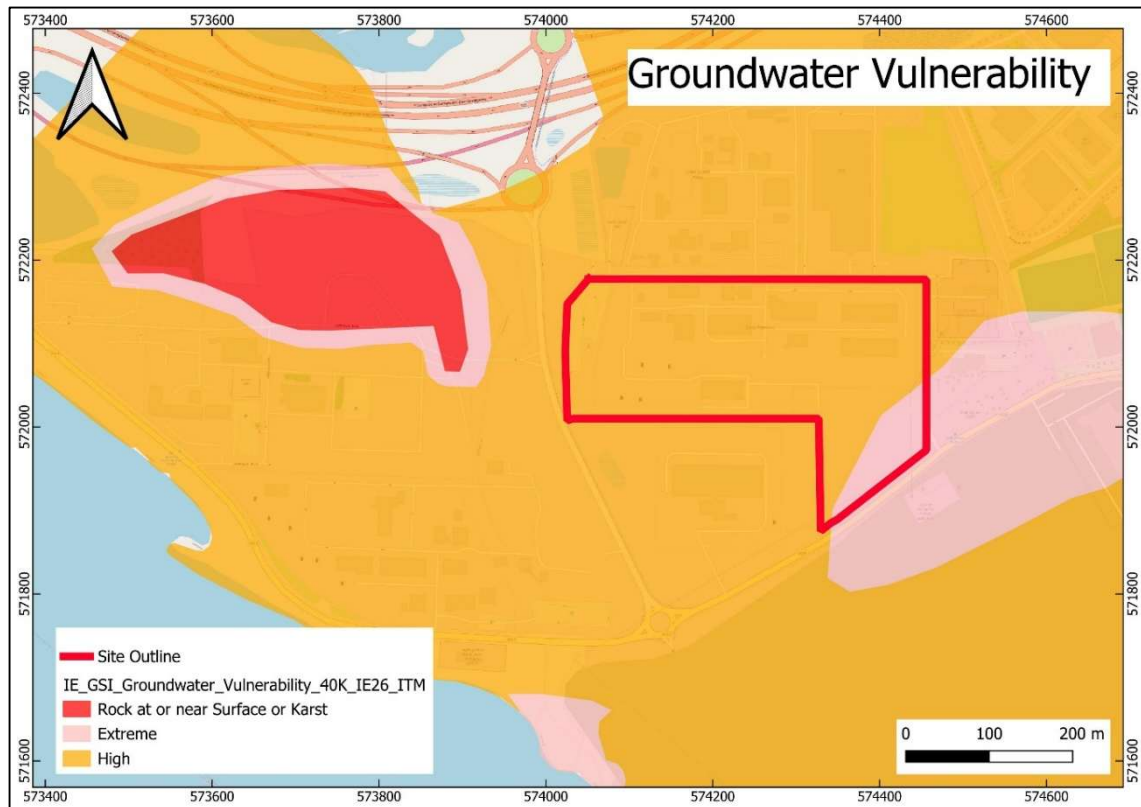


Figure 9-6 Groundwater vulnerability map (GSI, 2025).

9.4.15 Groundwater Recharge

The groundwater recharge across the majority of the site is classified as 101-150 mm per year, defined as a moderate recharge (GSI, 2025). The western boundary of the Site, underlain by gravel derived from Devonian Sandstone, is mapped as a zone of very high recharge (501 to 550 mm per year) (Figure 9-7) (GSI, 2025).

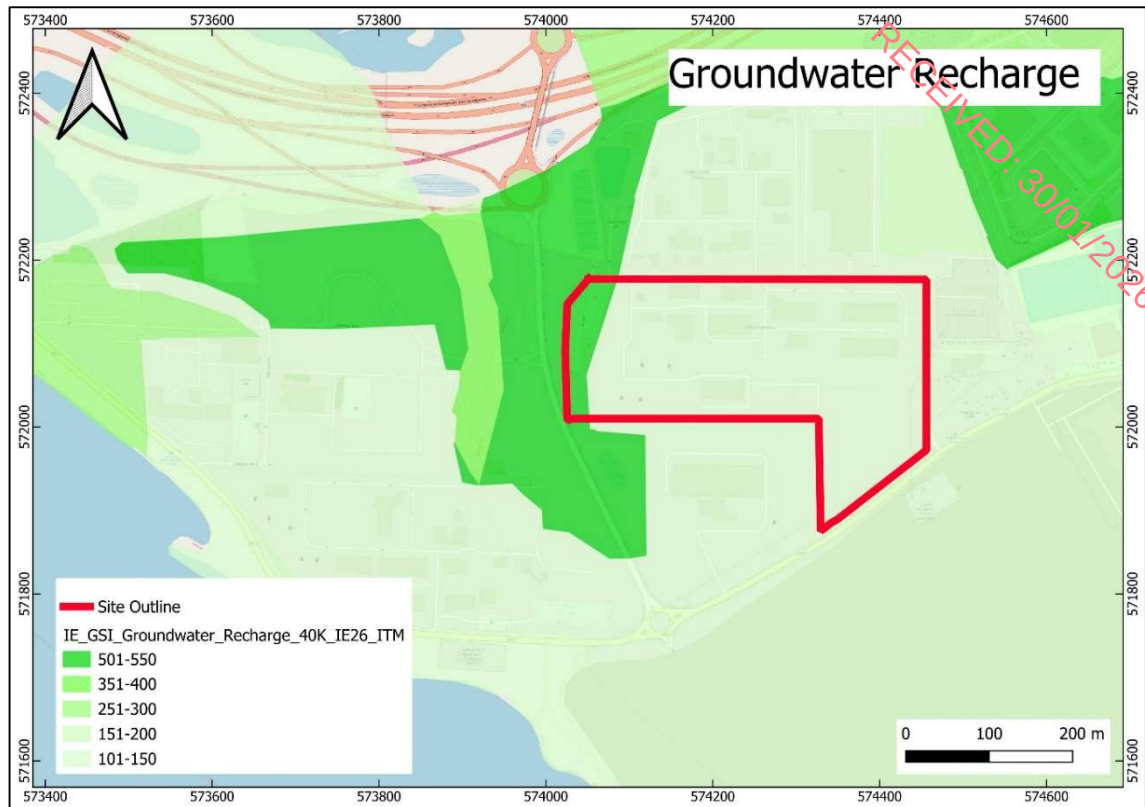


Figure 9-7 Groundwater recharge map (GSI, 2025).

9.4.16 Groundwater Abstractions

9.4.16.1 *Public Supply Groundwater Abstractions*

The area is in industrial use and generally serviced by public mains. There are no groundwater source protection zones in the study area.

9.4.16.2 *Other Abstractions/Well Records*

The GSI Well Card Index available at GSI.ie is a record of wells drilled in Ireland. Whilst it is not a comprehensive listing, the current index records two wells mapped as potentially within a 0.4km radius of the site (Figure 9-8). There is a well located approximately 380m to the east of the site, drilled in 1998 for industrial use. The site lies within the mapped zone of a well (mapped with a 2km accuracy) drilled in 1994 to a depth of 14.5m with unknown use. As the area is in industrial use since 1978 it is considered very unlikely that any potable water abstraction occurs within the study area prior to groundwater discharge to the drainage ditch that runs into Bury's Bridge Basin.

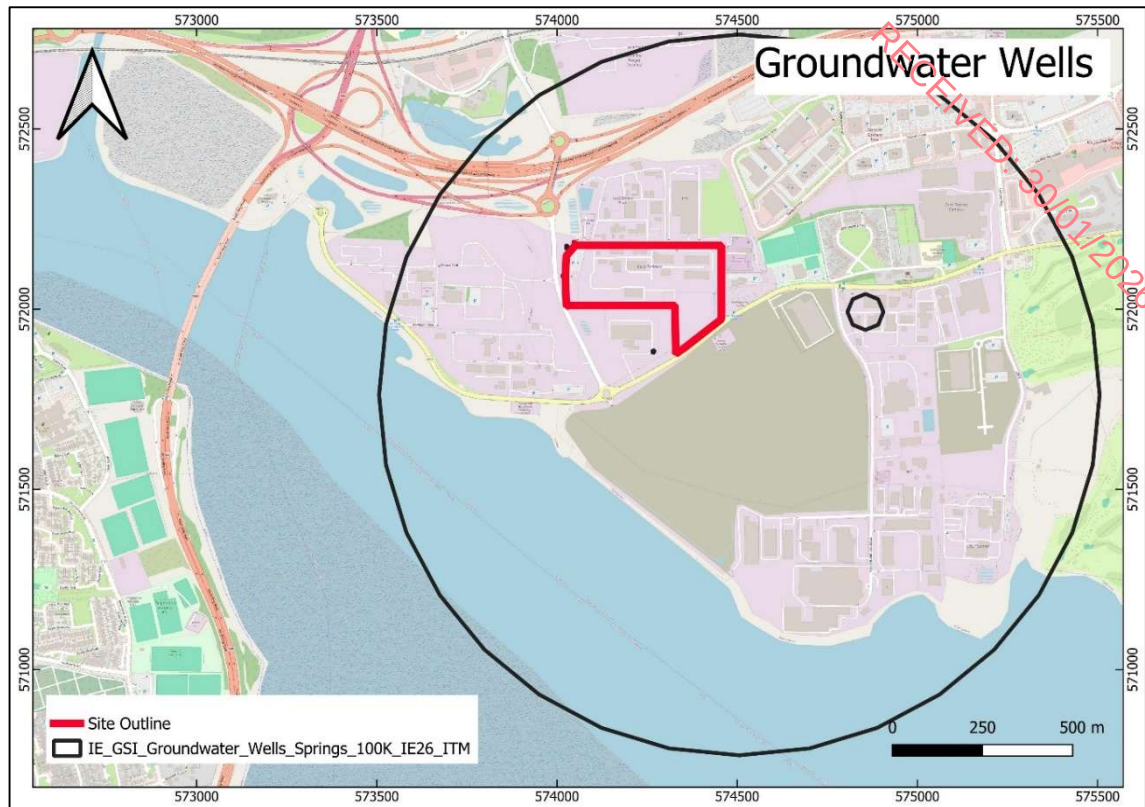


Figure 9-8 Groundwater wells map (GSI, 2025).

9.4.17 Designated Sites

The Cork Harbour (IE0004030) Special Area of Conservation (SPA) is located c. 400m to the west of the site. The nearest Special Area of Conservation (SAC) is the Great Island Channel (IE0001058) which is approximately 2km to the east of the site. There is also a proposed Natural Heritage site known as Dunkettle Shore, (ref 001082), located approximately 300m west of the site.

9.4.18 Conceptual Site Model

A conceptual site model (CSM) was created incorporating information derived from the desk study. The model is presented in Appendix 9-A .

9.4.18.1 Site Characteristics

The site is located within an industrial setting, with historical and ongoing chemical manufacturing occurring on site and at nearby industrial sites. There are records of existing groundwater contamination at the site and potential for unknown historical soil contamination to be present at the site or nearby industrial facilities.

The site has a mixture of hard and soft surfacing and is underlain by variable thickness of overburden – from c. 1 to 18 m. Overburden is composed in areas of made ground of tarmac or concrete above silty made ground to c. 1.0 m bgl. Topsoil in limited areas is c. 0.3 m thick. Beneath made ground or topsoil sands and gravels extend to from 1.0 to 18 m bgl. Weathered or competent limestone first occurs from 1.0 to 18 m bgl.

Groundwater records from static measurements indicate a depth to groundwater between c. 4 to 8 m bgl across the site. Groundwater is believed to flow slowly to the northwest and discharge to a ditch that in turn discharges to Bury's Bridge Basin, a tidal channel that flows into Lough Mahon. The flow eventually exits into Cork Harbour to the south-east.

9.4.18.2 *Sensitivity of Potential Receptors*

Soils (including made ground, topsoil and subsoil at the site)

A review of online sources indicates that the quaternary sediment at the site is classified as Urban. Review of imagery and reports from the desk study indicate that the surface of the site consists of made ground (typically tarmac or concrete in open areas or beneath buildings) and topsoil within lawn areas. The soils are considered of low importance or sensitivity as a potential resource and will be reused on site in accordance with the mitigation measures for the proposed development.

There is potential for soil contamination to be present in the made ground or subsoils at the site and at industrial facilities within the study area at a moderate local scale, consistent with historical light industrial usage. Due to the potential for contamination, soils are conservatively considered of medium importance and sensitivity for the purposes of this assessment in accordance with the IGI published guidance (2022).

Bedrock

The Waulsortian Limestone bedrock beneath the Site is considered of low resource importance and low sensitivity as a receptor. A minimal amount of bedrock (c. 224 m³) is estimated to be required to be removed as part of the proposed development.

Bedrock Aquifer

The bedrock aquifer beneath the Site is classified as a Regionally Important Karstified Aquifer (Rkd) and is accordingly considered of high importance as a receptor. As the aquifer is also classified by the GSI as of high vulnerability at the site and of extreme vulnerability in a limited area in the southeast of the Site, and due to the shallow bedrock encountered at the Site during recent site investigations, the aquifer is considered of high sensitivity for the purposes of this assessment.

Geological Heritage Sites

Designated Geological Heritage sites, including the site of Rock Farm Quarries, located c. 800m east of the site and within the study area, are considered of high importance at a national scale and accordingly are considered a high sensitivity receptor for the purposes of this assessment.

RECEIVED 30/01/2026

9.4.18.3 *Potential Sources of Impacts*

Potential sources of impacts arising from the construction and operational phases of the proposed development include:

Construction Phase

- Excavation and removal of soils from the site.
- Erosion and compaction of soils.
- Storage of resources on site.
- Unknown contaminated ground (excavation, handling, transport).
- Accidental spill or leakage to ground.
- Importation of contaminated fill.
- Dewatering of excavations if required.

Operational Phase

- Accidental spill or leakage of contaminants used or stored at site with migration to ground.
- Accidental spill or leakage of contaminants from wastewater system.
- Increased hardstanding.

9.4.18.4 *Potential Impact Pathways*

Potential pathways to soils, geological and hydrogeological receptors include:

- Direct removal of soils.
- Spillage, leakage and migration of contamination sources to soils or bedrock.
- Spillage, leakage and migration of contamination sources with vertical migration of contaminants through permeable Soils and fractured limestone bedrock to groundwater, including the bedrock aquifer.
- Lateral migration of contaminants within groundwater to surface water and on to other potential receptors.
- Activities including plant/vehicle traffic, slope regrading, laying of hardstanding, storage of materials on soft surfaces.
- Incorrect stockpiling leading to erosion and weathering of resource.
- Loss of groundwater/depression of water table.
- Reduced infiltration of rainwater.

9.4.18.5 Source-Pathway-Receptor Linkages

The Designated Geological Heritage site, Rock Farm Quarries, is located c. 800m to the east of the site, across hydraulic gradient. Review of information from the desk study, the site layout and the surface water flow, indicate there is no viable pathway for contamination to migrate from the site to Rock Farm Quarries.

Potentially viable Source (S) Pathway (P) Receptor (R) linkages related to the construction and operational phases of the proposed development include:

Construction Phase

- **(S)** Removal of soil or subsoil **(P)** excavation and removal **(R)** soils
- **(S)** Erosion and compaction of soils **(P)** activities including plant/vehicle traffic, slope regrading, laying of hardstanding, storage of materials on soft surfaces **(R)** soils
- **(S)** Stored excavated soil or subsoil resource on site **(P)** incorrect stockpiling leading to erosion and weathering, reducing resource quality **(R)** soil
- **(S)** Unknown contaminated ground **(P)** spill, leakage or spread of unknown contamination during excavation/disturbance, handling or transport **(R)** soils or bedrock
- **(S)** Unknown contaminated ground **(P)** spill, leakage or spread of unknown contamination during excavation/disturbance, handling or transport **(R)** groundwater including the bedrock aquifer
- **(S)** Spill or leakage of materials used during construction to ground (e.g. fuels, solvents, cement containing) **(P)** migration vertically or laterally to ground **(R)** soils or bedrock
- **(S)** Spill or leakage of fluids used during construction to ground (fuels, solvents **(P)** migration vertically or laterally via subsoil or bedrock to groundwater **(R)** groundwater, including bedrock aquifer
- **(S)** Importation of contaminated fill **(P)** migration vertically or laterally via subsoil or bedrock to in-situ Soils or bedrock **(R)** soils or bedrock
- **(S)** Dewatering of groundwater **(P)** loss of groundwater/depression of water table **(R)** groundwater, including bedrock aquifer
- **(S)** Importation of contaminated fill **(P)** migration vertically or laterally via subsoil or bedrock to groundwater **(R)**, including bedrock aquifer

Operational Phase

- **(S)** Spills or leaks of material stored or used on site (potential including process chemicals, fuel, solvents) **(P)** migration vertically or laterally to ground **(R)** soils and bedrock
- **(S)** Spills or leaks of materials stored or used at Site (potential including process chemicals, fuel, solvents) **(P)** migration vertically or laterally via subsoil or bedrock to groundwater **(R)**, including the bedrock aquifer
- **(S)** Minor spills or leaks from wastewater system **(P)** migration vertically or laterally to ground **(R)** soils and bedrock
- **(S)** Minor spills or leaks from wastewater system **(P)** migration vertically or laterally via subsoil or bedrock to groundwater **(R)**, including the bedrock aquifer
- **(S)** Increased hardstanding **(P)** Reduced infiltration of rainwater **(R)** groundwater, including bedrock aquifer

The environment across the study area has been categorised in accordance with the IGI Guidelines. It has been classified as a Type D environment which corresponds with a sensitive geological/hydrogeological environment, due to the presence of a karstified aquifer, high groundwater vulnerability, and proximity to sensitive receptors.

9.4.19 Assessment of Potential Effects

This section assesses the potential effects of the proposed development on the soil, geological and hydrogeological environment.

It should be noted that any risk to surface water or human health receptors, including risk arising from contaminated soil or groundwater are assessed in the Chapters concerning those receptors.

9.4.20 Do Nothing Effect

In the 'Do Nothing Effect' scenario, the Proposed Development would not be implemented, and no physical changes would occur to the land, soils, geology, or hydrogeology. As a result, there would be no associated impacts, and the effect on the receiving geological and hydrogeological environment would be considered neutral.

9.4.21 Potential Construction Phase Effects

It should be noted that any risk to surface water or human health receptors, including risk arising from contaminated soils or groundwater are assessed in the Chapters concerning those receptors.

9.4.21.1 Soil Excavation

Excavation of made ground, topsoil and subsoil (together referred to as soils) will be required for the construction of the new production and laboratory building, installation of underground ducting, and foundation works for ancillary infrastructure such as the RTO, CHP, tank farm and substations. A proportion of the excavated material is likely to be removed permanently from the site.

Whilst topsoil and subsoil are considered non-renewable resources, the topsoil at the existing industrial site is currently not in agricultural use and is unlikely to be in future. Subsoil at the site occurs widely locally and the area is not listed in extractive industry databases. The soils at the site are considered of low resource importance. However, there is potential for contamination to be present in soils due to historical industrial use, and the soils are therefore considered of medium importance and sensitivity for the purposes of the assessment.

The possible removal of soils from the site is considered a likely, minor, direct, adverse and permanent effect on a medium sensitivity receptor. It is therefore considered to be only of slight significance as a potential pre-mitigation impact.

9.4.21.2 *Incorrect Stockpiling of Excavated Soil Intended for Reuse*

Poor practices during stockpiling of excavated soil intended for reuse may lead to degradation of the soils as a resource. This is considered a likely, direct and permanent minor adverse effect on a medium sensitivity report and therefore of slight significance pre-mitigation.

9.4.21.3 *Excavation, Disturbance, Handling, Storage or Removal of Potentially Contaminated Soil*

As the site has a light industrial history, unknown contaminated soils may be encountered during excavations. Incorrect disturbance, removal, handling or storage of such soils have the potential to mobilise contaminants with potential for migration to soils, bedrock or groundwater (including the bedrock aquifer).

Migration to soils has a potential likely, indirect, long-term, reversible, minor effect on the in-situ medium sensitivity of soils. The potential significance of the impact on soils is therefore considered slight pre-mitigation.

Mobilisation and migration to groundwater has a potential likely, direct, moderate adverse effect on the high sensitivity bedrock aquifer and the potential impact is therefore significant/moderate pre-mitigation.

9.4.21.1 *Importation and Use of Contaminated Fill Material*

Should importation and use of contaminated fill material occur at the site there is potential for migration of contamination within the fill to in-situ soils or bedrock or to groundwater, including the bedrock aquifer. This is considered a potential unlikely, permanent, reversible, direct, moderate adverse effect on the medium sensitivity Soils/bedrock and high sensitivity groundwater, including the bedrock aquifer. Accordingly, the potential impacts are considered moderate for the soils and bedrock and significant to moderate for groundwater, including the bedrock aquifer.

9.4.21.2 *Soil Compaction and Erosion*

During construction activities, including plant and vehicle movement, regrading of soils, laying of hardstanding and storage of materials outside hardstanding areas, soils may be compacted, potentially leading to reduction in infiltration, waterlogging, degradation of soil structure and greater run-off and erosion.

Compaction, erosion and soil degradation are therefore considered likely, temporary, minor adverse direct effects on soils during the construction phase. These effects if they occur are expected to be localised and reversible. As soils are considered medium sensitivity, the potential significance of the impact on soils is considered slight pre-mitigation.

9.4.21.3 *Leak or Spill of Potentially Polluting Materials Used or Stored On Site During the Construction Phase to Soil or Groundwater*

Potentially polluting materials stored or used on site during construction phase activities, include oils, fuels and cements (incl. concrete, wash waters, grouts).

Where these, or other polluting materials, are leaked or spilled to ground, they have a potential likely, direct, long-term, reversible, moderate to major adverse effect on the in-situ medium sensitivity of soils as medium sensitivity receptors. The potential significance of the impact on medium sensitivity soils is considered moderate to significant pre-mitigation.

Where polluting materials, are leaked or spilled and migrate to groundwater, they have a potential likely, direct, long-term, reversible, moderate to major adverse effect on groundwater, including the bedrock aquifer. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered moderate to significant pre-mitigation.

9.4.21.4 *Dewatering of Excavations*

As depth to groundwater is recorded between c. 4 m and 8 m bgl at the site, temporary dewatering may be required for deeper excavations at the site. Dewatering activity has the potential to result in localised changes to groundwater levels. The effect of dewatering is a likely, temporary, reversible, negligible, effect on a high sensitivity receptor. Accordingly, the potential significance of the impact of dewatering prior to mitigation is considered to be imperceptible.

9.4.22 Potential Operational Phase Effects

9.4.22.1 *Accidental Leaks/Spills of Potentially Polluting Substances*

Leaks or spills of potentially polluting substances may arise from activities involving process chemical storage/use and storage/use of other potentially polluting substances, such as oils, fuels or solvents. These substances could potentially migrate to soils or bedrock and to groundwater, including the bedrock aquifer.

Where leaks and spills migrate to permeable ground there is a potential likely, direct, long-term, reversible, moderate adverse effect on the in-situ soils and bedrock. The potential significance of the effect on medium sensitivity Soils or bedrock is considered moderate to significant pre-mitigation.

Where polluting substances are leaked or spilled and migrate to permeable ground and onward to groundwater, there is a potential likely, direct, long-term, reversible, moderate to major adverse effect on groundwater, including the bedrock aquifer. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered moderate to significant pre-mitigation.

9.4.22.1 *Leakage from Wastewater Network*

The upgraded wastewater treatment system that forms part of the proposed development will include subsurface sewer infrastructure. Potential spills or leakage from the wastewater treatment system could potentially migrate to soils or bedrock and to groundwater, including the bedrock aquifer.

Where migration occurs to permeable ground, wastewater has a potential likely, direct, long-term, reversible, moderate to major adverse effect on the in-situ medium sensitivity of soils as medium sensitivity receptors. The potential significance of the impact on medium sensitivity soils is considered moderate to significant pre-mitigation.

Where wastewater is leaked or spilled and migrates to permeable ground and onward to groundwater, there is a potential likely, direct, long-term, reversible, moderate adverse effect on groundwater, including the bedrock aquifer. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered slight to moderate pre-mitigation.

9.4.22.2 *Reduced Infiltration*

Increased hardstanding areas on site is likely to cause decreased infiltration and thereby effect groundwater levels. However, the scale of changes are likely to be small on a local scale. The impact is potentially indirect and permanent and the magnitude is considered minor, with a slight to moderate effect on the High sensitivity groundwater, including bedrock aquifer.

Table 9-1 Conceptual site model, incorporating viable SPR linkages with potential impacts of the proposed development. See Appendix 9-A for schematic CSM.

Potential receptor	Source and potential pathway(s)	Likelihood	Sensitivity	Magnitude of Effect	Significance	Comments / Justification
Topsoil, made ground and subsoil (in-situ or stored on site after excavation)	Construction Phase					
	Construction Phase: Direct removal of made ground, topsoil or subsoil from the site	Likely	Medium	Minor adverse	Slight	A proportion of the excavated material is likely to be removed permanently from the site. Sensitivity and importance of soils at the site is rated as medium due to the potential presence of contamination based on a history of light industrial use.
	Construction Phase: Incorrect stockpiling	Likely	Medium	Minor adverse effect (direct and permanent)	Slight	Erosion and weathering, reducing resource quality.
	Construction Phase: Contaminated soil disturbance, handling, storage or removal	Likely	Medium	Minor adverse (indirect, long-term, reversible).	Slight	Due to the site's light industrial history unknown contamination may be encountered during works with potential to impact soil or subsoil.
	Construction Phase: Importation of contaminated fill material with migration of contaminants to in-situ Soils or bedrock	Unlikely	Medium	Moderate to major adverse effect (direct, reversible and long-term).	Moderate to significant	Materials including oils, fuels and cements (incl. concrete, wash waters, grouts).
	Construction Phase: Erosion and compaction (due to plant traffic/vehicles, soil regrading, laying of hardstanding, storage of materials on soft surfaces)	Likely	Medium	Minor adverse (direct, temporary)	Slight	Compaction, potentially leading to reduction in infiltration, waterlogging, degradation of soil structure and greater run-off and erosion. Sensitivity is rated as medium due to medium importance of soils (potential

Potential receptor	Source and potential pathway(s)	Likelihood	Sensitivity	Magnitude of Effect	Significance	Comments / Justification
						contamination from light industrial use).
	Construction Phase: Migration of spilled/leaked pollutants stored/used on site to ground and onward to soil/subsoil or bedrock.	Likely	Medium	Moderate to major adverse effect (direct and long-term)	Moderate to significant	Flow direct to permeable soil or from hardstanding to permeable soil and onward to subsoil or bedrock.
Groundwater including the bedrock aquifer	Construction Phase: Contaminated soil disturbance, handling, storage or removal	Likely	High	Moderate adverse effect (direct and permanent).	Moderate to significant	Due to the site's light industrial history unknown contamination may be encountered during works with potential to impact soil or subsoil.
	Construction Phase: Migration of spilled /leaked pollutants stored/used on site during construction to ground and onward via subsoil and bedrock.	Likely	High	Moderate to major adverse effect (direct and long-term).	Moderate to significant	Flow direct to permeable soil or from hardstanding to permeable soil and onward to groundwater. Groundwater vulnerability is high and likely to be increased locally to extreme by removal of topsoil or subsoil during excavations.
	Construction Phase: Importation of contaminated fill material with migration of contaminants to in-situ to groundwater.	Unlikely	High	Moderate adverse effect (direct and permanent).	Moderate to significant	
Groundwater including the bedrock aquifer	Construction Phase: Dewatering of groundwater influx to excavations.	Likely	High	Negligible adverse effect (direct, temporary, reversible)	Imperceptible	

Potential receptor	Source and potential pathway(s)	Likelihood	Sensitivity	Magnitude of Effect	Significance	Comments / Justification
Operational Phase						
Soils, subsoils, bedrock	Operational phase: Migration of spilled /leaked pollutants stored/used on site to ground and onward to soil/ subsoil or bedrock.	Likely	Medium	Moderate adverse effect (direct and long-term, reversible)	Moderate to significant	Flow direct to permeable soil or from hardstanding to permeable soil and onward to subsoil or bedrock
	Operational phase: Wastewater leaks on pipework	Likely	Medium	Minor adverse effect (indirect, temporary, reversible)	Slight	Potential for minor leaks on wastewater system
Groundwater including the Bedrock Aquifer	Operational phase: Migration of spilled /leaked pollutants stored/used on site to ground and onward via subsoil and bedrock.	Likely	High	Moderate to major adverse effect (direct and permanent)	Moderate to significant	Flow direct to permeable soil or from hardstanding to permeable soil and onward to groundwater
	Operational phase: Wastewater leaks on pipework	Likely	Medium	Moderate adverse effect (indirect, long-term, reversible)	Slight to Moderate	Potential for minor leaks on wastewater system
	Operational phase: Reduced infiltration of rainwater due to increased hardstanding	Likely	High	Minor adverse effect (indirect and permanent)	Slight to Moderate	

9.5 Mitigation Measures

9.5.1 Construction Phase Mitigation measures

9.5.1.1 *Construction Environmental Management Plan*

An outline construction environmental management plan (CEMP) has been prepared for the construction phase. A construction stage construction management plan (CSCEMP) will be prepared by the site contractor to ensure effective soil and water management in accordance with best practices during the construction phase. The CSCEMP will cover potentially polluting activities and include an emergency response procedure. All relevant personnel working on the site will be trained in the implementation of the procedures.

9.5.1.2 *Soil Excavation – Reuse of Excavated Topsoil or Subsoil*

Excavated soils will be reused on-site where feasible for infilling and landscaping works, particularly for levelling, landscaping and reinstatement works. Any soils stripping will be carefully planned to avoid unnecessary exposure of subsoils, especially in areas of high groundwater vulnerability.

The potential slight significance of the impact of removal on soils at the site will be mitigated by reuse of excavated topsoil or subsoil. The low levels of soil removed constitute a likely, direct, negligible adverse effect on a medium sensitivity receptor. Post-mitigation the significance of the potential impact is therefore considered to be imperceptible.

9.5.1.3 *Mitigation of Incorrect Stockpiling of Excavated Soil Intended for Reuse*

Poor practice during stockpiling of excavated soil intended for reuse may lead to degradation of the stockpiled soil as a resource.

The potential slight significance of poor stockpiling practice on the stockpiled soils will be mitigated by application of best practices in soil stockpiling.

Temporary stockpiles will be located away from drainage ditches and surface water features and will be managed to prevent erosion, dust generation, and runoff. Movement of soil will be minimised to preserve its structure and reduce degradation.

Management of soils stockpiles in accordance with best practice will reduce potential degradation to an unlikely, direct and permanent negligible adverse effect on a medium sensitivity receptor. Post-mitigation the significance of the potential impact is therefore considered to be imperceptible.

9.5.1.4 *Excavation, Disturbance, Handling, Storage or Removal of Potentially Contaminated Soil*

The potential slight adverse impact on in situ soils of excavation, disturbance, handling, storage or removal of unknown contaminated soils will be mitigated by application of best practices in the management of contaminated land.

If contaminated soils are encountered, they will be required to be handled, transported on-site and off-site for disposal or recovery by licensed contractors, in accordance with best practice and associated EPA guidance on contaminated soil management.

All excavated material will be visually inspected for signs of contamination, such as staining or odours. If contamination is suspected, samples will be taken and analysed to determine the presence of pollutants. Any material found to be contaminated will be delineated, separated and removed from site by a licensed waste contractor.

Where feasible and safe, uncontaminated made ground may be reused as fill material, subject to validation testing and approval under the site's waste management procedures.

Upon application of the above mitigation, the potential moderate impact on in-situ soils will be reduced. A potential adverse effect on soils will be unlikely, direct, short-term, reversible and negligible. The potential significance of the impact on soils is therefore likely to be imperceptible to slight post-mitigation.

Likewise, upon application of the above mitigation measures, the potential moderate to significant impact on high sensitivity groundwater (including the bedrock aquifer) will be reduced. A potential adverse effect on groundwater (including the bedrock aquifer) will be unlikely, direct, long-term and minor on the high sensitivity bedrock aquifer and the potential impact is therefore slight to moderate post-mitigation.

9.5.1.5 *Mitigation of Potential Effects of Importation and Use of Contaminated Fill Material*

Potential for importation and use of contaminated fill material to the site and resulting migration of contamination to in-situ soils, bedrock or groundwater, including the bedrock aquifer, will be mitigated by measures, including those set out below.

All imported aggregate and fill materials will be sourced from authorised suppliers and will comply with relevant environmental and engineering standards. Materials will be assessed for suitability and potential contamination prior to delivery. The use of recycled materials will be considered where appropriate, provided they meet the required specifications and pose no risk to soil or groundwater quality.

Upon application of the above mitigation, the potential moderate impact on in-situ soils and bedrock or moderate to significant impact on groundwater, including the bedrock aquifer, will be reduced. The potential adverse effect will be unlikely, direct, temporary, reversible and negligible on the medium sensitivity soils or bedrock and on groundwater, including the high sensitivity bedrock aquifer.

The potential significance of the impacts on soil and bedrock is likely therefore to be imperceptible and on groundwater are likely to be slight to moderate post-mitigation.

9.5.1.6 *Mitigation of Soil Compaction and Erosion*

Potential for soils compaction and erosion at the site will be mitigated by measures including use of designated haul routes and post-construction soils remediation.

Upon application of the above mitigation, the potential slight impact on in-situ soils will be reduced. A potential adverse effect on soils will be likely, temporary, local, negligible adverse and direct. The potential significance of compaction and erosion impacts on soils are likely therefore to be imperceptible post-mitigation.

9.5.1.7 *Leak or Spill of Potentially Polluting Materials Used or Stored On-Site During the Construction Phase to Soil or Groundwater*

Potentially polluting materials stored or used on site during construction phase activities, include oils, fuels and cements (incl. concrete, wash waters, grouts). Potential for impacts from leaks or spills of these stored materials will be mitigated by measures including those set out below.

Mitigation will include bunded storage, spill kits, and emergency response protocols. To minimise the risk of hydrocarbon contamination, refuelling and maintenance of construction vehicles will be carried out in designated areas away from surface water drains or channels. Fuel and oil storage tanks will be located in bunded areas with a capacity of at least 110% of the largest container. Spill kits and absorbent materials will be readily available on-site, and personnel will be trained in their use. Mobile refuelling units will be double-skinned and equipped with containment systems to prevent leaks during transport and use.

Cement mitigation measures such as designated washout areas and containment systems will be used. Concrete and cement materials will be handled in a manner that prevents alkaline runoff from entering the soils or groundwater. Wet concrete activities will be risk assessed, and washout of concrete trucks will occur off-site or in designated containment areas. Measures will be implemented to prevent discharge of water containing cement to the ground, and all mixing and pouring will be carried out in controlled zones with appropriate drainage and containment.

Upon application of the above mitigation, the potential moderate to significant pre-mitigation effect on in-situ soils and the potential moderate to significant pre-mitigation effects on groundwater will be reduced. The potential adverse effect on soils will be unlikely, temporary, local, negligible adverse and direct. The potential significance of the effects on soils are likely therefore to be imperceptible post-mitigation. The potential adverse effect on groundwater will be unlikely, direct, long-term, reversible, negligible to minor. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered negligible to slight post-mitigation.

9.5.1.8 *Dewatering of Excavations*

Where dewatering of excavations is required during the construction phase the potential for imperceptible impacts on groundwater will be mitigated by measures including those set out below.

Dewatering will be carried out in a controlled manner to minimise impacts on groundwater levels and flow. Discharge of abstracted water will be directed to appropriate treatment or attenuation systems before release to surface water or sewer networks. Monitoring of groundwater levels will be undertaken during dewatering activities to ensure that sensitive receptors, such as nearby surface water features or ecological habitats, are not adversely affected.

Post-mitigation the effect of dewatering is a likely, temporary, reversible, negligible effect on the high sensitivity bedrock aquifer. Accordingly, the potential significance of the effect of dewatering is considered likely to be imperceptible post-mitigation.

9.5.2 *Potential Operational Phase Effects*

9.5.2.1 *Accidental Leaks/Spills of Potentially Polluting Substances*

Leaks or spills of potentially polluting substances may arise from activities involving process chemical storage/use and storage/use of other potentially polluting substances, such as oils, fuels or solvents. Potential moderate to significant pre-mitigation effect on in-situ soils and the potential moderate to significant pre-mitigation effects on groundwater from leaks or spills will be mitigated by measures including those set out below.

Mitigation measures such as bunding, integrity testing of storage systems and the associated provisions of the Environmental Management System (EMS) along with the Industrial Emissions Licence (IEL) will be implemented.

All hydrocarbon storage will be bunded, and impermeable surfacing will be used in high-risk areas.

Routine inspections and spill response procedures will be implemented to prevent and manage any incidents.

Fuel, oil and solvent storage tanks will be located in bunded areas with a capacity of at least 110% of the largest container or 25% of the total volume of primary containment vessels within a given bund, whichever is the greater.

Spill kits and absorbent materials will be readily available on-site, and personnel will be trained in their use.

In order to minimise any impact on the underlying subsurface strata from material spillages, fuel and chemical storage tanks will be stored above ground in designated areas with an impervious base.

These areas will be bunded to a volume of 110% of the capacity of the largest tank/ container within the bunded area or 25% of the total volume of primary containment vessels within a given

bund, whichever is the greater as per EPA requirements. Drainage from the bundled areas will be inspected and properly managed.

All bunding and integrity testing will be completed as per IEL requirements. Testing will ensure that containment systems remain effective and that any deterioration or damage is identified and addressed promptly. Records of inspections and maintenance will be maintained, and corrective actions will be implemented where necessary to prevent environmental impacts.

Any chemicals, oils, herbicides required for site maintenance will be stored in suitable contained areas.

Upon implementation of the above mitigation there will be a potential unlikely, direct, long-term, reversible, minor adverse effect on the in-situ soil, resulting in a potential slight significance of effect. There will be a potential unlikely, direct, long-term, reversible, minor adverse effect on groundwater, including the bedrock aquifer. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered moderate to slight after mitigation.

9.5.2.2 *Leakage from Wastewater Sewers*

Leaks or spills from the wastewater treatment system have a potential slight pre-mitigation effect on in-situ soils and potential slight to moderate pre-mitigation effects on groundwater from leaks or spills will be mitigated by measures including those set out below.

Mitigation measures will include robust pipe materials, leak detection systems, and regular maintenance under the EMS and IEL to ensure that the risk of leakage is minimised.

Upon implementation of the above mitigation there will be a potential unlikely, direct, long-term, reversible, negligible adverse effect on the in-situ soil, resulting in a imperceptible significance of effect.

There will be a potential unlikely, direct, long-term, reversible, negligible adverse effect on groundwater, including the bedrock aquifer. The potential significance of the impact on high sensitivity groundwater, including the bedrock aquifer, is therefore considered imperceptible after mitigation.

9.6 Residual Effects

9.6.1 Construction Phase

No significant residual impacts on soils, geology, or hydrogeology are anticipated during the construction phase of the proposed development, following the implementation of the mitigation measures outlined in section 9.5.

9.6.2 Operational Phase

No significant residual impacts on soils, geology, or hydrogeology are expected during the operational phase of the proposed development, following the implementation of the mitigation measures outlined in section 9.5 and management in accordance with the site EMS, IEL and ongoing monitoring.

9.7 Cumulative Effects

Cumulative effects as defined by the EU Guidelines include impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project. The EPA defines cumulative effects as *“The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.”* (EPA, 2022).

The assessment of cumulative impacts considers the total impact associated with the proposed development when combined with other past, present, and reasonably foreseeable future developments.

Based on a review of the planning application viewer on 18 November 2025 there are no committed developments in proximity to the proposed development that are likely to give rise to cumulative impacts with it.

Currently, the total potential cumulative impact that it is practically possible to consider is set out below.

The proposed development envisages the development a phased development over c. 10 years, the specification or other details of which are not detailed at this time. Broadly, should units or phases be developed consecutively, using best practice industry mitigation measures, the cumulative impacts in the construction phase are likely to be unchanged (slight to moderate) for soils, geology and hydrogeology for the reasons outlined in this chapter. Should the phases occur concurrently the erosion and compaction impacts will have a potentially likely, moderate (rather than minor), direct, adverse and temporary effect, however the effects would be reduced to imperceptible with the implementation of best practise measures as outlined in mitigation measures in this chapter. For all other potential effects the assessment remains unchanged.

9.8 Monitoring

Monitoring will be undertaken during the construction and operational phases to ensure that mitigation measures are effectively implemented and that no unforeseen impacts occur to soils, geology, or hydrogeology.

During the construction phase, monitoring will include visual inspections of excavation activities, soils stockpiles, and fuel/chemical handling areas to ensure compliance with the Construction Environmental Management Plan (CEMP). Groundwater levels and quality may also be monitored if dewatering is required.

During the operational phase, groundwater monitoring will continue in accordance with EPA licensing requirements. This will include sampling from existing monitoring wells for parameters such as pH, conductivity, ammoniacal nitrogen, sulphate, and volatile organic compounds (VOCs).

Results will be reviewed regularly to confirm that site activities are not adversely affecting the underlying aquifer or nearby surface water features. Any exceedances will be investigated and addressed through corrective actions outlined as per EPA requirements.

9.9 References

European Parliament and Council. 2014. Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. Official Journal of the European Union L 124, 25 April 2014, pp. 1-18.

European Communities Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive).

Environmental Protection Agency (EPA) (2003) *Advice Notes on Current Practice in the Preparation of EIS*. EPA, Wexford.

Environmental Protection Agency (EPA) (2015) *Advice Notes for Preparing Environmental Impact Statements*. EPA, Wexford.

Environmental Protection Agency (EPA) (2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*. EPA, Wexford.

Environmental Protection Agency (EPA) (2025) *EPA Online Mapping and Extractive Industry Register*. Available at: <http://www.epa.ie/> (Accessed: October 2025).

Geological Survey Ireland (GSI) (2025) *GSI Public Viewer and Online Mapping*. Available at: <http://www.gsi.ie/mapping> (Accessed: May 2025).

Geological Survey Ireland (GSI) (2023) *Rock Farm Quarries – County Geological Site Report*. Available at: https://gsi.geodata.gov.ie/downloads/Geoheritage/Reports/CK078_Cork_CGS_Rock_Farm_Quarries.pdf (Accessed: May 2025).

Geological Survey Ireland (GSI) (2025) *Online Mineral Database and Extractive Industry Mapping*. Available at: <https://www.arcgis.com/home/item.html?id=8fc82bff28364d169b83fbf6e133fd15> (Accessed: May 2025).

Institute of Geologists of Ireland (IGI) (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*. IGI, Dublin.

Institute of Geologists of Ireland (IGI) (2022) *Geology in Environmental Impact Statements, A Guide*. IGI, Dublin

Ordnance Survey Ireland (OSI) *6-inch and 25-inch Historical Maps*. Available at: <https://www.osi.ie/> (Accessed: October 2025).

Ireland (2001). Planning and Development Regulations 2001 (S.I. No. 600 of 2001). Dublin, Government of Ireland.

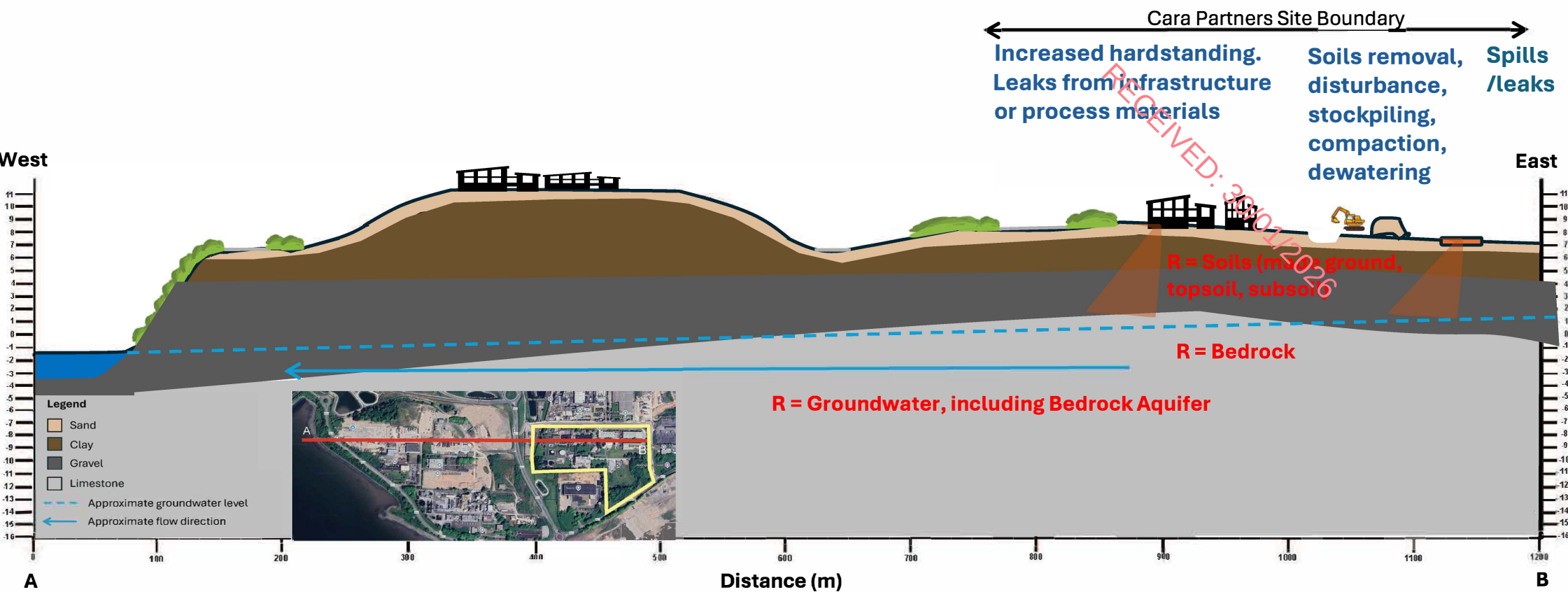
This page is intentionally blank.

RECEIVED: 30/01/2026

Appendix 9-A

Conceptual Site Model

RECEIVED: 30/01/2026



Note: "R" = Receptor