H2Teesside Project

Environmental Permit Application Reference: [EPR/AP3328SQ/A001]

Land at and in the vicinity of the former Redcar Steel Works site, Redcar and in Stockton-on-Tees, Teesside

Document Reference: [AP3328SQ-APP-AQ] Air Quality Operational Dispersion Modelling Assessment

Environmental Permitting (England and Wales) Regulations 2016

Applicants: H2 Teesside Ltd

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1 INTRODUCTION

1.1 Overview

1.1.1 The H2Teesside Project (the 'Proposed Development') will be one of the UK's largest blue hydrogen production facilities with a capacity of up to approximately 1.2 gigawatts ('GW') thermal, representing more than 10% of the Government's low carbon hydrogen production target of 10 GW by 2030.

1.1.2 The Proposed Development, encompassing a Hydrogen Production Facility, associated connections, temporary construction compounds, and landscape/ecological areas, is situated on land in Redcar and Cleveland, Stockton-on-Tees, and Hartlepool (hereafter referred to as the Proposed Development Site).

1.1.3 This assessment considers the effects on air quality as a result of the normal and non-routine (start-up and emergency) operation of the Proposed Development. For more details about the Proposed Development, refer to the Supporting Statement.

1.1.4 Emissions associated with the operational Proposed Development have the potential to affect human health and sensitive ecosystems, if not appropriately managed. This technical report identifies and proposes measures required to address potential impacts and significant effects of the Proposed Development on air quality during its operational phase.

1.1.5 The magnitude of air quality impacts at sensitive human and ecological receptors has been quantified for pollutants emitted from the main stacks associated with the Proposed Development. The impact of emissions on sensitive ecological receptors has been considered in the context of relevant critical levels and critical loads for designated and non-designated ecological sites.

1.1.6 The assessment has considered emissions from the boilers, fired heaters, flares and emergency diesel generators during different operational conditions once Phase 2 is complete. Non-routine emissions, such as those which may occur during the commissioning process (which is subject to a commissioning plan) or other short-term events would typically only occur on an infrequent basis, would be detected by the process control system and rectified within a short time period. The plant operation will be regulated by the Environment Agency through the Environmental Permit required for the operation of the Proposed Development. Emissions during non-routine operation have the potential for significant short-term effects at sensitive receptors, and an assessment has been undertaken of non-routine operational scenarios.

1.2 Scope

<u>Combustion Plant and Carbon Capture Plant</u>

1.2.1 The assessment has considered the impact of operational process emissions on local air quality, under normal operating conditions, with the auxiliary boilers (one per phase) and pilot flares operating for 8,760 hours per year, as this represents the worst case for annual average impacts. The assessment considers impacts in the earliest year in which the Proposed Development is due to commence operation, 2028.

1.2.2 The assessment also considers two non-routine operating scenarios for the assessment of short-term impacts. These scenarios include different sources and fuel types, which can lead to different emission rates than during normal operation.

1.2.3 The scenarios and sources included in this assessment are:

- start-up – including Fired Heaters (natural gas fired), flares (to include pilot and flares operating as in Emergency scenario, in 3 different modes, referred to as scenario 1, 2 and 3), and Auxiliary Boilers (natural gas fired);
- normal operation – including auxiliary boilers (hydrogen and tailings gas fired) and flares in normal operation (pilot and purge only); and
- emergency – including Emergency flares operation (in 3 different modes, referred to as scenario 1, 2 and 3) and emergency diesel generators.

1.2.4 The carbon capture plant (CCP) is designed as a closed loop system, as part of the H_2 generation process and is not part of the combustion process for the Fired Heater or Auxiliary Boilers. Due to this, there are no predicted emissions from the CCP, and no assessment of the CCP has been reported within this Technical Appendix.

1.2.5 The Study Area for the operational Proposed Development point source emissions extends up to 15 km from the emission sources to assess the potential impacts on ecological receptors. This is in line with the Environment Agency (EA) risk assessment methodology (Department for Environment, Food & Rural Affairs (Defra) and Environment Agency, 2016, as updated in 2023) but also includes additional sites requested by the biodiversity specialists based on their professional judgment:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites and Sites of Special Scientific Interest (SSSIs) within 15 km (10km set out in the guidance, plus a further 5km requested by the project's biodiversity specialists); and
- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWSs) and National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)) within 2 km.

1.2.6 In terms of human health receptors, based on similar modelling studies and EA guidance, impacts from the operational Proposed Development become negligible within approximately 2 km and therefore sensitive receptors for the human health impacts only are concentrated within a 2 km Study Area.

1.2.7 The dispersion of emissions has been predicted using the latest version of the atmospheric dispersion model (ADMS) (Version 6). The results are presented in both tabular format within this Technical Appendix and as contours of predicted ground level process contributions (PCs) overlaid on mapping of the surrounding area, and the following figures have been produced showing the predicted isopleths, or attached from the DCO Environmental Statement:

- Figure 8-1: Air Quality Study Area – Human Health Receptors and Monitoring.
- Figure 8-2: Air Quality Study Area – Ecological Receptors.
- Figure 8-3: Air Quality Study Area – Construction Road Traffic Locations.
- Figure 8-4: Air Quality Study Area – Operational Model Inputs Phase 1.
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- Figure 12: Nitrogen Deposition from Process Contribution for the Proposed Development during Normal Operations for Phase 1 and 2 Combined – for the Worst Affected Meteorological Year of 2022.
- Figure 13: Acid Deposition from Process Contribution for the Proposed Development during Normal Operations for Phase 1 and 2 Combined – for the Worst Affected Meteorological Year of 2022.

1.2.8 The dispersion modelling assessment has concentrated on the combustion emissions associated with the operation of the Fired Heaters (start-up only), auxiliary boilers, operational flares (both normal and emergency) and emergency diesel generators of oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), ammonia (NH_3), carbon monoxide (CO), Particulate Matter (PM_{10} and $PM_{2.5}$) and sulphur dioxide (SO_2).

1.2.9 Emissions from Large Combustion Plant (LCP) are governed by the Industrial Emissions Directive (IED Directive 2010/75/EU) (European Union, 2010), which contains measures relating to the control of emissions, including setting limits on emissions to air from LCP and requires operators to monitor and report emissions.

1.2.10 The boilers have an aggregated thermal input greater than 50 MW. These units are therefore classified has LCP according to the IED.

1.2.11 The Proposed Development would be regulated as a Part A(1) installation under the IED and in accordance with the LCP Best Available Technique (BAT) Reference document (Bref) (European Commission, 2017). The current LCP Bref and associated BAT conclusion document was issued in 2017. The recommendations of the LCP Bref are enforceable through Environmental Permits and the Environment Agency would set specific emission limits in the Environmental Permit issued to the Proposed Development, based on the BAT-associated emission levels (BAT-AELs). Emission Limits Values (ELVs) used in this assessment have been derived from the applicable document.

1.2.12 Individually, the fired heaters and emergency generators fall under the Medium Combustion Plant Directive. However, as they won't be operated for more than 500 hours per year, they will not be subject to ELVs but will be regulated through Environmental Permits for the installation.

1.2.13 A comparison has been made between predicted model output concentrations (process contributions), and short-term and long-term Air Quality Assessment Levels (AQALs).

<u>Cumulative Impacts</u>

1.2.14 Existing sources of pollution in the area are accounted for in the adoption of site-specific background pollutant concentrations from archive sources and a programme of project-specific baseline air quality monitoring in proximity to the Proposed Development site.

1.2.15 It is recognised, however, that there is a potential impact on local air quality from emission sources which have either received or are about to receive planning permission but have yet to come into operation. Two examples of proposed developments considered within the study area but that do not have operational emissions to air are HyGreen and Lightsource BP solar projects.

1.2.16 The full list of cumulative schemes to be considered for the Proposed Development can be found below whilst details of the model inputs are provided in Annex B. The cumulative impact of the following consented schemes with the Proposed Development have been considered in this assessment:

- ID 2: The Tees Combined Cycle Power Plant, EN010082;
- ID 3: Net Zero Teesside, EN010103;
- ID 19: Peak Resources Ltd, R/2017/0876/FFM;
- ID 20: CBRE anaerobic biogas production facility and combined heat and power plant, R/2016/0484/FFM;
- ID 22: Grangetown energy recovery facility (ERF), R/2019/0767/OOM;

- ID 30: Tourian Renewables, R/2019/0031/FFM;
- ID 46: Redcar Energy Centre (REC), R/2020/0411/FFM;
- ID166: O2N Energy (materials recycling facility and production of energy from waste), 13/2892/EIS;
- ID 178: Green Lithium Refining, R/2023/0291/ESM;
- ID 212: Teesside Green Energy Park, 22/1525/EIS; and
- ID 219: Greenergy Renewable Fuels and Circular Products Facility, 23/1019/EIS.

1.2.17 The results presented within the assessment are inherently cumulative, as the air quality modelling for the operational phase includes all relevant committed developments on top of the existing background, both with and without the Proposed Development. The results of the inherently cumulative assessment are presented in Section 6, with the details of the cumulative developments included in the model presented in Annex B.

Sources of Information

1.2.18 The data that has been used within this assessment includes pertinent information from:

- Supporting Statement;
- data on emissions to atmosphere from the operational process, supplied by the Applicant;
- details on the Proposed Development site layout;
- Ordnance Survey mapping (OS, 2023);
- baseline air quality data from project specific monitoring, published sources and Local Authorities; and
- meteorological data supplied by ADM Ltd (AMD Ltd, 2023).

2 ASSESSMENT CRITERIA

2.1 Legislation

2.1.1 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations (as amended 2016) (HM Government,2016), including 'The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (HM Government, 2020).

2.1.2 The UK is no longer a member of the European Union (EU). Some types of EU legislation such as Regulations and Decisions, are directly applicable as law in an EU Member State. This meant that, as a Member State, these types of legislation applied automatically in the UK, under section 2(1) of the European Communities Act 1972 (c.68), without any further action required by the UK. These types of legislation are published by the Publications Office of the European Union on the

EUR-Lex website. This legislation is now published on legislation.gov.uk as 'legislation originating from the EU'.

2.1.3 Other types of EU legislation, such as Directives, are indirectly applicable, which means they require a Member State to make domestic implementing legislation before becoming law in that State. In the UK this was often achieved by making Statutory Instruments rather than passing primary legislation. This implementing legislation has always been published on legislation.gov.uk.

2.1.4 EU legislation which applied directly or indirectly to the UK before 23:00 hours on 31st December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation' under the control of the UK's Parliaments and Assemblies. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c.16). Section 4 of the 2018 Act ensures that any remaining EU rights and obligations, including directly effective rights within EU treaties, continue to be recognised and available in domestic law after exit.

The Air Quality Standards Regulations and Air Quality Strategy

2.1.5 The Clean Air for Europe (CAFE) programme consolidated and replaced (with the exception of the 4th Daughter Directive) preceding Directives with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (hereafter referred to as the 'EU Air Quality Framework Directive') (Council for European Communities, 2008). This Directive is transcribed into UK legislation by the Air Quality Standards Regulations 2010 which came into force on 11th June 2010 (HMSO, 2010). The 2010 Regulations were amended by the Air Quality Standards Regulations 2016 which came into force on 31st December 2016. These limit values are legally-binding and are considered to apply everywhere (with the exception of the carriageway and central reservation of roads and any locations where the public do not have access).

2.1.6 The UK AQS was initially published in 2000 (Defra, 2000), under the requirements of the Environment Act of 1995 (HM Government,1995). An AQS addendum was published in 2003 (Defra, 2003) which tightened several of the objectives and introduced a new objective. A revised AQS was published in 2007 (Defra, 2007) which set objectives for key pollutants as a tool to help Local Authorities manage local air quality improvements in general alignment with the EU Air Quality Framework Directive. The AQS objectives are either the same or more stringent than the EU limit values defined in the Air Quality Standards Regulations. The AQS objectives that are applicable to this study are shown in Table 1.

2.1.7 In addition, the Environment Agency (EA) has defined Environmental Assessment Levels (EALs) for the protection of human heath for pollutant species without Air Quality Strategy (AQS) objectives, however the only applicable EAL is a 1-hour limit for CO. Table 1 presents the air quality standards (hereafter collectively referred to as "Air Quality Assessment Levels" or "AQAL") applicable to this assessment.

Table 2-1: Air Quality Assessment Levels (AQAL) - Protection of Human Health

POLLUTANT	SOURCE	CONCENTRATION (µg/m^3)	MEASURED AS
NO_2	National Air Quality Objective Value	40	Annual mean
		200	1-hour mean, not to be exceeded more than 18 times per year
PM_{10}	National Air Quality Objective Value	40	Annual mean
		50	24-hour mean, not to be exceeded more than 35 times a year
$PM_{2.5}$	National Air Quality Objective Value	20	Annual mean
CO	National Air Quality Objective Value	10,000	Maximum daily running 8-hour mean
	EAL	30,000	Maximum 1-hour mean
SO_2	National Air Quality Objective Value	266	15-minute mean, not to be exceeded more than 35 times a year
		350	1-hour mean, not to be exceeded more than 24 times a year
		125	24-hour mean, not to be exceeded more than 3 times a year

The Environment Act (2021)

2.1.8 The Environment Act 2021 (HM Government, 2021) amends the Environment Act 1995. On 9th November 2021, the Act was approved after being first introduced to Parliament in January 2020 to address environmental protection and the delivery of the Government's 25-year environment plan following Brexit. It includes provisions to establish a post-Brexit set of statutory environmental principles and ensure environmental governance through an environmental watchdog, the Office for Environmental Protection (OEP).

2.1.9 Part IV of the Act requires the Government to produce a national AQS which contains standards, objectives, and measures for improving ambient air quality. The AQS proposes that the Secretary of State publish a report reviewing the AQS every five years (as a minimum and with yearly updates to Parliament). The AQS also proposes that the government set two targets by October 2022: the first on the amount of $PM_{2.5}$ in the ambient air (the figure and deadline for compliance remain unspecified) and a second long-term target set at least 15 years ahead to encourage stakeholder investment.

Assessment Criteria for Sensitive Ecological Receptors

2.1.10 The UK is bound by the terms of the European Birds and Habitats Directives and the Ramsar Convention. The Conservation of Habitats and Species Regulations 2010 (HM Government, 2010) provides for the protection of European sites created under these policies, i.e. Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, Special Protection Areas (SPAs) classified under the Birds Directive, and Ramsar Sites designated as wetlands of international importance. The 2010 Regulations apply specific provisions of the European Directives to SACs, SPAs, candidate SACs (cSACs) and proposed SPAs (pSPAs), which require them to be given special consideration and further assessment by any development which is likely to lead to a significant effect upon them.

2.1.11 The legislation concerning the protection and management of designated sites and protected species within England is set out within the provisions of the 2010 Regulations, the Wildlife and Countryside Act 1981 (as amended) (HM Government, 1981) and the Countryside and Rights of Way Act 2000 (as amended)(HM Government, 2000).

2.1.12 The impact of emissions from the installation on sensitive ecological receptors is quantified within this assessment in two ways:

- As direct impacts arising due to increases in atmospheric pollutant concentrations; assessed against Critical Levels; and
- indirect impacts arising through the deposition of acids and nutrient nitrogen to the ground surface; assessed against Critical Loads.

2.1.13 The Critical Levels for the protection of vegetation and ecosystems are set out in Table 2 and apply regardless of habitat type. These values have been adopted as the assessment criteria for the impact of the process on designated nature sites.

Table 2-2: Critical Levels (CL) – Protection of Vegetation and Ecosystems

POLLUTANT	SOURCE	CONCENTRATION ($\mu g/m^3$)	MEASURED AS
Oxides of nitrogen (NO_x)	National Air Quality Objective Value	30	Annual mean
	Environment Agency air emissions risk assessment guidance	75	Daily Mean
Ammonia (NH_3)	Environment Agency air emissions risk assessment guidance for lichen and bryophytes	1	Annual mean
	Environment Agency air emissions risk assessment guidance	3	Annual mean

2.1.14 Critical Load criteria for the deposition of acids and nutrient nitrogen are dependent on the habitat type and species present and are specific to the sensitive receptors considered within the assessment. The Critical Loads are set out on the Air Pollution Information System website (Centre for Ecology and Hydrology, 2017).

2.1.15 The Critical Load criteria adopted for the sensitive ecological receptors considered by the assessment are site dependent. As such they are presented in Table 11 along with each site's specific designation.

Environmental Permitting

2.1.16 The national Environmental Permitting Regulations (EPR) (HM Government, 2016b) include both the requirements of the Industrial Emissions Directive (IED) (European Parliament and Council of the European Union, 2010) and the requirements of the Medium Combustion Plant Directive (MCPD) (European Parliament and Council of the European Union, 2015).

2.1.17 The aggregated installation size exceeds the 50 megawatt thermal (MWth) input criteria for Large Combustion Plant (LCP), however there are a number of plant items that can be considered to be Medium Combustion Plant, having a net input above one MWth but below fifty MWth, irrespective of the type of fuel they use. Hence, the requirements of the MCPD would apply to those units. However, as they won't be operated for more than 500 hours per year, they will not be subject to ELVs but will be regulated through Environmental Permits for the installation.

Terminology

2.1.18 The following terminology has been used in this report when assessing the modelled impacts on local air quality:

- Process Contribution (PC): The ground level concentration predicted by the model from emissions contributed by the Installation's activities (i.e. operation of the boilers) alone; and
- Predicted Environmental Concentration (PEC): PC plus the baseline pollutant concentration identified at each modelled receptor location.

2.2 Human Health Significance Criteria

2.2.1 The EA's Risk Assessment for Specific Activities guidance (Environment Agency, 2024) identifies stage one screening criteria for comparison of the PC with AQALs state that an emission may be considered to have an insignificant impact where:

- Short term PC <=10% of the AQAL; and
- Long term PC <=1% of the AQAL.

2.2.2 The second stage of screening considers the PCs in the context of the existing background pollutant concentrations; the PEC is considered acceptable where:

- Short term PC <20% of the short term AQAL minus twice the long-term background concentration; and
- Long term PEC (PC + background concentration) <70% of the AQAL.

2.2.3 The EA's Risk Assessment guidance indicates that where AQALs are likely to be breached as a result of contributions from an installation, or where installation releases constitute a major proportion of the standard or objective, such releases are likely to be considered unacceptable.

2.2.4 Where the PEC is not predicted to exceed the AQAL and the proposed emissions comply with the best available techniques associated emission levels (BAT-AEL), or equivalent requirements, the emissions may be considered acceptable by the EA.

2.3 Ecological Significance Criteria

2.3.1 For ecologically protected sites an assessment is made as to whether the emissions from the Proposed Development are "likely to have a significant effect", and whether this could lead to an "adverse effect on site integrity". Sites within 15 km have been considered in the assessment.

2.3.2 The EA's Risk Assessment guidance screening criteria for significance of the PC have been applied to the outcome of the dispersion modelling for all identified ecological sites. For short-term impacts, where the PC >100% of the EAL, the EA's guidance indicates such an impact would not be acceptable.

3 METHODOLOGY

3.1 Dispersion Model Selection

3.1.1 The assessment of emissions from the Proposed Development has been undertaken using the advanced dispersion model ADMS (version V6), supplied by Cambridge Environmental Research Consultants Limited (CERC). ADMS is a modern dispersion model that has an extensive published validation history for use in the UK. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

3.1.2 The dispersion modelling undertaken for this assessment of emissions from the operational Proposed Development includes:

- modelling of maximum ground-level impacts from normal operation, as well as three emergency and start up scenarios, to evaluate the effect on dispersion; and;
- reporting of impacts at identified human health and sensitive ecological receptors from the combustion plant listed in Table 3-4 and Table 3-5, at their design release heights above ground level.

3.2 Model Inputs

3.2.1 The general model conditions used in the assessment are summarised in Table 3-1-1. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3-1: General ADMS 5 Model Inputs

VARIABLE	INPUT
Surface Roughness at source	0.3 m
Surface Roughness at meteorological site	0.3 m
Receptors	Selected discrete receptors (see Table 3-4, and Table 3-5)
	Nested receptor grid, with variable spacing (see Table 3-6)
Receptor Location	X, Y co-ordinates determined by GIS
	Z = 1.5 m for human health receptors
	Z = 0 m (ground level) for ecological receptors
Source Location	See Table 3-2.
Emissions	Data provided by designer
Sources	See Table 3-3
Meteorological Data	5 years of hourly sequential meteorological data from Durham Tees Valley Airport meteorological station (2018 to 2022)
Terrain Data	Not required
Buildings that may cause building downwash effects	See Table 3-7

Emissions Data

3.2.2 During normal operation, the Auxiliary Boiler stacks would be the primary sources of emissions from both the hydrogen generation processes associated with the Proposed Development.

3.2.3 In addition, there would be a stack associated with the flares (used during normal (pilot and purge) and emergency operations, for phase 1 and 2), two stacks for the Fired Heaters (start-up only, one for each phase) and two stacks for the emergency diesel generators (one for each phase).

3.2.4 The main reported emissions for the Proposed Development have been modelled at a release height of 70 m above finished ground level for the Auxiliary Boilers, with an internal stack diameter of 1.9 m. This release height is based on the results of a previous Stack Height Assessment undertaken as part of the DCO process. It is considered that this represents a conservative assessment, and the higher release height would result in lower impacts at modelled receptor locations. Following the same approach, the Fired Heaters have been modelled at a release height of 35 m above finished ground level for the Auxiliary Boilers, with an internal stack diameter of 0.9 m.

3.2.5 For the flares, effective release heights and equivalent stack diameters have been calculated for each of the operational scenarios. This final release height of 65 m is based on the results of the Stack Height Assessment, as well as consideration of the minimum release height required for safety and design reasons. The release height of 65 m is understood to be the minimum release height and at any increased release height, lower pollutant concentrations would be anticipated.

3.2.6 The physical properties of assessed emission sources, as represented within the model, are shown in Table 3-2 and Table 3-3. The position of the stacks and the buildings included within the model are illustrated in Figure 8-4: Air Quality Study Area – Operation Model Inputs Phase 1 and Figure 8-5: Air Quality Study Area – Operation Model Inputs Phase 2.

Table 3-2: Emissions Inventory per Unit

PARAMETER	UNIT	FIRED HEATER (START-UP)	FLARE (NORMAL OPERATION)	FLARE (EMERGENCY) SCENARIO 1	FLARE (EMERGENCY) SCENARIO 2	FLARE (EMERGENCY) SCENARIO 3	AUXILIARY BOILER (START UP)	AUXILIARY BOILER (NORMAL OPERATION)	EMERGENCY DIESEL GENERATORS
Stack Position	M (Easting, Northing National Grid)	Phase 1 – 456360, 525375 Phase 2 – 456558, 525792	Phase 1 – 456477, 525580 Phase 2 - 456588, 525536	Phase 1 – 456477, 525580 Phase 2 - 456588, 525536			Phase 1 – 456421, 525325 Phase 2 – 456634, 525765	Phase 1 – 456421, 525325 Phase 2 – 456634, 525765	Phase 1 – 456542, 525209 Phase 2 – 456441, 525830
Release Height (above ground level)	m	35	66.4*	99.9*	97.7*	100.6*	70	70	10
Effective internal stack diameter	m	0.9	0.9	11.5	10.8	11.8	1.9	1.9	0.92
Flue temperature	°C	200	1,000	1,000	1,000	1,000	259	155	600
Flue H_2O content	%	18.0	-	0.0045	-	-	-	29.3	-

PARAMETER	UNIT	FIRED HEATER (START-UP)	FLARE (NORMAL OPERATION)	FLARE (EMERGENCY) SCENARIO 1	FLARE (EMERGENCY) SCENARIO 2	FLARE (EMERGENCY) SCENARIO 3	AUXILIARY BOILER (START UP)	AUXILIARY BOILER (NORMAL OPERATION)	EMERGENCY DIESEL GENERATORS
Flue O_2 content (wet)	%	1.6	0	0.05	0.05	0.05	-	1.6	-
Stack gas exit velocity	m/s	16.6	20	20	20	20	16.5	16.1	15.0
Stack flow (actual)	Am^3/s	10.5	1.0	-	-	-	46.7	45.7	10.0
Stack flow (normalised)	kNm^3/hr	18.3	-	-	-	-	61.0	77.5	-

* Effective Stack Height (m)

3.2.7 The modelled pollutant emission rates (in grams per second (g/s)) have been calculated based on normal flow and BAT emission levels (boiler and fired heater), g/kW-hr Tier 2 emission levels (emergency diesel generator) or by mass balance (flares). The emission limits assumed to apply to the Proposed Development are shown in Table 3-3.

3.2.8 The assessment has assumed that the Proposed Development would operate at continuous design load (8,760 hours per year) during normal operation. No time-based variation in emissions have therefore been accounted for within the model.

Table 3-3: Emissions Concentrations and the Assessed Emission Rate per Units

POLLUTANT	UNIT (SOURCE)	FIRED HEATER (START-UP)	FLARE (NORMAL OPERATION)	FLARE (EMERGENCY) SCENARIO 1	FLARE (EMERGENCY) SCENARIO 2	FLARE (EMERGENCY) SCENARIO 3	AUXILIARY BOILER (START UP)	AUXILIARY BOILER (NORMAL OPERATION)	EMERGENCY DIESEL GENERATORS (8.89 MWTH)
Oxides of Nitrogen Long-term	mg/Nm^3 (ELV/BAT)	200	-	-	-	-	100	75	-
Oxides of Nitrogen Short-term	mg/Nm^3 (ELV/BAT)	200	-	-	-	-	100	106.25	-
Carbon monoxide	mg/Nm^3 (ELV/BAT)	100	-	-	-	-	100	-[1]	-
Particulate Matter	mg/Nm^3 (ELV/BAT)	-	-	-	-	-	-[2]	-[2]	-
Ammonia	mg/Nm^3 (ELV/BAT)	-[3]	-	-	-	-	-[3]	3	-
Sulphur Dioxide	mg/Nm^3 (ELV/BAT)	3.9	-	-	-	-	-[2]	-[2]	-
Oxides of Nitrogen	g/kW-hr (Tier 2)	-	-	-	-	-	-	-	6.4
Carbon monoxide	g/kW-hr (Tier 2)	-	-	-	-	-	-	-	3.5

POLLUTANT	UNIT (SOURCE)	FIRED HEATER (START-UP)	FLARE (NORMAL OPERATION)	FLARE (EMERGENCY) SCENARIO 1	FLARE (EMERGENCY) SCENARIO 2	FLARE (EMERGENCY) SCENARIO 3	AUXILIARY BOILER (START UP)	AUXILIARY BOILER (NORMAL OPERATION)	EMERGENCY DIESEL GENERATORS (8.89 MWTH)
Particulate Matter	g/kW-hr (Tier 2)	-	-	-	-	-	-	-	0.2
Oxides of Nitrogen Long-term	g/s	1.02	0.010	21.97	19.23	23.00	1.69	1.61	5.51
Oxides of Nitrogen Short-term	g/s	1.02	-	21.97	19.23	23.00	1.69	2.29	5.51
Carbon monoxide	g/s	0.51	0.048	100.17	87.66	104.85	1.69	-	3.01
Particulate Matter	g/s	-	0.0009[4]	8.72	7.63	9.13	-	-	0.17
Ammonia	g/s	-	-	-	-	-	-	0.0646	-
Sulphur Dioxide	g/s	0.02	-	-	-	-	-	-	-

[1] Negligible emissions from Hydrogen. [2] Negligible emissions from Hydrogen/Natural gas. [3] No SCR at start up. [4] Negligible emissions

3.3 Modelled Domain

Sensitive Human Receptors

3.3.1 The modelling has predicted concentrations of the modelled pollutants relevant to human health at discrete air quality sensitive receptors, as listed in Table 3-4. The locations of these receptors are also shown in Figure 8-1: Air Quality Study Area Human Health Receptors and Monitoring (ES Volume II, EN070009/APP/6.3). The receptors are selected to be representative of residential dwellings, recreational areas, and schools in the area around the Proposed Development (OR = Operational Receptor).

Table 3-4: Human Receptor Locations

RECEPTOR REFERENCE	RECEPTOR DESCRIPTION	GRID REFERENCE		DISTANCE AND DIRECTION FROM THE OPERATIONAL SITE STACKS
		X	Y	
O1	Marsh Farm House, Warrenby Road, Coatham, Redcar	457950	525045	1.3 km east
O2	Cleveland Golf Links, Coatham, Redcar	458090	525550	1.2 km east
O3	South Gare Fishermans Association, Redcar	455680	527395	1.3 km north
O4	Marine Club, Redcar	455550	527345	1.3 km north
O5	Tingdene Beach Caravan Park, Coatham, Redcar	458675	525415	1.8 km east
O6	120 Broadway W, Dormanstown, Redcar	457895	523735	1.8 km south-east
O7	68 York Rd, Coatham, Redcar	458900	525060	2.2 km east
O8	Dormanstown Primary Academy, Redcar	458250	523585	2.2 km south-east
O9	Coatham Church of England School, Coatham, Redcar	459195	524980	2.5 km east

Sensitive Ecological Receptors

3.3.2 In accordance with the Environment Agency's air emissions risk assessment guidance (Defra and Environment Agency, 2016, as updated in 2023), the impacts associated with emissions from the Proposed Development on statutory sensitive ecological sites have been quantified. The Study Area for the operational Proposed

Development point source emissions extends up to 15 km from the emission sources to assess the potential impacts on ecological receptors (including internationally and locally designated sites). This is in line with the Environment Agency Risk Assessment Methodology (Defra and Environment Agency, 2016, as updated in 2023) but also includes additional sites requested by the Proposed Development biodiversity specialists. Further details of the sites considered within 15 km is provided below.

3.3.3 The assessment considers European designated sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites) and Sites of Special Scientific Interest (SSSIs) within 15 km of the operational Proposed Development, as recommended by the EA's risk assessment guidance for "large emitters" (Defra and Environment Agency, 2016, as updated in 2023). The most notable of these sites is the Teesmouth and Cleveland Coast Ramsar, SPA and SSSI, which is adjacent to the Proposed Development site.

3.3.4 In addition, LWSs within 2 km of the Proposed Development have been included in the assessment.

3.3.5 Ground-level concentrations of the modelled pollutants relevant to sensitive ecological receptors have been predicted at locations listed in Table 3-5 and the locations of these receptors are shown in Figure 8-2: Air Quality Study Area Ecological Receptors (ES Volume II, EN070009/APP/6.3). The location reported for each ecological receptor is informed by the pattern of dispersion from the Proposed Development Main Site. In some instances, particularly for designated sites close to the Main Site, more than one receptor has been selected to provide an average for each type of designation (i.e. Ramsar, SPA, SSSI, NNR). Because some types of designation overlap in part of the same site more than receptor is sometimes presented (i.e. the Teesmouth and Cleveland Coast is a Ramsar, SPA and SSSI but the area covering the Ramsar is smaller than the one covering the SSSI for example).

Table 3-5: Ecological Receptor Locations

RECEPTOR IDENTIFICATION	ECOLOGY SITE	GRID REFERENCE (X, Y)		DISTANCE AND DIRECTION FROM THE MAIN SITE
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	457283*	526000*	150 m north
OE2	Teesmouth and Cleveland Coast SPA, SSSI	456300*	526098*	0 m adjacent north
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	457860*	524991*	1.2 km east
OE4	Eston Pumping Station LWS	456474*	523797*	1 km south
OE5	Teesmouth NNR	454525*	527129*	1.78 km north-west

RECEPTOR IDENTIFICATION	ECOLOGY SITE	GRID REFERENCE (X, Y)		DISTANCE AND DIRECTION FROM THE MAIN SITE
OE6	Teesmouth and Cleveland Coast SSSI	455835*	526155*	0 m adjacent north
OE7	North York Moors SPA and SSSI	462481	513981	12.5 km south-east
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	448225	537450	13.6 km north-west
OE9	Cliff Ridge SSSI	457283	511718	13.2 km south
OE10	Durham Coast SSSI and Durham Coast NNR	448796	536560	12.6 km north-west
OE11	Durham Coast SSSI	449483	536169	12 km north-west
OE12	Hart Bog SSSI	445293	535376	14.3 km north-west
OE13	Langbaurgh Ridge SSSI	455524	512382	12.5 km south
OE14	Lovell Hill Pools SSSI	459643	519105	6.6 km south
OE15	Roseberry Topping SSSI	457878	512782	12.2 km south
OE16	Saltburn Gill SSSI	467005	521269	11 km south-east

**Coordinates for the closest point to the Main Site; results presented throughout this report and associated annexes are of the maximum impact anywhere within each site, so exact coordinates can vary.*

Modelled Domain – Receptor Grid

3.3.6 Emissions from the Proposed Development have also been modelled on a receptor grid of variable spacing to determine the location and magnitude of maximum ground level impacts.

3.3.7 The dispersion model output has been reported at specific receptors and as a nested grid of values. The inner grid extends 2,000 m at a resolution of 25 m x 25 m. The middle grid extends from 2,000 m to 5,000 m at a resolution of 100 m x 100 m. The outer grid extends from 5,000 m to 10,000 m at a resolution of 500 m x 500 m. Details of the receptor grid are summarised in Table 3-6.

Table 3-6: Modelled Domain, Receptor Grid

GRID SPACING (M)	DIMENSIONS (KM)	NUMBER OF NODES IN EACH DIRECTION	NATIONAL GRID REFERENCE OF SOUTH-WEST CORNER
25	4x4	161	454461, 523665
100	10x10	101	451461, 520665

GRID SPACING (M)	DIMENSIONS (KM)	NUMBER OF NODES IN EACH DIRECTION	NATIONAL GRID REFERENCE OF SOUTH-WEST CORNER
500	20x20	41	446461, 515665

3.4 Meteorological Data

3.4.1 Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that will be modelled. This is achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.

3.4.2 The meteorological site that was selected for the assessment is Durham Tees Valley Airport, located approximately 22 km south-west of the Proposed Development Site, at a flat airfield in a principally agricultural area, and therefore a surface roughness of 0.3 m (representative of an agricultural area) has been selected for the meteorological site within the model.

3.4.3 The modelling for this assessment has utilised 5 years of meteorological data for the period 2018 to 2022. Wind roses for each of the years within this period are shown in Plate 1.

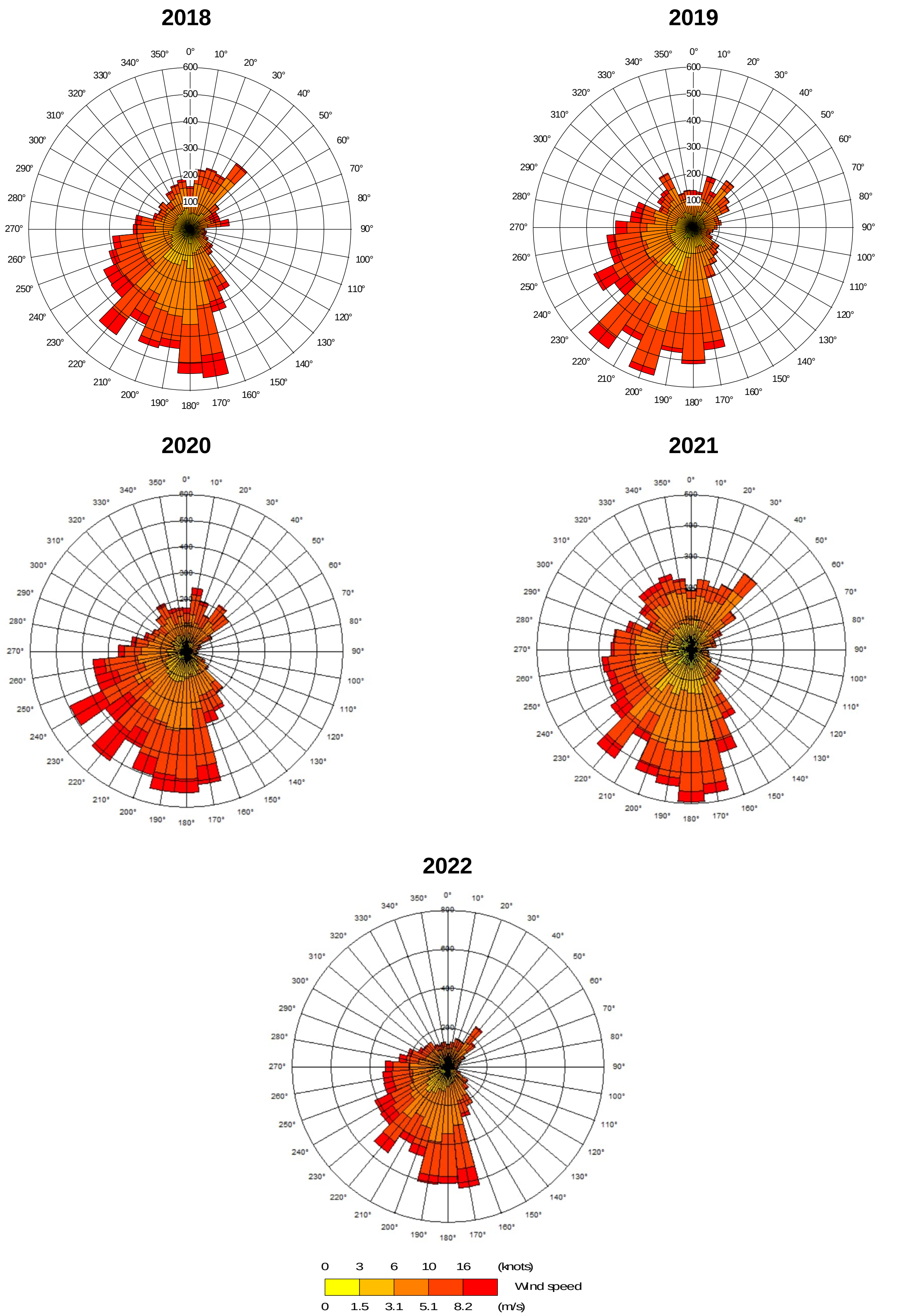

Plate 1: Windroses for Durham Tees Valley Airport Meteorological Station, 2018 to 2022

3.5 Building Downwash Effects

3.5.1 The buildings that make up the Proposed Development have the potential to affect the dispersion of emissions from the operational process stack. The ADMS buildings effect module has therefore been used to incorporate building downwash effects as part of the model set up. Buildings greater than one third of the range of stack heights modelled have been included within the modelling assessment as these are determined effective buildings. An approximation is made based on Equation 1 and referenced in ADMS 6 User guide (CERC, 2023), where any buildings of height, H_i, less than a fraction 1 / α of the source height are excluded.

Equation 1: Determination of the 'effective building'

$$\alpha = 1 + 2\min(1, \frac{W_i}{H_i})$$

where W_i is the crosswind width of the building i.

3.5.2 The modelled locations are shown in Table 3-7 and a plan showing the building layout used in the ADMS simulation is illustrated in Figure 8-4: Air Quality Study Area – Operation Model Inputs Phase 1 and Figure 8-5: Air Quality Study Area – Operation Model Inputs Phase 2. The dimensions of the buildings are indicative of the likely layout that could potentially be required.

Table 3-7: Buildings Incorporated into the Modelling Assessment

BUILDING MODEL ID	BUILDING CENTRE GRID REFERENCE (X, Y)	HEIGHT (m)	LENGTH (m)	WIDTH (m)	ANGLE (°)
Tank2P2	456592, 525846	22	15	15	112
Tank1P2	456571, 525855	22	15	15	112
ASU_P2	456516, 525951	40	85	57	112
VAU121-A_P1_AuxBoilerandBFWP1	456421, 525323	15	35	15	112
DV113-B	456596, 525687	52	6	6	112
PAU110-A_P2	456591, 525824	15	20	18	112
PAU110-A_P1	456398, 525298	15	20	18	112
VAU115-A	456513, 525672	25	50	26	112
VAU121-A_P2	456635, 525767	15	35	15	112
PAU122-A_P2	456606, 525776	20	12	20	112
PAU122-A_P1	456419, 525348	20	12	20	112
Compressor shelter H2 storage P2	456584, 525628	15	17	37	112

BUILDING MODEL ID	BUILDING CENTRE GRID REFERENCE (X, Y)	HEIGHT (m)	LENGTH (m)	WIDTH (m)	ANGLE (°)
Compressor Shelter H2 storage P1	456506, 525470	15	17	37	112
Raw water treatment P2	456717, 525779	20	53	17	112
Raw water treatment P1	456278, 525322	20	17	53	112
Demin Water plant package P2	456631, 525807	15	38	24	112
Demin Water plant package P1	456299, 525241	15	38	24	112
Cooling water unit P1	456273, 525408	17	32	32	112
Cooling water unit P2	456458, 525786	17	32	32	112
DV111-A_P1	456374, 525360	31	6	6	112
DV111-A_P2	456578, 525793	31	6	6	112
PAU112_P2	456543, 525717	19	27	35	112
VAU111-A_SUB_U1_P2	456557, 525752	32	27	33	112
PAU112_P1	456401, 525440	19	27	35	112
GHR_ATR_AnalyserP1	456387, 525405	23	27	33	112

P1 – Phase 1, P2 – Phase 2

3.5.3 The immediate local area downwind (north-east) of the Proposed Development is flat and undeveloped land followed by the coast and the North Sea. Upwind (south-west) of the Proposed Development Site is dominated by industrial land uses and is relatively flat. The Main Site is adjacent to the River Tees Estuary to the west. A surface roughness of 0.3 m, corresponding to the predominant terrain type, has therefore been selected to represent the local terrain.

3.5.4 Site-specific terrain data has not been used in the model, as there are no potentially significant changes in gradient within the Study Area.

3.6 NO_x to NO_2 Conversion

3.6.1 Emissions of nitrogen oxides from industrial point sources are typically dominated by nitric oxide, with emissions from combustion sources typically in the ratio of nitric oxide to nitrogen dioxide of 9:1. However, it is nitrogen dioxide that has specified environmental standards due to its potential impact on human health. In the ambient air, nitric oxide is oxidised to nitrogen dioxide by the ozone present, and the rate of oxidation is dependent on the relative concentrations of nitric oxide and ozone in the ambient air.

3.6.2 For the purposes of detailed modelling, and in accordance with Environment Agency technical guidance (Defra and Environment Agency, 2016, as updated in 2023) it is assumed that 70% of nitric oxide emitted from the stack is oxidised to nitrogen dioxide in the long term and 35% of the emitted nitric oxide is oxidised to nitrogen dioxide in the local vicinity of the site in the short-term.

3.7 Calculation of Deposition at Sensitive Ecological Receptors

3.7.1 The deposition of nutrient nitrogen and acid at sensitive ecological receptors has been calculated, using the modelled process contribution predicted at the receptor points. The deposition rates are determined using conversion rates and factors contained within Environment Agency guidance (Air Quality Advisory Group, 2014), which account for variations deposition mechanisms in different types of habitats.

3.7.2 The conversion rates and factors used in the assessment are detailed in Table 3-8 and Table 3-9.

Table 3-8: Conversion Factors – Calculation of Nutrient Nitrogen Deposition

POLLUTANT	DEPOSITION VELOCITY GRASSLAND (m/s)	DEPOSITION VELOCITY WOODLAND (m/s)	CONVERSION FACTOR (µg/m^3/s to keq/ha/yr)
NOx as NO_2	0.0015	0.003	96
NH_3	0.02	0.03	259.7

Table 3-9: Conversion Factors – Calculation of Acid Deposition

POLLUTANT	DEPOSITION VELOCITY GRASSLAND (m/s)	DEPOSITION VELOCITY WOODLAND (m/s)	CONVERSION FACTOR (µg/m^3/s to keq/ha/yr)
SO_2	0.012	0.024	9.86
NO_2	0.0015	0.003	6.85

3.8 Specialised Model Treatments

3.8.1 Emissions have been modelled such that they are not subject to dry and wet deposition or depleted through chemical reactions. The assumption of continuity of mass is likely to result in an over-estimation of impacts at receptors, and therefore is considered to be conservative.

4 BASELINE AIR QUALITY

4.1 Overview

4.1.1 This section presents the information used to evaluate the background and baseline ambient air quality in the area surrounding the Proposed Development. The following steps have been taken in the determination of background values. Where appropriate, the study focuses on data gathered in the vicinity of the site:

- identification of Air Quality Management Areas;
- review of Redcar and Cleveland Borough Council (RCBC) ambient monitoring data (RCBC, 2024);
- review of data from Defra's background mapping database (Defra, 2020);
- AECOM monitoring undertaken in the area around the Site; and
- review of background data and site relevant critical loads from the Air Pollution Information System (APIS) website.

4.2 Air Quality Management Areas

4.2.1 RCBC, Hartlepool Borough Council and Stockton on Tees Borough Council (STBC) have not declared any AQMAs within their administrative area, and there are no AQMAs declared by other Local Authorities within the Study Area.

4.3 Local Authority Ambient NO_x and NO_2 Monitoring Data

Redcar And Cleveland Borough Council

4.3.1 RCBC currently operate one automatic monitoring site, located at Dormanstown Primary School, approximately 1.5 km to the south-east of the operational Proposed Development. The site was chosen to monitor roadside and industrial emissions. Data for 2023 was available at the time of writing with annual concentrations of NO_2, PM_{10} and $PM_{2.5}$ of 9 µg/m^3, 10 µg/m^3, and 7 µg/m^3 respectively.

4.3.2 In addition, NO_2 diffusion tube monitoring is carried out at 14 locations within the borough. The nearest NO_2 diffusion tubes are again located at Dormanstown Primary School (R17, R18, R19). At the time of writing, the most recent monitoring data available from RCBC diffusion tube monitoring is for 2022 and the average measured annual NO_2 concentration was 11.6 µg/m^3.

4.3.3 All monitoring locations within the Study Area are below the annual mean NO_2 objective of 40 µg/m^3 in 2022.

4.4 Defra Background Data

4.4.1 Defra's 2018-based background maps are available at a 1x1 km resolution for the UK for the year 2018 and are projected forward to the year 2030. These projections of pollution concentrations across England are available for NO_2, PM_{10}, $PM_{2.5}$ and NO_x.

4.4.2 Background concentrations from the Defra 2018-based background maps are presented for the year 2018 in Table 4-1 taken for the grid square in which the operational Proposed Development is located (456500, 525500) for NO_x and NO_2. Background concentrations for CO are not available for the most recent Defra maps, but data for 2001-based background concentrations are available and this has been adjusted for 2018 using the Defra published year adjustment factors. Background concentrations for SO_2 are not available from Defra maps but available on APIS for 2020 (2019 to 2021 average).

4.4.3 Data for 2018 has been presented, as the typical trend shown in the Defra background mapping is that over the projected time period, concentrations of NO_2 and NO_x are shown to be decreasing. This corresponds to a reduction overtime of vehicle emissions as newer, cleaner vehicles replace older ones. Therefore, assuming no reduction occurs until the opening year of the Proposed Development (2030, is considered to represent a conservative approach.

4.4.4 A review of the background map concentrations over the Study Area for human health receptors shows that the concentration presented in Table 4-1 for the Site location is also representative of the background concentrations at the receptor locations (the average NO_2 concentration in the grid squares with identified receptors was 12.8 µg/m^3).

Table 4-1: 2022 DEFRA Background Concentrations (NGR 456500, 525500)

POLLUTANT	BACKGROUND CONCENTRATION (µg/m^3)
NO_2	13.3
PM_{10}	9.6
$PM_{2.5}$	6.3
CO	110.9
SO_2	2.02

4.5 AECOM Monitoring Data

4.5.1 A three month diffusion tube monitoring survey of the Study Area commenced in July 2022, in order to gather data on the ambient concentrations of NO_2 at representative human health and ecological receptor locations. The data collected relevant to the Operational assessment are shown in Table 4-2.

4.5.2 A second survey was conducted for three months in 2023, from mid-June to mid-September, to confirm the air quality in the area had not changed substantially since the initial survey. Results show the NO_2 concentration in the area have been relatively stable and are presented in Annex C.

Table 4-2: AECOM Nitrogen Dioxide Diffusion Tube Monitoring

SITE ID	MONITORING LOCATION	GRID REFERENCE		2022 ANNUAL MEAN CONCETRATION (µg/m^3)
		X	Y	
DT1	A1085, west of West Coatham Lane	457402	523655	24.0
DT2	A1085, east of West Coatham Lane	457668	523958	35.8
DT3	Teesmouth and Cleveland Coast SSSI, south of Warrenby	459008	524872	14.7

SITE ID	MONITORING LOCATION	GRID REFERENCE		2022 ANNUAL MEAN CONCETRATION ($\mu g/m^3$)
		X	Y	
DT4	A1085, east of Grangetown	455455	520617	16.9
DT5	A1053, south of junction with A66	455431	520975	17.6
DT6	A1085, north of junction with A1053	455949	521326	40.1
DT7	Junction of Eston Road/A174	457131	519556	24.0
DT8	High Street, Old Lackenby	456466	519123	17.6
DT9	Woodlands Road, Normanby	455100	517473	13.0
DT10	Springhill, Ormesby	453905	517394	9.9
DT11	Mosedale Road, Grangetown	455488	519463	11.7
DT12	Lilac Cloase, Lazenby	457237	519877	9.2
DT13	South Avenue, Dormanstown	458147	523551	15.5
DT14	Seaton Common Road, Seaton Carew	453310	528182	11.9
DT15	South Gare Access Road	457341	525680	16.9
DT16	South Gare Access Road	456650	525953	15.2
DT17	South Gare Access Road	456323	526112	16.3
DT18	A1046/Port clarence Road, Port Clarence	449399	522028	20.7
DT19	Limetrees Close, High Clarence	449091	522434	13.3
DT20	A178/Seaton Carew Road	450821	525066	15.5
DT21	A1046/Port clarence Road, Port Clarence	449943	521663	20.4

4.5.3 The diffusion tube data suggests that the urban background monitoring sites have comparable or lower NO_2 concentrations that the Defra data, and therefore it was considered appropriate to use the Defra data for the assessment, as a worst case.

4.6 Ecological Site Background Data

4.6.1 The NO_x concentrations are available from the APIS website for designated SAC, SPA and SSSI sites. The average concentrations present at the relevant habitat receptor sites are presented in Table 4-4.

Table 4-3: APIS Background Data NO_x

RECEPTOR ID	ECOLOGY SITE	BACKGROUND NO_x (µg/m^3)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	16.5
OE2	Teesmouth and Cleveland Coast SPA, SSSI	17.0
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	20.9
OE4	Eston Pumping Station LWS	18.3
OE5	Teesmouth NNR	21.2
OE6	Teesmouth and Cleveland Coast SSSI	20.7
OE7	North York Moors SPA and SSSI	6.6
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	7.0
OE9	Cliff Ridge SSSI	6.6
OE10	Durham Coast SSSI and Durham Coast NNR	7.9
OE11	Durham Coast SSSI	8.0
OE12	Hart Bog SSSI	8.1
OE13	Langbaurgh Ridge SSSI	7.1
OE14	Lovell Hill Pools SSSI	9.6
OE15	Roseberry Topping SSSI	6.8
OE16	Saltburn Gill SSSI	8.9

4.6.2 In addition, the APIS website provides information on the relevant critical loads for the assessment of depositional impacts, as well as background nitrogen deposition and acid deposition load. This data has been presented in Table 4-4.

Table 4-4: APIS Background Deposition Information

RECEPTOR ID	ECOLOGY SITE	N-DEPOSITION	ACID DEPOSITION	
		(KG N/HA/YR)	(KEQ N/HA/YR)	(KEQ S/HA/YR)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	12.66	0.78	0.22
OE2	Teesmouth and Cleveland Coast SPA, SSSI	12.66	0.78	0.22

RECEPTOR ID	ECOLOGY SITE	N-DEPOSITION	ACID DEPOSITION	
		(KG N/HA/YR)	(KEQ N/HA/YR)	(KEQ S/HA/YR)
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	12.62	0.7	0.19
OE4	Eston Pumping Station LWS	12.95	0.71	0.2
OE5	Teesmouth NNR	13.75	0.82	0.29
OE6	Teesmouth and Cleveland Coast SSSI	12.66	0.78	0.22
OE7	North York Moors SPA and SSSI	16.9	1.09	0.17
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	12.62	0.66	0.18
OE9	Cliff Ridge SSSI	12.62	0.66	0.18
OE10	Durham Coast SSSI and Durham Coast NNR	12.62	0.66	0.18
OE11	Durham Coast SSSI	14.04	0.65	0.17
OE12	Hart Bog SSSI	14.51	N/A	N/A
OE13	Langbaurgh Ridge SSSI	20.19	0.67	0.14
OE14	Lovell Hill Pools SSSI	12.66	0.78	0.22
OE15	Roseberry Topping SSSI	12.66	0.78	0.22
OE16	Saltburn Gill SSSI	12.62	0.7	0.19

4.7 Summary of Background Air Quality

4.7.1 For human health receptors, the background concentrations for NO_2 and CO have been taken from the Defra background mapping, as presented in Table 4-1. Although the diffusion tube data for Dormanstown indicates slightly higher NO_2 concentrations compared to the Defra background maps, it is considered that as the Defra data and the automatic monitoring data at the same location show good correlation, this is most appropriate for use in the assessment.

4.7.2 The background NO_x for ecological receptors were sourced from APIS using the specific location for the relevant ecological receptor, as detailed in Table 4-3.

4.7.3 Where no short-term concentrations are available, short-term background concentrations have been calculated by multiplying the selected annual mean background concentration by a factor of two, in accordance with the Environment

Agency Risk Assessment methodology (Defra and Environment Agency, 2016, as updated in 2023).

4.7.4 To represent a conservative approach, it has been assumed that background concentrations would not decrease in future years. Therefore, the current background concentrations have been assumed to apply to the projected opening year of 2030.

5 ASSESSMENT OF LIMITATIONS AND ASSUMPTIONS

5.1.1 This section outlines the potential limitations associated with the dispersion modelling assessment. Where assumptions have been made, this is also detailed here.

5.1.2 The greatest uncertainty associated with any dispersion modelling assessment arises through the inherent uncertainty of the dispersion modelling process itself. Nevertheless, the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from industrial sources.

5.1.3 To minimise the likelihood of under-estimating the PC to ground level concentrations from the main stack, the following conservative assumptions have been made within the assessment:

- the operational Proposed Development has been assumed to operate on a continuous basis i.e., for 8,760 hour per year, although in practice the Hydrogen Production Facility would require routine maintenance periods;
- the modelling predictions are based on the use of five full years of meteorological data from Durham Tees Valley Airport meteorological station for the years 2018 to 2022 inclusive, with the highest result being reported for all years assessed; This is considered to be conservative;
- the modelling is based on the current layout available; it is not proportionate to sensitivity test all the different building locations. The effect of buildings on pollutant dispersal is greatest in the immediate area within the site. It is considered unlikely that alterations to building layouts would notably change offsite operational predictions of pollutant contributions; and
- emission concentrations for the process are calculated based on the use of IED limits, Best Available Techniques Achievable Emission Limits (BAT-AEL) concentrations, or maximum envisaged emission rates from licensors; in practice annual average rates would be below this to enable continued compliance with environmental permit requirements.

5.1.4 The following assumption has been made in the preparation of the assessment:

- 70% NO_x to NO_2 conversion rate has been assumed in predicting the long-term process contribution, and 35% for the short-term process contribution respectively.

6 OPERATIONAL EMISSIONS MODELLING RESULTS

6.1 Human Health Receptor Results

Nitrogen Dioxide Emissions

6.1.1 The predicted change in annual mean NO_2 concentrations that would occur during the operation of the Proposed Development, at the identified human health receptors and at the offsite maximum are presented in Table 6-1. Any variations in the addition of the change to the baseline concentrations are due to rounding only.

6.1.2 The maximum predicted annual mean NO_2 concentration that occurs anywhere within the Study Area as a result of the Proposed Development is 0.2 µg/m^3, and this occurs at close to the northern boundary of the site, within the dunes of the Teesmouth and Cleveland Coast SSSI, SPA and Ramsar site. The annual mean NO_2 predicted environmental concentration (i.e. the process contribution, existing background concentration and the process contributions of other committed developments) is 14.9 µg/m^3 and therefore is below the annual mean NO_2 AQAL of 40 µg/m^3.

6.1.3 The discrete receptor most affected by long term emissions from the Proposed Development is receptor O2, at Saltview Terrace, Stockton-on-Tees, Middlebrough TS2 1SQ, with a predicted annual mean NO_2 concentration as a result of the Proposed Development of 0.1 µg/m^3, representing 0.2% of the AQAL.

6.1.4 The impact from the normal operation of the Proposed Development is not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the long-term PC is less than 1% of the AQAL.

Table 6-1: Predicted Change in Annual Mean NO_2 Concentrations – Normal Operation

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	40	0.1	0.1%	13.3	14.2	14.3	35.7%
O2	40	0.1	0.2%	13.3	14.4	14.4	36.1%
O3	40	0.1	0.2%	13.3	14.6	14.6	36.6%
O4	40	0.1	0.1%	13.3	14.4	14.5	36.2%
O5	40	0.1	0.1%	13.3	14.2	14.3	35.7%
O6	40	<0.1	0.1%	13.3	14.4	14.4	36.0%
O7	40	<0.1	0.1%	13.3	14.1	14.1	35.4%
O8	40	<0.1	0.1%	13.3	14.3	14.3	35.8%
O9	40	<0.1	0.1%	13.3	14.1	14.1	35.2%
Maximum anywhere offsite	40	0.2	0.6%	13.3	14.6	14.9	37.2%

PC = Process Contribution, AQAL = Air Quality Assessment Level, BC = Background Concentration, PEC = Predicted Environmental Concentration

6.1.5 The predicted change in hourly mean NO_2 concentrations (as the 99.79th percentile of hourly averages) that would occur during the operation of the Proposed Development, at the identified human health receptors and at the offsite maximum are presented in Table 6-2.

6.1.6 The maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during normal operation that occurs anywhere within the Study Area as a result of the Proposed Development is 3.1 µg/m^3, and this occurs again just to the north of the Proposed Development. The predicted environmental concentration (i.e., the process contribution, the existing background concentration and the process contribution from other committed developments) is 32.1 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.7 During the Start Up Scenario 1, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area (2 km) as a result of the Proposed Development is 9.7 µg/m^3, and this occurs to the north of the Proposed Development. The predicted environmental concentration (i.e., the process contribution the existing background concentration and the process contribution from other committed developments) is 38.7 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.8 During the Start Up Scenario 2, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area (2 km) as a result of the Proposed Development is 9.2 µg/m^3, and this occurs to the north of the Proposed Development. The predicted environmental concentration (i.e., the process contribution the existing background concentration and the process contribution from other committed developments) is 38.2 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.9 During the Start Up Scenario 3, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area (2 km) as a result of the Proposed Development is 9.7 µg/m^3, and this occurs to the north of the Proposed Development. The predicted environmental concentration (i.e., the process contribution the existing background concentration and the process contribution from other committed developments) is 38.7 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.10 During the Emergency Scenario 1, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area as a result of the Proposed Development is 87.7 µg/m^3, and this occurs to the north of the operational Proposed Development. The predicted environmental concentration (i.e., the process contribution, the existing background concentration and the process contribution from other committed developments) is 116.8 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.11 During the Emergency Scenario 2, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area as a result of the Proposed Development is 78.2 µg/m^3, and this occurs to the north of the operational Proposed Development. The predicted environmental concentration (i.e., the process contribution, the existing background concentration and the process contribution from other committed developments) is 107.2 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.12 During the Emergency Scenario 3, the maximum predicted hourly mean NO_2 concentration (as the 99.79th percentile of hourly averages) during that occurs anywhere within the Study Area as a result of the Proposed Development is 78.2 µg/m^3, and this occurs to the north of the operational Proposed Development. The predicted environmental concentration (i.e., the process contribution, the existing background concentration and the process contribution from other committed developments) is 107.2 µg/m^3 and therefore is well below the hourly mean NO_2 AQAL of 200 µg/m^3.

6.1.13 The discrete receptor most affected by short term emissions from the Proposed Development is receptor O2, at Saltview Terrace, Stockton-on-Tees, Middlebrough TS2 1SQ, with a predicted hourly mean NO_2 Process Contribution as a result of the Proposed Development of 1.0 µg/m^3, and a PEC of 32.2 µg/m^3 during normal operation.

6.1.14 NO_2 emissions from the Proposed Development are therefore not predicted to lead to a risk of the hourly mean air quality standard being exceeded anywhere within the Study Area.

6.1.15 The impact from the normal, start up and emergency operation of the Proposed Development is not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the short term PC is less than 10% of the AQAL at all sensitive receptors.

6.1.16 At the place of maximum impact, impacts from the normal and start-up operation of the Proposed Development are not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the short-term PC is less than 10% of the AQAL. During emergency, the impacts could exceed 10% of the AQAL but as they remain below 100% of the AQAL and would not occur at a location where the public is regularly present, emissions can be considered to have an insignificant impact.

Table 6-2: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Normal Operation

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	200	0.9	0.5%	26.6	31.3	32.2	16.1%
O2	200	1.0	0.5%	26.6	31.4	32.3	16.2%
O3	200	1.0	0.5%	26.6	33.0	34.0	17.0%
O4	200	0.9	0.5%	26.6	32.5	33.5	16.7%
O5	200	0.8	0.4%	26.6	30.8	31.6	15.8%
O6	200	0.7	0.4%	26.6	30.2	30.9	15.5%
O7	200	0.7	0.3%	26.6	30.6	31.3	15.6%
O8	200	0.7	0.3%	26.6	30.1	30.8	15.4%
O9	200	0.7	0.3%	26.6	30.1	30.8	15.4%
Maximum anywhere offsite	200	3.1	1.5%	26.6	29.0	32.1	16.1%

Table 6-3: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Start Up Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	200	2.0	1.0%	26.6	31.3	33.3	16.6%
O2	200	2.2	1.1%	26.6	31.4	33.6	16.8%
O3	200	2.0	1.0%	26.6	33.0	35.0	17.5%
O4	200	1.9	0.9%	26.6	32.5	34.4	17.2%
O5	200	2.0	1.0%	26.6	30.8	32.8	16.4%
O6	200	1.6	0.8%	26.6	30.2	31.7	15.9%
O7	200	1.8	0.9%	26.6	30.6	32.3	16.2%
O8	200	1.5	0.7%	26.6	30.1	31.6	15.8%
O9	200	1.7	0.8%	26.6	30.1	31.8	15.9%
Maximum anywhere offsite	200	9.7	4.8%	26.6	29.0	38.7	19.4%

Table 6-4: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Start Up Scenario 2

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	200	2.0	1.0%	26.6	31.3	33.3	16.6%
O2	200	2.2	1.1%	26.6	31.4	33.5	16.8%
O3	200	2.0	1.0%	26.6	33.0	34.9	17.5%
O4	200	1.9	0.9%	26.6	32.5	34.4	17.2%
O5	200	2.0	1.0%	26.6	30.8	32.8	16.4%
O6	200	1.6	0.8%	26.6	30.2	31.7	15.9%
O7	200	1.7	0.9%	26.6	30.6	32.3	16.2%
O8	200	1.5	0.7%	26.6	30.1	31.6	15.8%
O9	200	1.6	0.8%	26.6	30.1	31.7	15.9%
Maximum anywhere offsite	200	9.2	4.6%	26.6	29.0	38.2	19.1%

Table 6-5: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Start Up Scenario 3

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	200	2.0	1.0%	26.6	31.3	33.3	16.6%
O2	200	2.2	1.1%	26.6	31.4	33.6	16.8%
O3	200	2.0	1.0%	26.6	33.0	35.0	17.5%
O4	200	1.9	0.9%	26.6	32.5	34.4	17.2%
O5	200	2.0	1.0%	26.6	30.8	32.8	16.4%
O6	200	1.6	0.8%	26.6	30.2	31.7	15.9%
O7	200	1.8	0.9%	26.6	30.6	32.4	16.2%
O8	200	1.5	0.7%	26.6	30.1	31.6	15.8%
O9	200	1.6	0.8%	26.6	30.1	31.7	15.9%
Maximum anywhere offsite	200	9.7	4.8%	26.6	29.0	38.7	19.4%

Table 6-6: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Emergency Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	200	9.7	4.9%	26.6	31.3	41.0	20.5%
O2	200	7.7	3.8%	26.6	31.4	39.0	19.5%
O3	200	12.5	6.2%	26.6	33.0	45.5	22.7%
O4	200	12.2	6.1%	26.6	32.5	44.7	22.4%
O5	200	6.2	3.1%	26.6	30.8	37.0	18.5%
O6	200	9.4	4.7%	26.6	30.2	39.6	19.8%
O7	200	5.7	2.9%	26.6	30.6	36.3	18.2%
O8	200	7.4	3.7%	26.6	30.1	37.5	18.8%
O9	200	5.4	2.7%	26.6	30.1	35.5	17.8%
Maximum anywhere offsite	200	87.7	43.9%	26.6	29.0	116.8	58.4%

Table 6-7: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Emergency Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	200	9.7	4.9%	26.6	31.3	41.0	20.5%
O2	200	7.7	3.8%	26.6	31.4	39.0	19.5%
O3	200	12.5	6.2%	26.6	33.0	45.5	22.7%
O4	200	12.2	6.1%	26.6	32.5	44.7	22.4%
O5	200	6.2	3.1%	26.6	30.8	37.0	18.5%
O6	200	9.4	4.7%	26.6	30.2	39.6	19.8%
O7	200	5.7	2.9%	26.6	30.6	36.3	18.2%
O8	200	7.4	3.7%	26.6	30.1	37.5	18.8%
O9	200	5.4	2.7%	26.6	30.1	35.5	17.8%
Maximum anywhere offsite	200	78.2	39.1%	26.6	29.0	107.2	53.6%

Table 6-8: Predicted Change in Hourly Mean NO_2 Concentrations (as the 99.79th Percentile of Hourly Averages) – Emergency Scenario 3

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	200	9.7	4.9%	26.6	31.3	41.0	20.5%
O2	200	7.7	3.8%	26.6	31.4	39.0	19.5%
O3	200	12.5	6.2%	26.6	33.0	45.5	22.7%
O4	200	12.2	6.1%	26.6	32.5	44.7	22.4%
O5	200	6.2	3.1%	26.6	30.8	37.0	18.5%
O6	200	9.4	4.7%	26.6	30.2	39.6	19.8%
O7	200	5.7	2.9%	26.6	30.6	36.3	18.2%
O8	200	7.4	3.7%	26.6	30.1	37.5	18.8%
O9	200	5.4	2.7%	26.6	30.1	35.5	17.8%
Maximum anywhere offsite	200	78.2	39.1%	26.6	29.0	107.2	53.6%

Carbon Monoxide Emissions

6.1.17 The predicted change in the maximum eight hour rolling mean CO concentrations that would occur during the operation of the Proposed Development, at the identified human health receptors and at the offsite maximum are presented in Table 6-9 to Table 6-22. Any variations in the addition of the change to the baseline concentrations are due to rounding only.

6.1.18 The maximum eight hour rolling mean CO PC that is predicted to occur anywhere in the study area as a result of the Proposed Development is less than 1% of the relevant AQAL for every scenario. The maximum predicted PEC at any receptor is 2.6% of the AQAL during normal operation.

6.1.19 The maximum one hour mean CO PC that is predicted to occur anywhere in the study area as a result of the Proposed Development is less than 1% of the relevant AQAL for every scenario. The maximum predicted PEC at any receptor is also less than 1% during normal operation.

6.1.20 The impact from the normal, start up and emergency operation of the Proposed Development is not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the short-term PC is less than 10% of the AQAL.

Table 6-9: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Normal Operation

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	10,000	0.1	<0.1%	221.8	250.3	250.4	2.5%
O2	10,000	0.1	<0.1%	221.8	263.7	263.8	2.6%
O3	10,000	0.1	<0.1%	221.8	240.7	240.8	2.4%
O4	10,000	0.1	<0.1%	221.8	240.0	240.1	2.4%
O5	10,000	0.1	<0.1%	221.8	253.2	253.3	2.5%
O6	10,000	0.1	<0.1%	221.8	249.9	250.0	2.5%
O7	10,000	0.1	<0.1%	221.8	247.8	247.9	2.5%
O8	10,000	<0.1	<0.1%	221.8	244.5	244.6	2.4%
O9	10,000	0.1	<0.1%	221.8	245.1	245.1	2.5%
Maximum anywhere offsite	10,000	0.3	<0.1%	221.8	242.8	243.1	2.4%

Table 6-10: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Start Up Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	10,000	18.6	0.2%	221.8	250.4	269.0	2.7%
O2	10,000	22.1	0.2%	221.8	263.8	285.9	2.9%
O3	10,000	14.3	0.1%	221.8	240.7	255.0	2.6%
O4	10,000	14.8	0.1%	221.8	240.0	254.9	2.5%
O5	10,000	19.2	0.2%	221.8	253.3	272.4	2.7%
O6	10,000	17.5	0.2%	221.8	249.9	267.5	2.7%
O7	10,000	14.8	0.1%	221.8	247.9	262.6	2.6%
O8	10,000	18.7	0.2%	221.8	244.5	263.2	2.6%
O9	10,000	13.7	0.1%	221.8	245.1	258.7	2.6%
Maximum anywhere offsite	10,000	33.1	0.3%	221.8	242.8	275.9	2.8%

Table 6-11: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Start Up Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	10,000	18.3	0.2%	221.8	250.4	268.7	2.7%
O2	10,000	21.5	0.2%	221.8	263.8	285.2	2.9%
O3	10,000	14.2	0.1%	221.8	240.7	254.9	2.5%
O4	10,000	14.5	0.1%	221.8	240.0	254.6	2.5%
O5	10,000	18.3	0.2%	221.8	253.3	271.5	2.7%
O6	10,000	16.7	0.2%	221.8	249.9	266.7	2.7%
O7	10,000	14.0	0.1%	221.8	247.9	261.9	2.6%
O8	10,000	17.6	0.2%	221.8	244.5	262.2	2.6%
O9	10,000	12.9	0.1%	221.8	245.1	258.0	2.6%
Maximum anywhere offsite	10,000	31.5	0.3%	221.8	242.8	274.3	2.7%

Table 6-12: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Start Up Scenario 3

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	10,000	18.7	0.2%	221.8	250.4	269.1	2.7%
O2	10,000	22.3	0.2%	221.8	263.8	286.0	2.9%
O3	10,000	14.2	0.1%	221.8	240.7	255.0	2.5%
O4	10,000	14.9	0.1%	221.8	240.0	254.9	2.5%
O5	10,000	19.4	0.2%	221.8	253.3	272.7	2.7%
O6	10,000	17.7	0.2%	221.8	249.9	267.7	2.7%
O7	10,000	15.0	0.1%	221.8	247.9	262.9	2.6%
O8	10,000	18.9	0.2%	221.8	244.5	263.5	2.6%
O9	10,000	13.9	0.1%	221.8	245.1	259.0	2.6%
Maximum anywhere offsite	10,000	33.6	0.3%	221.8	242.8	276.4	2.8%

Table 6-13: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Emergency Scenario 1

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	10,000	19.8	0.2%	221.8	250.4	270.1	2.7%
O2	10,000	22.6	0.2%	221.8	263.8	286.4	2.9%
O3	10,000	23.1	0.2%	221.8	240.7	263.8	2.6%
O4	10,000	18.3	0.2%	221.8	240.0	258.4	2.6%
O5	10,000	19.6	0.2%	221.8	253.3	272.9	2.7%
O6	10,000	18.3	0.2%	221.8	249.9	268.2	2.7%
O7	10,000	15.1	0.2%	221.8	247.9	262.9	2.6%
O8	10,000	19.2	0.2%	221.8	244.5	263.7	2.6%
O9	10,000	13.9	0.1%	221.8	245.1	259.0	2.6%
Maximum anywhere offsite	10,000	135.0	1.4%	221.8	242.8	377.8	3.8%

Table 6-14: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Emergency Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	10,000	19.4	0.2%	221.8	250.4	269.8	2.7%
O2	10,000	22.0	0.2%	221.8	263.8	285.7	2.9%
O3	10,000	23.1	0.2%	221.8	240.7	263.8	2.6%
O4	10,000	18.3	0.2%	221.8	240.0	258.3	2.6%
O5	10,000	18.7	0.2%	221.8	253.3	271.9	2.7%
O6	10,000	17.5	0.2%	221.8	249.9	267.5	2.7%
O7	10,000	14.4	0.1%	221.8	247.9	262.2	2.6%
O8	10,000	18.2	0.2%	221.8	244.5	262.7	2.6%
O9	10,000	13.1	0.1%	221.8	245.1	258.2	2.6%
Maximum anywhere offsite	10,000	113.7	1.1%	221.8	242.8	356.5	3.6%

Table 6-15: Predicted Change in Maximum 8 Hour Rolling Mean CO Concentrations – Emergency Scenario 3

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	10,000	19.8	0.2%	221.8	250.4	270.2	2.7%
O2	10,000	22.8	0.2%	221.8	263.8	286.5	2.9%
O3	10,000	23.1	0.2%	221.8	240.7	263.8	2.6%
O4	10,000	18.3	0.2%	221.8	240.0	258.4	2.6%
O5	10,000	19.8	0.2%	221.8	253.3	273.1	2.7%
O6	10,000	18.5	0.2%	221.8	249.9	268.4	2.7%
O7	10,000	15.3	0.2%	221.8	247.9	263.1	2.6%
O8	10,000	19.5	0.2%	221.8	244.5	264.0	2.6%
O9	10,000	14.1	0.1%	221.8	245.1	259.2	2.6%
Maximum anywhere offsite	10,000	113.7	1.1%	221.8	242.8	356.5	3.6%

Table 6-16:Predicted Change in Maximum 1 Hour CO Concentrations – Normal Operation

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	30,000	0.2	<0.1%	221.8	264.2	264.4	0.9%
O2	30,000	0.2	<0.1%	221.8	270.6	270.8	0.9%
O3	30,000	0.2	<0.1%	221.8	261.6	261.7	0.9%
O4	30,000	0.2	<0.1%	221.8	260.9	261.1	0.9%
O5	30,000	0.2	<0.1%	221.8	258.0	258.1	0.9%
O6	30,000	0.1	<0.1%	221.8	256.3	256.4	0.9%
O7	30,000	0.1	<0.1%	221.8	257.3	257.4	0.9%
O8	30,000	0.1	<0.1%	221.8	256.8	257.0	0.9%
O9	30,000	0.1	<0.1%	221.8	255.6	255.7	0.9%
Maximum anywhere offsite	30,000	0.5	<0.1%	221.8	238.8	239.3	0.8%

Table 6-17: Predicted Change in Maximum 1 Hour CO Concentrations – Start Up Scenario 1

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	30,000	32.1	0.1%	221.8	264.2	296.3	1.0%
O2	30,000	32.4	0.1%	221.8	270.6	303.1	1.0%
O3	30,000	25.4	0.1%	221.8	261.6	287.0	1.0%
O4	30,000	24.5	0.1%	221.8	260.9	285.4	1.0%
O5	30,000	29.2	0.1%	221.8	258.0	287.2	1.0%
O6	30,000	25.3	0.1%	221.8	256.3	281.6	0.9%
O7	30,000	25.0	0.1%	221.8	257.3	282.4	0.9%
O8	30,000	22.6	0.1%	221.8	256.8	279.4	0.9%
O9	30,000	22.7	0.1%	221.8	255.6	278.3	0.9%
Maximum anywhere offsite	30,000	44.9	0.1%	221.8	238.8	283.7	0.9%

Table 6-18: Predicted Change in Maximum 1 Hour CO Concentrations – Start Up Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	30,000	30.5	0.1%	221.8	264.2	294.7	1.0%
O2	30,000	30.9	0.1%	221.8	270.6	301.6	1.0%
O3	30,000	24.0	0.1%	221.8	261.6	285.6	1.0%
O4	30,000	23.4	0.1%	221.8	260.9	284.3	0.9%
O5	30,000	27.1	0.1%	221.8	258.0	285.1	1.0%
O6	30,000	23.8	0.1%	221.8	256.3	280.0	0.9%
O7	30,000	23.2	0.1%	221.8	257.3	280.5	0.9%
O8	30,000	20.9	0.1%	221.8	256.8	277.7	0.9%
O9	30,000	20.9	0.1%	221.8	255.6	276.5	0.9%
Maximum anywhere offsite	30,000	42.3	0.1%	221.8	238.8	281.0	0.9%

Table 6-19: Predicted Change in Maximum 1 Hour CO Concentrations – Start Up Scenario 3

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	30,000	32.5	0.1%	221.8	264.2	296.7	1.0%
O2	30,000	32.8	0.1%	221.8	270.6	303.4	1.0%
O3	30,000	25.9	0.1%	221.8	261.6	287.5	1.0%
O4	30,000	24.8	0.1%	221.8	260.9	285.7	1.0%
O5	30,000	29.9	0.1%	221.8	258.0	287.9	1.0%
O6	30,000	25.8	0.1%	221.8	256.3	282.1	0.9%
O7	30,000	25.6	0.1%	221.8	257.3	283.0	0.9%
O8	30,000	23.1	0.1%	221.8	256.8	279.9	0.9%
O9	30,000	23.3	0.1%	221.8	255.6	278.9	0.9%
Maximum anywhere offsite	30,000	45.8	0.2%	221.8	238.8	284.6	0.9%

Table 6-20: Predicted Change in Maximum 1 Hour CO Concentrations – Emergency Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	30,000	32.7	0.1%	221.8	264.2	297.0	1.0%
O2	30,000	32.6	0.1%	221.8	270.6	303.3	1.0%
O3	30,000	37.7	0.1%	221.8	261.6	299.2	1.0%
O4	30,000	40.1	0.1%	221.8	260.9	301.0	1.0%
O5	30,000	29.6	0.1%	221.8	258.0	287.5	1.0%
O6	30,000	26.2	0.1%	221.8	256.3	282.5	0.9%
O7	30,000	25.3	0.1%	221.8	257.3	282.6	0.9%
O8	30,000	23.1	0.1%	221.8	256.8	279.9	0.9%
O9	30,000	22.9	0.1%	221.8	255.6	278.5	0.9%
Maximum anywhere offsite	30,000	368.0	1.2%	221.8	238.8	606.7	2.0%

Table 6-21: Predicted Change in Maximum 1 Hour CO Concentrations – Emergency Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	30,000	31.2	0.1%	221.8	264.2	295.4	1.0%
O2	30,000	31.2	0.1%	221.8	270.6	301.8	1.0%
O3	30,000	37.6	0.1%	221.8	261.6	299.2	1.0%
O4	30,000	40.1	0.1%	221.8	260.9	301.0	1.0%
O5	30,000	27.4	0.1%	221.8	258.0	285.4	1.0%
O6	30,000	24.6	0.1%	221.8	256.3	280.9	0.9%
O7	30,000	23.6	0.1%	221.8	257.3	280.9	0.9%
O8	30,000	21.5	0.1%	221.8	256.8	278.3	0.9%
O9	30,000	21.1	0.1%	221.8	255.6	276.7	0.9%
Maximum anywhere offsite	30,000	368.0	1.2%	221.8	238.8	606.7	2.0%

Table 6-22: Predicted Change in Maximum 1 Hour CO Concentrations – Emergency Scenario 3

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	30,000	33.2	0.1%	221.8	264.2	297.4	1.0%
O2	30,000	33.0	0.1%	221.8	270.6	303.7	1.0%
O3	30,000	37.7	0.1%	221.8	261.6	299.2	1.0%
O4	30,000	40.1	0.1%	221.8	260.9	301.0	1.0%
O5	30,000	30.3	0.1%	221.8	258.0	288.2	1.0%
O6	30,000	26.7	0.1%	221.8	256.3	283.0	0.9%
O7	30,000	25.9	0.1%	221.8	257.3	283.2	0.9%
O8	30,000	23.6	0.1%	221.8	256.8	280.4	0.9%
O9	30,000	23.5	0.1%	221.8	255.6	279.1	0.9%
Maximum anywhere offsite	30,000	368.0	1.2%	221.8	238.8	606.7	2.0%

Particulate Matter (PM_{10})

6.1.21 The predicted change in 90.41st percentile of 24-hour mean PM_{10} concentrations that would occur during the operation of the Proposed Development in start-up and emergency mode, at the identified human health receptors and at the offsite maximum, are presented in Table 6-23 to Table 6-28. Any variations in the addition of the change to the baseline concentrations are due to rounding only.

6.1.22 The maximum predicted short-term PC at any receptor is below 1% for all scenarios, while at the point of maximum impact it is up to 4.4%. This is predicted to occur during Start-up operation scenario, and during emergency operation. It is considered that the PC of PM_{10} would be unlikely to give rise to significant effects at any receptor location during all modelled scenarios.

6.1.23 The impact from the start up and emergency operation of the Proposed Development is not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the short-term PC is less than 10% of the AQAL.

Table 6-23: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Start Up Scenario 1

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	50	<0.1	<0.1%	19.2	19.3	19.3	38.6%
O2	50	0.1	0.1%	19.2	19.2	19.3	38.6%
O3	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O4	50	<0.1	<0.1%	19.2	19.2	19.3	38.5%
O5	50	<0.1	0.1%	19.2	19.2	19.3	38.6%
O6	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O7	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O8	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O9	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
Maximum anywhere offsite	50	0.2	0.4%	19.2	19.2	19.4	38.9%

Table 6-24: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Start Up Scenario 2

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	50	<0.1	0.1%	19.2	19.3	19.3	38.6%
O2	50	0.1	0.1%	19.2	19.2	19.3	38.6%
O3	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O4	50	<0.1	<0.1%	19.2	19.2	19.3	38.5%
O5	50	0.1	0.1%	19.2	19.2	19.3	38.6%
O6	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O7	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O8	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O9	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
Maximum anywhere offsite	50	0.2	0.4%	19.2	19.2	19.4	38.9%

Table 6-25: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Start Up Scenario 3

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	50	<0.1	<0.1%	19.2	19.3	19.3	38.6%
O2	50	0.1	0.1%	19.2	19.2	19.3	38.6%
O3	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O4	50	<0.1	<0.1%	19.2	19.2	19.3	38.5%
O5	50	<0.1	0.1%	19.2	19.2	19.3	38.6%
O6	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O7	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
O8	50	<0.1	<0.1%	19.2	19.3	19.3	38.5%
O9	50	<0.1	0.1%	19.2	19.2	19.3	38.5%
Maximum anywhere offsite	50	0.2	0.4%	19.2	19.2	19.4	38.9%

Table 6-26: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Emergency Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	50	0.2	0.3%	19.2	19.3	19.4	38.8%
O2	50	0.2	0.4%	19.2	19.2	19.4	38.9%
O3	50	0.1	0.3%	19.2	19.2	19.4	38.8%
O4	50	0.1	0.3%	19.2	19.2	19.4	38.7%
O5	50	0.1	0.3%	19.2	19.2	19.4	38.7%
O6	50	0.1	0.2%	19.2	19.3	19.4	38.7%
O7	50	0.1	0.2%	19.2	19.2	19.3	38.7%
O8	50	0.1	0.1%	19.2	19.3	19.3	38.7%
O9	50	0.1	0.2%	19.2	19.2	19.3	38.7%
Maximum anywhere offsite	50	2.2	4.4%	19.2	19.2	21.4	42.8%

Table 6-27: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Emergency Scenario 2

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	50	0.2	0.3%	19.2	19.3	19.4	38.8%
O2	50	0.2	0.4%	19.2	19.2	19.4	38.9%
O3	50	0.1	0.3%	19.2	19.2	19.4	38.8%
O4	50	0.1	0.2%	19.2	19.2	19.4	38.7%
O5	50	0.1	0.3%	19.2	19.2	19.4	38.8%
O6	50	0.1	0.2%	19.2	19.3	19.4	38.7%
O7	50	0.1	0.2%	19.2	19.2	19.3	38.7%
O8	50	0.1	0.1%	19.2	19.3	19.3	38.7%
O9	50	0.1	0.2%	19.2	19.2	19.3	38.7%
Maximum anywhere offsite	50	2.2	4.4%	19.2	19.2	21.4	42.8%

Table 6-28: Predicted Change in 24-Hour Mean PM_{10} Concentrations (as the 90.41st Percentile of 24-Hour averages) – Emergency Scenario 3

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	50	0.2	0.3%	19.2	19.3	19.4	38.8%
O2	50	0.2	0.4%	19.2	19.2	19.4	38.9%
O3	50	0.1	0.3%	19.2	19.2	19.4	38.8%
O4	50	0.1	0.3%	19.2	19.2	19.4	38.7%
O5	50	0.1	0.3%	19.2	19.2	19.4	38.7%
O6	50	0.1	0.2%	19.2	19.3	19.4	38.7%
O7	50	0.1	0.2%	19.2	19.2	19.3	38.7%
O8	50	0.1	0.1%	19.2	19.3	19.3	38.7%
O9	50	0.1	0.2%	19.2	19.2	19.3	38.7%
Maximum anywhere offsite	50	2.2	4.4%	19.2	19.2	21.4	42.8%

Sulphur Dioxide

6.1.24 The predicted change in SO_2 concentrations that would occur during the Start-Up operation of the Proposed Development, at the identified human health receptors and at the offsite maximum are presented in Table 6-29 to Table 6-37. Any variations in the addition of the change to the baseline concentrations are due to rounding only.

6.1.25 The SO_2 PC that is predicted to occur anywhere in the study area as a result of the Proposed Development is less than 1% of the relevant AQALs for short-term (24-hour mean, 1 hour mean and 15-minute mean) impacts. It is considered that the PC of SO_2 would be unlikely to give rise to significant effects at any receptor location during all modelled scenarios.

6.1.26 The impact from the start up operation of the Proposed Development is not predicted to exceed the stage one screening criteria that states that an emission may be considered to have an insignificant impact where the short-term PC is less than 10% of the AQAL.

Table 6-29: Predicted Change in 15 Minute Mean SO_2 Concentrations (as the 99.9th Percentile of 15 Minute averages) – Start-Up Scenario 1

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	260	0.1	<0.1%	4	9.2	9.3	3.6%
O2	260	0.1	<0.1%	4	8.6	8.7	3.4%
O3	260	0.1	<0.1%	4	7.1	7.2	2.8%
O4	260	0.1	<0.1%	4	7.1	7.2	2.8%
O5	260	0.1	<0.1%	4	8.5	8.5	3.3%
O6	260	0.1	<0.1%	4	11.8	11.9	4.6%
O7	260	0.1	<0.1%	4	8.9	8.9	3.4%
O8	260	0.1	<0.1%	4	11.7	11.8	4.5%
O9	260	0.1	<0.1%	4	8.6	8.6	3.3%
Maximum anywhere offsite	260	0.6	0.2%	4	34.7	35.3	13.6%

Table 6-30: Predicted Change in 1 Hour Mean SO_2 Concentrations (as the 99.73rd Percentile of 1 Hour averages) – Start-Up Scenario 1

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	350	0.1	<0.1%	4	6.9	7.0	2.0%
O2	350	0.1	<0.1%	4	6.5	6.6	1.9%
O3	350	0.1	<0.1%	4	5.8	5.8	1.7%
O4	350	0.1	<0.1%	4	5.7	5.8	1.7%
O5	350	<0.1	<0.1%	4	6.5	6.5	1.9%
O6	350	<0.1	<0.1%	4	8.7	8.7	2.5%
O7	350	<0.1	<0.1%	4	6.6	6.6	1.9%
O8	350	<0.1	<0.1%	4	8.8	8.9	2.5%
O9	350	<0.1	<0.1%	4	6.6	6.6	1.9%
Maximum anywhere offsite	350	0.5	0.2%	4	28.6	29.2	8.3%

Table 6-31: Predicted Change in 24-Hour Mean SO_2 Concentrations (as the 99.18th Percentile of 24-Hour averages) – Start-Up Scenario 1

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	125	<0.1	<0.1%	4	4.9	4.9	3.9%
O2	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O3	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O4	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O5	125	<0.1	<0.1%	4	4.6	4.7	3.7%
O6	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O7	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O8	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O9	125	<0.1	<0.1%	4	4.7	4.7	3.8%
Maximum anywhere offsite	125	0.3	0.1%	4	14.3	14.6	11.6%

Table 6-32: Predicted Change in 15 Minute Mean SO_2 Concentrations (as the 99.9th Percentile of 15 Minute averages) – Start-Up Scenario 2

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	260	0.1	<0.1%	4	9.2	9.3	3.6%
O2	260	0.1	<0.1%	4	8.6	8.7	3.4%
O3	260	0.1	<0.1%	4	7.1	7.2	2.8%
O4	260	0.1	<0.1%	4	7.1	7.2	2.8%
O5	260	0.1	<0.1%	4	8.5	8.5	3.3%
O6	260	0.1	<0.1%	4	11.8	11.9	4.6%
O7	260	0.1	<0.1%	4	8.9	8.9	3.4%
O8	260	0.1	<0.1%	4	11.7	11.8	4.5%
O9	260	0.1	<0.1%	4	8.6	8.6	3.3%
Maximum anywhere offsite	260	0.6	0.2%	4	34.7	35.3	13.6%

Table 6-33: Predicted Change in 1 Hour Mean SO_2 Concentrations (as the 99.73rd Percentile of 1 Hour averages) – Start-Up Scenario 2

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	350	0.1	<0.1%	4	6.9	7.0	2.0%
O2	350	0.1	<0.1%	4	6.5	6.6	1.9%
O3	350	0.1	<0.1%	4	5.8	5.8	1.7%
O4	350	0.1	<0.1%	4	5.7	5.8	1.7%
O5	350	<0.1	<0.1%	4	6.5	6.5	1.9%
O6	350	<0.1	<0.1%	4	8.7	8.7	2.5%
O7	350	<0.1	<0.1%	4	6.6	6.6	1.9%
O8	350	<0.1	<0.1%	4	8.8	8.9	2.5%
O9	350	<0.1	<0.1%	4	6.6	6.6	1.9%
Maximum anywhere offsite	350	0.5	0.1%	4	28.6	29.1	8.3%

Table 6-34: Predicted Change in 24-Hour Mean SO_2 Concentrations (as the 99.18th Percentile of 24-Hour averages) – Start-Up Scenario 2

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	125	<0.1	<0.1%	4	4.9	4.9	3.9%
O2	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O3	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O4	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O5	125	<0.1	<0.1%	4	4.6	4.7	3.7%
O6	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O7	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O8	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O9	125	<0.1	<0.1%	4	4.7	4.7	3.8%
Maximum anywhere offsite	125	0.3	0.1%	4	14.3	14.6	11.6%

Table 6-35: Predicted Change in 15 Minute Mean SO_2 Concentrations (as the 99.9th Percentile of 15 Minute averages) – Start-Up Scenario 3

RECEPTOR	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/AQAL (%)
O1	260	0.1	<0.1%	4	9.2	9.3	3.6%
O2	260	0.1	<0.1%	4	8.6	8.7	3.4%
O3	260	0.1	<0.1%	4	7.1	7.2	2.8%
O4	260	0.1	<0.1%	4	7.1	7.2	2.8%
O5	260	0.1	<0.1%	4	8.5	8.5	3.3%
O6	260	0.1	<0.1%	4	11.8	11.9	4.6%
O7	260	0.1	<0.1%	4	8.9	8.9	3.4%
O8	260	0.1	<0.1%	4	11.7	11.8	4.5%
O9	260	0.1	<0.1%	4	8.6	8.6	3.3%
Maximum anywhere offsite	260	0.6	0.2%	4	34.7	35.3	13.6%

Table 6-36: Predicted Change in 1 Hour Mean SO_2 Concentrations (as the 99.73rd Percentile of 1 Hour averages) – Start-Up Scenario 3

RECEPTOR	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/AQAL (%)
O1	350	0.1	<0.1%	4	6.9	7.0	2.0%
O2	350	0.1	<0.1%	4	6.5	6.6	1.9%
O3	350	0.1	<0.1%	4	5.8	5.8	1.7%
O4	350	0.1	<0.1%	4	5.7	5.8	1.7%
O5	350	<0.1	<0.1%	4	6.5	6.5	1.9%
O6	350	<0.1	<0.1%	4	8.7	8.7	2.5%
O7	350	<0.1	<0.1%	4	6.6	6.6	1.9%
O8	350	<0.1	<0.1%	4	8.8	8.9	2.5%
O9	350	<0.1	<0.1%	4	6.6	6.6	1.9%
Maximum anywhere offsite	350	0.5	0.2%	4	28.6	29.2	8.3%

Table 6-37: Predicted Change in 24-Hour Mean SO_2 Concentrations (as the 99.18th Percentile of 24-Hour averages) – Start-Up Scenario 3

RECEPTOR	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/AQAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/AQAL (%)
O1	125	<0.1	<0.1%	4	4.9	4.9	3.9%
O2	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O3	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O4	125	<0.1	<0.1%	4	4.4	4.4	3.5%
O5	125	<0.1	<0.1%	4	4.6	4.7	3.7%
O6	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O7	125	<0.1	<0.1%	4	4.7	4.7	3.8%
O8	125	<0.1	<0.1%	4	5.6	5.6	4.5%
O9	125	<0.1	<0.1%	4	4.7	4.7	3.8%
Maximum anywhere offsite	125	0.3	0.1%	4	14.3	14.6	11.6%

6.2 Ecological Receptors Results

6.2.1 The results of the dispersion modelling of predicted impacts on sensitive ecological receptors are presented in Table 6-38 to Table 6-42. The tables set out the predicted PC to atmospheric concentrations of NO_x and NH_3 and nutrient nitrogen and acid deposition, as well as PEC (i.e., the process contribution, existing background concentration and the process contributions of other committed developments). Any variations in the addition of the change to the baseline concentrations are due to rounding only.

Oxides of Nitrogen and Ammonia Emissions – Critical Levels

6.2.2 The assessment results show that the predicted annual and 24-hour average NO_x impacts are below the screening criteria for the need for further assessment at all receptors.

6.2.3 The assessment results show that the predicted annual and annual average NH_3 impacts are below the screening criteria for the need for further assessment at all receptors.

6.2.4 PCs of more than 1% of the long-term critical level for NO_x occur at the adjacent Teesmouth and Cleveland Coast Ramsar, SPA, SSSI and Ramsar, but PECs are predicted to stay below 70% of the Critical Level at these locations, except at the Teesmouth and Cleveland Coast SSSI (OE6), where it is predicted to be of 76.5% of the critical level. Although this is above the second screening criteria, it is below 100% of the critical level.

6.2.5 The need for further assessment at all locations but OE6 can therefore be screened out based on the critical level criteria.

6.2.6 The Environment Agency and Natural England have agreed that depositional impacts that are below 1% of the relevant critical load for a site can be regarded as likely to be insignificant. Guidance from the IAQM clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number (paragraph 5.5.2.6 of Institute of Air Quality Management, 2020). Therefore, impacts at OE6 can also be screen out from the need for further assessment.

Nitrogen and acid deposition – Critical Loads

6.2.7 The assessment results show that the predicted nitrogen and acid deposition impacts are below the criteria for likely significance at all receptors, as PCs are less than 1% of their respective critical loads at all receptors except for the nitrogen deposition at the Teesmouth and Cleveland Coast Ramsar, SPA, SSSI (OE1, OE2 and OE6). However, at sensitive features in the Ramsar/SPA (i.e. bird nesting locations), the PC is less than 1% of the critical load (see Figure 12), and therefore impacts can be regarded as likely to be insignificant at these locations, according to the EA screening criteria.

6.2.8 The SSSI is designated for its dune habitat which is located north of the Main Site and is sensitive to nitrogen. The nitrogen dose marginally exceeds the insignificance threshold of 1% of the critical load being 1.1% of the critical load.

6.2.9 The PEC will also exceed the critical load being a maximum of 12.92 kgN/ha/yr at Coatham Sands/Dunes (OE6). This is due to the fact that current nitrogen deposition already exceeds the critical load.

6.2.10 The SSSI was designated in 2015 when the background nitrogen dose to short vegetation according to APIS was 13.07 to 13.53 kgN/ha/yr at Coatham Sands/Dunes and North Gare Sands. Moreover, APIS shows that in the years prior to 2015 (prior to designation) the background nitrogen deposition dose to short vegetation was higher; for example being 14.69 to 14.77 kgN/ha/yr in 2003 at Coatham Sands/Dunes and North Gare Sands. The calcareous dune habitat has thus developed and persisted in close proximity to an operational steel works and other industrial facilities when nitrogen deposition rates were considerably higher than the lower critical load of 10 kgN/ha/yr, or than is forecast to be the case under the 'in combination' assessment (13.67 kgN/ha/yr maximum). Since total nitrogen deposition is forecast to remain on an improving trend even when growth is considered 'in combination' and would therefore remain below historic nitrogen deposition rates under which the habitat in question developed, no significant effect on the SSSI is expected, particularly as the PC is only marginally above the insignificance threshold.

6.2.11 The DCO Ecology ES Chapter shows that a net improvement in nitrogen deposition in the local area is forecast and nitrogen deposition rates are forecast to be materially lower than in earlier decades, with the habitat structure having previously been extensively changed due to slag deposition and movement from at least the 1940s to the early 2000s. Much of the dunes north of the Proposed Development's site (i.e. Coatham Dunes) have developed on slag deposits from the various historic industrial activities in that area (notably Warrenby Slag Works). In these decades N deposition will have been higher than it is now due to much higher NOx emissions (and was certainly higher in 2003 than it is now according to APIS). For example, UK N deposition reduced from 465 kt N in 1990 to 278 kt N in 2017 (Samuel J. Tomlinson et al., 2021).

6.2.12 As per paragraph 6.2.6, the guidance from the IAQM clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number (paragraph 5.5.2.6 of Institute of Air Quality Management, 2020). Therefore, impacts at OE6 can also be screen out from the need for further assessment.

Table 6-38: NO_x Annual Mean Dispersion Modelling Results for Ecological Receptors

RECEPTOR	SITE NAME	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	30	0.3	1.1%	16.5	18.4	18.7	62.5%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		0.3	1.1%	17.0	18.9	19.2	64.1%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI		0.1	0.3%	20.9	22.2	22.3	74.3%
OE4	Eston Pumping Station LWS		0.1	0.2%	18.3	20.2	20.3	67.7%
OE5	Teesmouth NNR		<0.1	0.1%	21.2	22.2	22.3	74.2%
OE6	Teesmouth and Cleveland Coast SSSI		0.3	1.1%	20.7	22.6	22.9	76.5%
OE7	North York Moors SPA and SSSI		<0.1	<0.1%	6.6	6.9	6.9	22.9%

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		<0.1	<0.1%	7.0	7.3	7.3	24.2%
OE9	Cliff Ridge SSSI		<0.1	<0.1%	6.6	6.9	6.9	22.9%
OE10	Durham Coast SSSI and Durham Coast NNR		<0.1	<0.1%	7.9	8.2	8.2	27.3%
OE11	Durham Coast SSSI		<0.1	<0.1%	8.0	8.3	8.3	27.7%
OE12	Hart Bog SSSI		<0.1	<0.1%	8.1	8.3	8.3	27.6%
OE13	Langbaurgh Ridge SSSI		<0.1	<0.1%	7.1	7.4	7.4	24.7%
OE14	Lovell Hill Pools SSSI		<0.1	0.1%	9.6	10.1	10.1	33.7%
OE15	Roseberry Topping SSSI		<0.1	<0.1%	6.8	7.1	7.1	23.7%
OE16	Saltburn Gill SSSI		<0.1	<0.1%	8.9	9.2	9.2	30.7%

Table 6-39: Maximum 24-hour NO_x Dispersion Modelling Results for Ecological Receptors

RECEPTOR	SITE NAME	AQAL (µg/m³)	PROCESS CONTRIBUTION (PC) (µg/m³)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m³)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	75	2.7	3.6%	33.0	38.2	40.9	54.5%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		2.9	3.8%	34.0	33.0	35.8	47.8%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI		0.8	1.1%	41.8	47.4	48.2	64.3%
OE4	Eston Pumping Station LWS		1.3	1.7%	36.6	37.3	38.6	51.5%
OE5	Teesmouth NNR		0.7	0.9%	42.4	42.8	43.5	58.0%
OE6	Teesmouth and Cleveland Coast SSSI		2.9	3.8%	41.4	40.4	43.2	57.7%

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE7	North York Moors SPA and SSSI		0.2	0.2%	13.2	16.2	16.4	21.9%
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		0.1	0.2%	14.0	16.6	16.8	22.4%
OE9	Cliff Ridge SSSI		0.1	0.1%	13.2	16.2	16.3	21.8%
OE10	Durham Coast SSSI and Durham Coast NNR		0.2	0.2%	15.8	18.6	18.7	25.0%
OE11	Durham Coast SSSI		0.2	0.2%	16.0	18.8	19.0	25.3%
OE12	Hart Bog SSSI		0.1	0.2%	16.2	18.6	18.7	25.0%
OE13	Langbaurgh Ridge SSSI		0.1	0.1%	14.2	17.4	17.5	23.3%
OE14	Lovell Hill Pools SSSI		0.3	0.4%	19.2	22.9	23.2	30.9%

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE15	Roseberry Topping SSSI		0.1	0.2%	13.6	16.6	16.7	22.3%
OE16	Saltburn Gill SSSI		0.1	0.2%	17.8	20.1	20.2	26.9%

Table 6-40: NH_3 Annual Mean Dispersion Modelling Results for Ecological Receptors

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PROCESS CONTRIBUTION (PC) (µg/m^3)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) (µg/m^3)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	3	0.01	0.4%	1.2	1.2	1.2	40.4%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		0.01	0.4%	1.2	1.2	1.2	40.4%
OE3	Coatham Marsh LWS and		<0.01	0.1%	1.3	1.3	1.3	43.4%

RECEPTOR	SITE NAME	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/EAL (%)
	Teesmouth and Cleveland Coast SPA, SSSI							
OE4	Eston Pumping Station LWS		<0.01	0.1%	1.4	1.4	1.4	46.8%
OE5	Teesmouth NNR		<0.01	<0.1%	1.3	1.3	1.3	43.4%
OE6	Teesmouth and Cleveland Coast SSSI		0.01	0.4%	1.3	1.3	1.3	43.8%
OE7	North York Moors SPA and SSSI		<0.01	<0.1%	0.9	0.9	0.9	30.0%
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		<0.01	<0.1%	1.5	1.5	1.5	50.0%
OE9	Cliff Ridge SSSI		<0.01	<0.1%	1.4	1.4	1.4	46.7%
OE10	Durham Coast SSSI and Durham Coast NNR		<0.01	<0.1%	1.5	1.5	1.5	50.0%

RECEPTOR	SITE NAME	AQAL ($\mu g/m^3$)	PROCESS CONTRIBUTION (PC) ($\mu g/m^3$)	PC/EAL (%)	BACKGROUND CONCENTRATION (BC) ($\mu g/m^3$)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/EAL (%)
OE11	Durham Coast SSSI		<0.01	<0.1%	1.6	1.6	1.6	53.3%
OE12	Hart Bog SSSI		<0.01	<0.1%	1.6	1.6	1.6	53.3%
OE13	Langbaurgh Ridge SSSI		<0.01	<0.1%	1.6	1.6	1.6	53.3%
OE14	Lovell Hill Pools SSSI		<0.01	<0.1%	1.3	1.3	1.3	43.4%
OE15	Roseberry Topping SSSI		<0.01	<0.1%	1.4	1.4	1.4	46.7%
OE16	Saltburn Gill SSSI		<0.01	<0.1%	1.1	1.1	1.1	36.7%

Table 6-41: Dispersion Modelling Results for Ecological Receptors – Nutrient Nitrogen Deposition (Kg/Ha/Yr)

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KGN/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KGN/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KGN/HA/YR)	PEC (KGN/HA/YR)	PEC % CRITICAL LOAD
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	Coastal stable dune grassland (calcareous type)	10	0.11	1.1%	12.5	12.8	12.9	129.2%
OE2	Teesmouth and Cleveland Coast SPA, SSSI	Coastal stable dune grassland (calcareous type)	10	0.11	1.1%	12.5	12.8	12.9	129.2%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	Sub-Atlantic semi-dry calcareous grassland	10	0.03	0.3%	12.5	12.6	12.7	126.7%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KGN/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KGN/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KGN/HA/YR)	PEC (KGN/HA/YR)	PEC % CRITICAL LOAD
OE4	Eston Pumping Station LWS	Sub-Atlantic semi-dry calcareous grassland	10	0.02	0.2%	12.7	13.0	13.0	130.4%
OE5	Teesmouth NNR	Coastal stable dune grassland (calcareous type)	10	0.01	0.1%	13.5	13.7	13.7	136.7%
OE6	Teesmouth and Cleveland Coast SSSI	Coastal stable dune grassland (calcareous type)	10	0.11	1.1%	12.5	12.8	12.9	129.2%
OE7	North York Moors SPA and SSSI	Dry heaths, Raised and blanket bogs, Valley mires, poor fens and	5	<0.01	0.1%	15.5	15.6	15.6	311.5%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KGN/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KGN/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KGN/HA/YR)	PEC (KGN/HA/YR)	PEC % CRITICAL LOAD
		transition mires							
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	Coastal stable dune grassland (calcareous type)	10	<0.01	<0.1%	13.5	13.5	13.5	135.4%
OE10	Durham Coast SSSI and Durham Coast NNR	Coastal stable dune grassland (calcareous type)	10	<0.01	<0.1%	13.5	13.5	13.5	135.4%
OE11	Durham Coast SSSI	Coastal stable dune grassland (calcareous type)	10	<0.01	<0.1%	13.5	13.5	13.5	135.4%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KGN/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KGN/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KGN/HA/YR)	PEC (KGN/HA/YR)	PEC % CRITICAL LOAD
OE12	Hart Bog SSSI	Raised and blanket bogs, Valley mires, poor fens and transition mires	5	<0.01	0.1%	14.8	14.8	14.8	296.3%
OE14	Lovell Hill Pools SSSI	Outstanding dragonfly assemblage and Coenagrion pulchellum	10	<0.01	<0.1%	13.5	13.6	13.6	135.7%
OE16	Saltburn Gill SSSI	Carpinus and Quercus mesic deciduous forest	15	0.01	<0.1%	21.8	21.8	21.9	145.7%

Table 6-42: Dispersion Modelling Results for Ecological Receptors – Acid Deposition N (Keq/Ha/Yr)

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD (CL) RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.008	<0.1%	1.00	1.01	1.03	5.5%
OE2	Teesmouth and Cleveland Coast SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.008	<0.1%	1.00	1.01	1.03	5.5%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856	0.002	<0.1%	0.89	0.90	0.91	4.8%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD (CL) RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
			Min CL Max S 4.0						
OE4	Eston Pumping Station LWS	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.002	<0.1%	0.91	0.93	0.93	5.0%
OE5	Teesmouth NNR	No Sensitive Features							
OE6	Teesmouth and Cleveland Coast SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.008	<0.1%	1.00	1.01	1.03	5.5%
OE7	North York Moors SPA and SSSI	Calcareous grassland	Min CL min N 0.321 Min CL Max N 0.469	<0.001	<0.1%	1.26	1.26	1.26	250.6%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD (CL) RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
			Min CL Max S 0.148						
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	<0.001	<0.1%	0.84	0.84	0.84	4.5%
OE10	Durham Coast SSSI and Durham Coast NNR	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	<0.001	<0.1%	0.84	0.84	0.84	4.5%
OE11	Durham Coast SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856	<0.001	<0.1%	0.84	0.84	0.84	4.5%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD (CL) RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	FUTURE YEAR WITHOUT PROPOSED DEVELOPMENT (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
			Min CL Max S 4.0						
OE12	Hart Bog SSSI	Calcareous grassland	Min CL min N 0.321 Min CL Max N 0.469 Min CL Max S 0.148	<0.001	<0.1%	0.82	0.82	0.82	175.6%
OE14	Lovell Hill Pools SSSI	No Sensitive Features							
OE16	Saltburn Gill SSSI	Calcareous grassland	Min CL min N 0.142 Min CL Max N 2.639 Min CL Max S 2.448	<0.001	<0.1%	0.81	0.82	0.82	30.9%

7 CONCLUSIONS

7.1.1 This report has assessed the impact on local air quality of the operation of the Proposed Development. The assessment has used the dispersion model ADMS to predict the increases in pollutant species released from the Proposed Development to the Study Areas for human health and designated ecosystems.

7.1.2 Emissions from the Fired Heater stacks, Auxiliary Boilers, flares and emergency generator stacks would result in small increases in ground-level concentrations of the modelled pollutants. Taking into account available information on background concentrations within the modelled domain, predicted operational concentrations of the modelled pollutants would be within current environmental standards for the protection of human health.

7.1.3 The modelling of impacts at designated ecological receptors (SACs / Ramsar / SPAs and SSSIs) and other ecological sites has predicted that emissions would be unlikely to give rise to significant impacts with regard to increases in atmospheric concentrations of NO_X and NH_3 and nutrient nitrogen and acid deposition. The need for further assessment at all locations can therefore be screened out based on the EPR criteria and professional judgement.

7.1.4 Additional modelling of impacts would be completed at the end of Front End Engineering Design, whereby further modelling will be undertaken and the air quality risk assessment updated to take into account the final design and best available technique.

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ANNEX A : SENSITIVITY TESTING OF MODEL INPUTS

8.1.1 The maximum predicted concentrations of NO_2 at the worst-affected human health receptors and NO_x at the worst-affected statutory designated ecological receptor associated with the variable input parameters, are presented in Table 8-1 as the percentage of maximum reported values in Table 6-1, Table 6-2 and Table 6-38 above. A variation below 100% shows that the results in the main assessment are most likely higher, and vice-versa.

Table 8-1: Sensitivity Tests Results compared to the Main Assessment

MODEL INPUT VARIABLE	HUMAN HEALTH RECEPTORS		ECOLOGICAL RECEPTORS	
	SHORT-TERM	LONG-TERM	SHORT-TERM	LONG-TERM
Meteorological data (five year min to max)	94.6%	76.7%	74.6%	82.6%
Surface roughness representation (0.5 m)	96.4%	103.0%	109.6%	120.3%
Surface roughness representation (0.2 m)	99.6%	98.1%	92.6%	87.1%
No buildings	98.9%	97.3%	98.1%	96.7%

8.1.2 The main uncertainty associated with the model is considered to be the meteorological data, with a NO_2 process contribution variation of 76.7% in the annual mean NO_2 results and 74.6% in the 24h NOx results.

8.1.3 The surface roughness representation in the main model has been assessed at 0.3 m, representative of the maximum surface roughness associated with agricultural land. For the purposes of sensitivity testing, the surface roughness has been varied (between 0.5 and 0.2) and it was found that a higher surface roughness (0.5 m), on the whole resulted in higher impacts at the worst-case receptor, however for receptors further away from the source, the impacts would be reduced over those reported in the main assessment. The lower surface roughness of 0.2 m resulted in lower impacts.

8.1.4 Not including buildings leads to lower impact at the worst-affected receptors, which are some of the closest to site. As for the surface roughness, however for receptors further away from the source, the impacts would be reduced over those reported in the main assessment.

ANNEX B ANNEX B: CUMULATIVE ASSESSMENT INPUTS AND IN-COMBINATION RESULTS

Introduction

8.1.6 This Annex provides the details of the developments considered within the assessment to provide an inherently cumulative air quality assessment. This section is presented to inform on the cumulative inputs for the air quality model which have been utilised within the main air quality assessment and this section also present the In-Combination results. Cumulative impacts from existing sources of pollution in the area are accounted for in the adoption of site-specific background pollutant concentrations from archive sources and a programme of project-specific baseline air quality monitoring in close proximity to the Proposed Development site.

8.1.7 It is recognised, however, that there is a potential impact on local air quality from emission sources which have either received or are about to receive planning permission but have yet to come into operation. Those that are relevant for consideration due to their potential operational air quality impacts are:

- ID 2: The Tees Combined Cycle Power Plant, EN010082;
- ID 3: Net Zero Teesside, EN010103;
- ID 19: Peak Resources Ltd, R/2017/0876/FFM;
- ID 20: CBRE anaerobic biogas production facility and combined heat and power plant, R/2016/0484/FFM;
- ID 22: Grangetown energy recovery facility (ERF), R/2019/0767/OOM;
- ID 30: Tourian Renewables, R/2019/0031/FFM;
- ID 46: Redcar Energy Centre (REC), R/2020/0411/FFM;
- ID166: O2N Energy (materials recycling facility and production of energy from waste), 13/2892/EIS;
- ID 178: Green Lithium Refining, R/2023/0291/ESM;
- ID 212: Teesside Green Energy Park, 22/1525/EIS; and
- ID 219: Greenergy Renewable Fuels and Circular Products Facility, 23/1019/EIS.

8.1.8 Given the distance of one of the developments from the Proposed Development as well as the prevailing wind direction for the area and the number of pollutants emitted it is considered that the cumulative impacts will be not significant for the Greenergy Renewable Fuels and Circular Products Facility. Therefore, this development has not been included in the dispersion modelling. All other developments listed above have been included in the operational dispersion modelling. This has enabled their pollutant contributions to be added to background pollutant concentrations. This provides a total pollutant concentration for the future year without Proposed Development. The predicted environmental concentration can then be calculated by the addition of the process contribution from the Proposed Development.

8.1.9 Information on the emissions from these sources has been derived from the available Planning Applications and has been included in the ADMS model. Due to the nature of these emissions, the cumulative assessment has only included emissions of NO_x, PM_{10}, CO and SO_2, as these are the only pollutant species common to all the cumulative schemes.

Model Inputs

8.1.10 All cumulative model schemes have been assumed to run continuously at full output, therefore providing a worst-case assessment of the potential cumulative impact. The model inputs for the Proposed Development are as described in Table 3-1 to Table 3-3, and those for the cumulative schemes are shown in Table 8-2 to Table 8-7.

Table 8-2: Emission Inventory for the Cumulative Schemes (1)

Scheme	Net Zero Teesside	Redcar Energy Centre		Grangetown ERF	The Tees Combined Cycle Power Plant		CBRE	O2N Energy
Source name	NZT NE	Redcar Energy 1	Redcar Energy 2	Grangetown P	Teesside CCPP 1	Teesside CCPP2	CBRE_CHP	O2N
Stack Location	457046, 525393	455890, 526032	455895, 526030	454592, 521251	456453.55, 520437.16	456512.57, 520465.83	457285.3, 522315.2	446979, 521895
Temperature (°C)	60	140	140	140	72	72	200	138
Actual or Normalised (NTP)	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual
Efflux type	Velocity	Velocity	Velocity	Velocity	Volume	Velocity	Volume	Velocity
Velocity (m/s) / Volume flux (m^3/s)	24.8	19.1	19.1	15	928	18.462	9	16.95
Height (m)	115	80	80	70	75	75	28	65
Diameter (m)	6.6	2.3	2.3	3.48	8	8	0.52	2.1
NOx (g/s)	-	-	-	-	-	-	-	-
CO(g/s)	100.20	2.80	2.80	4.00	22.30	22.30	7.18	0.98
SO_2(g/s)	-	-	-	-	-	-	1.80	0.98
PM_{10} (g/s)	-	-	-	-	-	-	-	0.20

Table 8-3: Emission Inventory for the Cumulative Schemes (2)

Scheme	Green Lithium Refining				Teesside Green Energy Park
Source name	GreenLit1	GreenLit2	GreenLit3	GreenLit4	TeessideGreenPark
Stack Location	455768.9, 523356.714	455768.9, 523356.714	455452.814, 523651.395	455704.92, 523221.926	453157, 524499
Temperature (°C)	70	80	80	135	150
Actual or Normalised (NTP)	Actual	Actual	Actual	Actual	Actual
Efflux type	Velocity	Velocity	Velocity	Velocity	Velocity
Velocity (m/s) / Volume flux (m^3/s)	2.8	2.4	23.5	19.6	21.7
Height (m)	35	35	47	20	85
Diameter (m)	1.8	0.2	0.4	0.5	2
NOx (g/s)	-	-	-	-	-
CO(g/s)	0.5766	-	-	0.2579	1.492
SO_2(g/s)	-	-	-	-	0.895
PM_{10} (g/s)	0.1153	-	-	-	0.149

Table 8-4: Emission Inventory for the Cumulative Schemes (3)

Scheme	Tourian Renewables							
Source name	TourianB1	TourianB2	TourianB3	TourianB4	TourianF1	TourianF2	TourianF3	TourianF4
Stack Location	457874.6, 521542.7	457881.7, 521526.8	457888.9, 521510.8	457896, 521494.9	457852.4, 521553.6	457856, 521555.2	457854, 521549.9	457857.7, 521551.6
Temperature (°C)	140	140	140	140	850	850	850	850
Actual or Normalised (NTP)	NTP	NTP	NTP	NTP	NTP	NTP	NTP	NTP
Efflux type	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Velocity (m/s) / Volume flux (m^3/s)	0.407	0.407	0.407	0.407	0.249	0.249	0.249	0.249
Height (m)	18	18	18	18	12	12	12	12
Diameter (m)	0.2	0.2	0.2	0.2	2	2	2	2
NOx (g/s)	-	-	-	-	-	-	-	-
CO(g/s)	0.0407	0.0407	0.0407	0.0407	0.0087	0.0087	0.0087	0.0087
SO_2(g/s)	0.0143	0.0143	0.0143	0.0143	0.0249	0.0249	0.0249	0.0249
PM_{10} (g/s)	0.00204	0.00204	0.00204	0.00204	0.00124	0.00124	0.00124	0.00124

8.1.11

Table 8-5: Emission Inventory for the Cumulative Schemes (4)

Scheme	Peak Resources Ltd						
Source name	PeakRes1	PeakRes2	PeakRes3	PeakRes4	PeakRes5	PeakRes6	PeakRes7
Stack Location	452313.9,524445.5	452314.1,524423.1	452313.9,524400.4	452313.9,524377.8	452313.8,524355.4	452313.9,524332.7	452551.3,524556.4
Temperature (°C)	150	150	150	150	150	150	445
Actual or Normalised (NTP)	Actual	Actual	Actual	Actual	Actual	Actual	Actual
Efflux type	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity
Velocity (m/s) / Volume flux (m^3/s)	24.93	24.93	24.93	24.93	24.93	24.93	22.4
Height (m)	80	80	80	80	80	80	60
Diameter (m)	0.66	0.66	0.66	0.66	0.66	0.66	0.45
NOx (g/s)	-	-	-	-	-	-	-
CO(g/s)	0.354	0.354	0.354	0.354	0.354	0.354	-
SO_2(g/s)	0.213	0.213	0.213	0.213	0.213	0.213	-
PM_{10} (g/s)	0.071	0.071	0.071	0.071	0.071	0.071	-

Table 8-6: Emission Inventory for the Cumulative Schemes (5)

Scheme	Peak Resources Ltd										
Source name	PeakRes8	PeakRes9	PeakRes10	PeakRes11	PeakRes12	PeakRes 13	PeakRes14	PeakRes15	PeakRes16	PeakRes17	PeakRes18
Stack Location	452414.5,524464.9	452365.6,524419.4	452383.2,524414.5	452552.3,524487.4	452552.3,524490.1	452579.8,524382	452628.3,524388.9	452624.8,524383.2	452281.3,524260.3	452302.8,524480.1	452302.5,524536.9
Temperature (°C)	150	150	150	445	445	445	445	445	15	15	15
Actual or Normalised (NTP)	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual
Efflux type	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity	Velocity
Velocity (m/s) / Volume flux (m^3/s)	15.8	22.8	23.3	23.2	22.4	24.3	23.4	23.4	21.4	19.2	20.2
Height (m)	60	60	60	60	60	60	60	60	28	20	20
Diameter (m)	1	0.35	0.2	0.7	0.45	2.15	0.45	0.26	2.5	1.3	1.15
NOx (g/s)	-	-	-	-	-	-	-	-	-	-	-
CO (g/s)	-	-	-	-	-	-	-	-	-	-	-
SO_2 (g/s)	-	-	-	-	-	-	-	-	-	-	-
PM_{10} (g/s)	-	-	-	-	-	-	-	-	-	-	-

8.1.12 The buildings for each of the cumulative schemes, that may affect the dispersion of the emissions from the stacks have been included in the model run for the assessment of cumulative impacts. The buildings included in the model are shown in Table 8-7.

Table 8-7: Buildings for Inclusion in the Cumulative Scheme Model

CUMULATIVE SCHEME	BUILDING	GRID REFERENCE	HEIGHT (M)	LENGTH (M)	WIDTH (M)	ANGLE (°)
NZT Adsorber	Rectangular	457046, 525392	80.0	35.0	24.0	112.0
Redcar Energy Centre Boiler Hall	Rectangular	455863, 525961	49.0	25.0	63.0	112.5
Grangetown ERF	Rectangular	454568, 521276	45.0	25.0	63.0	65.0
The Tees CCPP HRSG 1	Rectangular	456468, 520407	45.0	26.0	30.0	65.0
The Tees CCPP HRSG 2	Rectangular	456528, 520434	45.0	26.0	30.0	65.0
CBRE CHP	Rectangular	457281, 522303	7.5	12.8	16.9	155.3
Green Lithium Refining	Rectangular	455571, 523563	43.0	317.3	69.2	135.2
Peak Resources Ltd	Rectangular	452304, 524389	47.0	65.2	129.9	269.7

Cumulative Assessment Results – Human Health and Ecological Receptors

8.1.13 Results of the cumulative assessment are as presented in Section 6. The results presented within the assessment are inherently cumulative, as explained in Section 8.1.6. In summary, the main assessment in inherently cumulative because the air quality modelling for the operational phase includes all relevant committed developments on top of the existing background, both with and without the Proposed Development.

In Combination Assessment Results – Ecological Receptors.

8.1.14 The in-combination assessment results below have been considered in the Habitats Regulations Assessment Report (EN070009/APP/5.10) submitted with the DCO Application.

Table 8-8: Annual Mean NOx Dispersion Modelling results for ecological receptors

RECEPTOR	SITE NAME	AQAL ($\mu g/m^3$)	PREDICTED CONCENTRATION (PC) ($\mu g/m^3$)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) ($\mu g/m^3$)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) ($\mu g/m^3$)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	30	2.5	8.2%	16.5	19.0	63.2%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		2.5	8.2%	17.0	19.5	64.9%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI		1.4	4.6%	20.9	22.3	74.3%
OE4	Eston Pumping Station LWS		2.1	6.9%	18.3	20.4	67.9%
OE5	Teesmouth NNR		1.8	6.1%	21.2	23.0	76.8%
OE6	Teesmouth and Cleveland Coast SSSI		2.5	8.2%	20.7	23.2	77.2%
OE7	North York Moors SPA and SSSI		0.3	0.9%	6.6	6.9	22.9%

RECEPTOR	SITE NAME	AQAL (µg/m³)	PREDICTED CONCENTRATION (PC) (µg/m³)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/EAL (%)
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		0.3	0.9%	7.0	7.3	24.2%
OE9	Cliff Ridge SSSI		0.3	0.9%	6.6	6.9	22.9%
OE10	Durham Coast SSSI and Durham Coast NNR		0.3	0.9%	7.9	8.2	27.3%
OE11	Durham Coast SSSI		0.3	1.0%	8.0	8.3	27.7%
OE12	Hart Bog SSSI		0.2	0.6%	8.1	8.3	27.6%
OE13	Langbaurgh Ridge SSSI		0.3	1.0%	7.1	7.4	24.7%
OE14	Lovell Hill Pools SSSI		0.5	1.7%	9.6	10.1	33.7%
OE15	Roseberry Topping SSSI		0.3	1.0%	6.8	7.1	23.7%
OE16	Saltburn Gill SSSI		0.3	1.0%	8.9	9.2	30.7%

Table 8-9: Maximum 24-hour NOx Dispersion Modelling results for ecological receptors

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PREDICTED CONCENTRATION (PC) (µg/m^3)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	75	14.7	19.6%	33.0	47.7	63.6%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		17.0	22.6%	34.0	51.0	68.0%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI		6.4	8.6%	41.8	48.2	64.3%
OE4	Eston Pumping Station LWS		7.1	9.4%	36.6	43.7	58.2%
OE5	Teesmouth NNR		12.5	16.7%	42.4	54.9	73.2%
OE6	Teesmouth and Cleveland Coast SSSI		20.0	26.7%	41.4	61.4	81.9%
OE7	North York Moors SPA and SSSI		3.2	4.3%	13.2	16.4	21.9%

RECEPTOR	SITE NAME	AQAL (µg/m³)	PREDICTED CONCENTRATION (PC) (µg/m³)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) (µg/m³)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m³)	PEC/EAL (%)
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		2.8	3.7%	14.0	16.8	22.4%
OE9	Cliff Ridge SSSI		3.1	4.2%	13.2	16.3	21.8%
OE10	Durham Coast SSSI and Durham Coast NNR		2.9	3.9%	15.8	18.7	25.0%
OE11	Durham Coast SSSI		3.0	4.0%	16.0	19.0	25.3%
OE12	Hart Bog SSSI		2.5	3.4%	16.2	18.7	25.0%
OE13	Langbaurgh Ridge SSSI		3.3	4.4%	14.2	17.5	23.3%
OE14	Lovell Hill Pools SSSI		4.0	5.3%	19.2	23.2	30.9%
OE15	Roseberry Topping SSSI		3.1	4.1%	13.6	16.7	22.3%
OE16	Saltburn Gill SSSI		2.4	3.2%	17.8	20.2	26.9%

Table 8-10: Annual Mean NH_3 Dispersion Modelling results for ecological receptors

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PREDICTED CONCENTRATION (PC) (µg/m^3)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	3	0.01	0.4%	1.2	1.2	40.4%
OE2	Teesmouth and Cleveland Coast SPA, SSSI		0.01	0.4%	1.2	1.2	40.4%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI		<0.01	0.1%	1.3	1.3	43.4%
OE4	Eston Pumping Station LWS		<0.01	0.1%	1.4	1.4	46.8%
OE5	Teesmouth NNR		<0.01	<0.1%	1.3	1.3	43.4%
OE6	Teesmouth and Cleveland Coast SSSI		0.01	0.4%	1.3	1.3	43.8%
OE7	North York Moors SPA and SSSI		<0.01	<0.1%	0.9	0.9	30.0%

RECEPTOR	SITE NAME	AQAL (µg/m^3)	PREDICTED CONCENTRATION (PC) (µg/m^3)	PC/EAL (%)	BACKGROND CONCENTRATION (BC) (µg/m^3)	PREDICTED ENVIRONMENTAL CONCENTRATION (PEC) (µg/m^3)	PEC/EAL (%)
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar		<0.01	<0.1%	1.5	1.5	50.0%
OE9	Cliff Ridge SSSI		<0.01	<0.1%	1.4	1.4	46.7%
OE10	Durham Coast SSSI and Durham Coast NNR		<0.01	<0.1%	1.5	1.5	50.0%
OE11	Durham Coast SSSI		<0.01	<0.1%	1.6	1.6	53.3%
OE12	Hart Bog SSSI		<0.01	<0.1%	1.6	1.6	53.3%
OE13	Langbaurgh Ridge SSSI		<0.01	<0.1%	1.6	1.6	53.3%
OE14	Lovell Hill Pools SSSI		<0.01	<0.1%	1.3	1.3	43.4%
OE15	Roseberry Topping SSSI		<0.01	<0.1%	1.4	1.4	46.7%
OE16	Saltburn Gill SSSI		<0.01	<0.1%	1.1	1.1	36.7%

Table 8-11: Dispersion Modelling Results for Ecological Receptors - Nutrient Nitrogen Deposition (Kg/Ha/Yr)

RECEPTOR ID	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KG/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KG/HA/YR)	PEC (KG/HA/YR)	PEC % CRITICAL LOAD
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	Coastal stable dune grassland (calcareous type)	10	0.42	4.2%	12.5	13.0	129.5%
OE2	Teesmouth and Cleveland Coast SPA, SSSI	Coastal stable dune grassland (calcareous type)	10	0.42	4.2%	12.5	13.0	129.5%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	Sub-Atlantic semi-dry calcareous grassland	10	0.21	2.1%	12.5	12.7	126.7%

RECEPTOR ID	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KG/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KG/HA/YR)	PEC (KG/HA/YR)	PEC % CRITICAL LOAD
OE4	Eston Pumping Station LWS	Sub-Atlantic semi-dry calcareous grassland	10	0.31	3.1%	12.7	13.1	130.5%
OE5	Teesmouth NNR	Coastal stable dune grassland (calcareous type)	10	0.27	2.7%	13.5	13.8	137.8%
OE6	Teesmouth and Cleveland Coast SSSI	Coastal stable dune grassland (calcareous type)	10	0.42	4.2%	12.5	13.0	129.5%
OE7	North York Moors SPA and SSSI	Dry heaths, Raised and blanket bogs, Valley mires, poor fens and transition mires	5	0.04	0.9%	15.5	15.6	311.5%
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	Coastal stable dune grassland (calcareous type)	10	0.04	0.4%	13.5	13.5	135.4%

RECEPTOR ID	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KG/HA/YR)	PC % CRITICAL LOAD	BACKGROUND NITROGEN DEPOSITION (KG/HA/YR)	PEC (KG/HA/YR)	PEC % CRITICAL LOAD
OE10	Durham Coast SSSI and Durham Coast NNR	Coastal stable dune grassland (calcareous type)	10	0.04	0.4%	13.5	13.5	135.4%
OE11	Durham Coast SSSI	Coastal stable dune grassland (calcareous type)	10	0.04	0.4%	13.5	13.5	135.4%
OE12	Hart Bog SSSI	Raised and blanket bogs, Valley mires, poor fens and transition mires	5	0.05	0.9%	14.8	14.8	296.3%
OE14	Lovell Hill Pools SSSI	Outstanding dragonfly assemblage and Coenagrion pulchellum	10	0.03	0.3%	13.5	13.6	135.7%
OE16	Saltburn Gill SSSI	Carpinus and Quercus mesic deciduous forest	15	0.09	0.6%	21.8	21.9	145.7%

Table 8-12: Dispersion Modelling Results for Ecological Receptors - Acid Deposition N (Keq/Ha/Yr)

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
OE1	Teesmouth and Cleveland Coast Ramsar, SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.030	<0.1%	1.00	1.03	5.5%
OE2	Teesmouth and Cleveland Coast SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.030	<0.1%	1.00	1.03	5.5%
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA, SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.015	<0.1%	0.89	0.91	4.8%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
OE4	Eston Pumping Station LWS	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.022	<0.1%	0.91	0.93	5.0%
OE5	Teesmouth NNR	No Sensitive Features						
OE6	Teesmouth and Cleveland Coast SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.030	<0.1%	1.00	1.03	5.5%
OE7	North York Moors SPA and SSSI	Calcareous grassland	Min CL min N 0.321 Min CL Max N 0.469 Min CL Max S 0.148	0.003	0.6%	1.26	1.26	251.2%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
OE8	North Cumbria Coast SPA, Durham Cost SAC, Northumbria Coast Ramsar	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.003	<0.1%	0.84	0.84	4.5%
OE10	Durham Coast SSSI and Durham Coast NNR	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.003	<0.1%	0.84	0.84	4.5%
OE11	Durham Coast SSSI	Calcareous grassland	Min CL min N 0.856 Min CL Max N 4.856 Min CL Max S 4.0	0.003	<0.1%	0.84	0.84	4.5%

RECEPTOR	SITE NAME	MOST STRINGENT CRITICAL LOAD CLASS APPLICABLE FOR THE SITE	LOWER VALUE OF APPLICABLE CRITICAL LOAD RANGE	PC (KEQ/HA/YR)	PC % CRITICAL LOAD	BACKGROUND ACID DEPOSITION (KEQ/HA/YR)	PEC (KEQ/HA/YR)	PEC % CRITICAL LOAD
OE12	Hart Bog SSSI	Calcareous grassland	Min CL min N 0.321 Min CL Max N 0.469 Min CL Max S 0.148	0.003	0.7%	0.82	0.82	176.3%
OE14	Lovell Hill Pools SSSI	No Sensitive Features						
OE16	Saltburn Gill SSSI	Calcareous grassland	Min CL min N 0.142 Min CL Max N 2.639 Min CL Max S 2.448	0.007	0.2%	0.81	0.82	31.2%

ANNEX C ANNEX C: 2023 DIFFUSION TUBE SURVEY

Table 8-13: 2023 Diffusion Tube Survey Results

SITE	UNADJUSTED MEAN (µg/m^3)	BIAS ADJUSTED MEAN NO_2 (µg/m^3)
DT01	22.6	19.0
DT02	35.0	29.4
DT04	13.0	11.0
DT05	13.0	10.9
DT06	37.3	31.3
DT07	21.7	18.2
DT08B*	12.9	10.8
DT09	10.6	8.9
DT10	7.9	6.6
DT11	8.9	7.5
DT12	7.5	6.3
DT13	14.1	11.8
DT14	10.5	8.8
DT15	16.6	13.9
DT16	13.8	11.6
DT17	12.8	10.8
DT18	18.5	15.6
DT19	13.6	11.4
DT20	14.4	12.1
DT21	18.8	15.8

*Moved slightly, along the same road