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8.0 AIR QUALITY

8.1 Introduction

8.1.1 This chapter of the Preliminary Environmental Information (PEI) Report identifies the potential impacts and effects of the Proposed Development on air quality. The air quality assessment has considered a realistic worst case for both Phases 1 and 2 and Cases A and B; for further detail regarding the phasing of the Proposed Development, and the different technologies being considered (i.e., Case A and Case B), please refer to Chapter 4: Proposed Development (PEI Report, Volume I).

8.1.2 The focus of the air quality assessment is on the following:

- construction emissions from vehicles;
- construction dust; and
- operational emissions from the production facility.

8.1.3 Emissions from Non-Road Mobile Machinery (NRMM) and operational emissions from vehicles are also discussed within the air quality assessment.

8.1.4 The preliminary assessment has been undertaken in accordance with best practice guidance from the Department for Environment, Food and Rural Affairs (Defra), the Environment Agency (EA) and the Institute of Air Quality Management (IAQM).

8.1.5 This chapter is supported by the following figures (PEI Report, Volume II) and technical appendices (PEI Report, Volume III):

- 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;
- Figure 8-5: Air Quality Study Area – Operational Model Inputs Phase 2;
- Figure 8-6: Annual Mean NO_2 Process Contribution for the Proposed Development during Normal Operations for Phase 1 and 2 Combined – Case B, for the Worst Affected Meteorological Year of 2022;
- Figure 8-7: 99.79th Percentile 1h NO_2 Process Contribution for the Proposed Development during Normal Operations for Phase 1 and 2 Combined – Case B, for the Worst Affected Meteorological Year of 2022;
- Figure 8-8: 99.79th Percentile 1h NO_2 Process Contribution for the Proposed Development during Start Up for Phase 1 and 2 Combined – Case A, for the Worst Affected Meteorological Year of 2021;
- Figure 8-9: 99.79th Percentile 1h NO_2 Process Contribution for the Proposed Development during Emergency Operations for Phase 1 and 2 Combined – Case B, for the Worst Affected Meteorological Year of 2022;
- Appendix 8A: Air Quality – Construction Assessment; and

- Appendix 8B: Air Quality – Operational Phase.

8.2 Legislation and Planning Policy Context

8.2.1 This section identifies and describes legislation, planning policy and guidance of relevance to the assessment of the potential air quality impacts.

Legislative Background

The Air Quality Directive 2008

8.2.2 European Union (EU) air quality legislation is provided within the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (The Air Quality Directive) (Council for European Communities, 2008), which is transcribed into United Kingdom (UK) legislation by The Air Quality Standards Regulations 2010 (The Stationery Office Limited, 2010) as amended by the Air Quality Standards (Amendment) Regulations 2016 (The Stationery Office Limited, 2016). These limit values are legally binding on the UK and have been set with the aim of avoiding, preventing, or reducing harmful effects on human health and on the environment.

8.2.3 EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the EU (Withdrawal) Act 2018 (c. 16) (The Stationery Office Limited, 2018). 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 the UK's exit from the EU.

The Air Quality Standards Regulations 2010

8.2.4 The 2010 Regulations (The Stationery Office Limited, 2010) set air quality limits for a number of major air pollutants that have the potential to impact public health, such as nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and particulate matter (PM) in the form of PM_{10} (PM of 10 micrometres (µm) diameter or less). The 2010 Regulations also include an exposure reduction objective for $PM_{2.5}$ (PM of 2.5 µm diameter or less) in urban areas and a national target value for $PM_{2.5}$.

The Environment Act 1995

8.2.5 The Environment Act 1995 (H.M Government, 1995a) requires the UK Government to produce a national Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland containing standards, objectives and measures for improving ambient air quality and to keep the policies identified under review.

8.2.6 Four versions of the national AQS have been published to date (2000 to 2019) with a further 2023 version having recently been subject to consultation. The current version is called the Clean Air Strategy 2019 (Defra, 2019). The national AQS requires that local authorities undertake a tiered assessment of air quality within their jurisdiction to determine whether (or not) the objectives established in the AQS are being achieved. Where the objectives are likely to be exceeded, the local authority must designate an Air Quality Management Area (AQMA) and establish an Air Quality Action Plan (AQAP), which outlines measures to achieve the objectives. These

objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure. The human health objectives that are applicable to this assessment are set out in Table 8-1. Defra has responsibility for coordinating assessments and AQAPs for the UK as a whole.

Table 8-1: National Air Quality Strategy Objectives (NAQS) - Protection of Human Health

POLLUTANT	SOURCE	CONCENTRATION ($\mu G/M^3$)	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
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

8.2.7 No AQMAs have been declared for the Proposed Development Site or the surrounding area. The nearest AQMA to the Proposed Development Site is located outside of the defined air quality Study Area (refer to Section 8.3), in Staithes, approximately 20 km to the south-east of the Proposed Development Site. This AQMA is designated for the exceedance of the 24-hour PM_{10} limit value. Based on Defra forecast models and local authority monitoring data, no exceedances of the EU standards have been identified in the vicinity of the Proposed Development Site.

The Environment Act 2021

8.2.8 The Environment Act 2021 (HM Government, 2021) amends the Environment Act 1995 (HM Government, 1995). 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). Part IV of the Environment Act (2021) requires the government to produce a new national AQS which contains standards, objectives and measures for improving ambient air quality. The AQS proposes for the Secretary of State (SoS) to publish a report reviewing the AQS every five years (as a minimum and with yearly updates to Parliament). The Act also included a proposal that the Government set two targets by October 2022: the first on the amount of $PM_{2.5}$ pollutant in the ambient air and a second long-term target set at least 15 years ahead to encourage stakeholder investment.

8.2.9 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (The Stationery Office Limited, 2022) introduced the two targets described above with a target level for annual mean concentrations of $PM_{2.5}$ to be achieved at relevant monitoring stations by 31st December 2040 and an exposure reduction target for the Secretary of State (SoS) to report on by 15th July 2041. For the purposes of these regulations, relevant monitoring locations are fixed monitoring stations within the national monitoring network. There are no such monitoring locations within the air quality Study Area for the Proposed Development.

Critical Levels and Loads

8.2.10 In addition to the ambient thresholds described above for human health critical levels for the protection of vegetation have also been set out in legislation (The Air Quality Standards Regulations 2010) and Environment Agency air emissions risk assessment guidance (Environment Agency, 2023b). The impact of emissions from the Proposed Development on sensitive ecological receptors can be quantified in two ways:

- as direct impacts arising due to increases in atmospheric pollutant concentrations, assessed against defined 'critical levels'; and
- as indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface, assessed against defined 'critical loads.'

8.2.11 The critical levels for the protection of vegetation and ecosystems are set out in Table 8-2 and apply regardless of the habitat type or species present at the habitat receptor. In the case of ammonia (NH_3), the greater sensitivity of lichens and bryophytes to these pollutants is reflected in the application of two critical levels, with a stricter critical level applied to locations where such species are present.

Table 8-2: Critical Levels (CL) – Protection of Vegetation and Ecosystems

POLLUTANT	SOURCE	CONCENTRATION ($\mu G/M^3$)	MEASURED AS
Oxides of nitrogen (NO_x)	UK objective value	30	Annual mean
	UK target value	75	Daily Mean
SO_2	UK target value for lichen and bryophytes	10	Annual mean
	UK objective value	20	Annual mean
Ammonia (NH_3)	UK target value for lichen and bryophytes	1	Annual mean
	UK target value	3	Annual mean

8.2.12 Critical load criteria for the deposition of nutrient nitrogen and acidifying species are dependent on the habitat type and species present, and therefore are specific to the sensitive receptors considered within the assessment. The relevant critical loads for the ecological receptors considered in this assessment are defined on the Air Pollution Information System website (Centre for Ecology and Hydrology and APIS, 2017).

8.2.13 Throughout the remainder of this chapter and the associated technical appendices, NAQS objectives, UK target values (i.e., Environmental Assessment Levels) and critical levels are collectively referred to as Air Quality Assessment Levels (AQALs).

Industrial Emissions Directive 2010 and Environmental Permitting Regulations (2016

8.2.14 The EU's Industrial Emissions Directive (IED) (European Commission, 2010) provides operational limits and controls to which regulated plant must comply, including Emission Limit Values (ELVs) for pollutant releases into the air. The operator of a plant covered by the IED is required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole. European BAT reference documents (BRefs) are published for each industrial sector regulated under the IED, and they include BAT-Associated Emission Levels (BAT-AELs) which are expected to be met through the application of BAT. These levels may be the same as the ELVs published in the IED, or they may be more stringent.

8.2.15 However, as an emerging technology, there is currently no finalised BRef or BAT guidance document available for a Production Facility with associated Carbon Capture, and therefore no BAT-AELs have been defined for the activity to date. However, guidance on Emerging techniques for hydrogen production with carbon

capture has been released (EA, 2023) and this will form the basis for discussions with the EA to agree appropriate BAT and AELs. This will be done as the environmental permit required for the operation of the Proposed Development is developed. The permit application is being made generally in parallel with this DCO submission.

Sensitive Ecosystems

8.2.16 The UK is bound by the terms of the European Birds (European Commission, 2009) and Habitats Directives (European Commission, 1992) and the Ramsar Convention (Ramsar, 1971). The Conservation of Habitats and Species Regulations 2017 (H.M Government, 2017) (the 2017 Regulations) provide for the protection of European Sites created under these i.e., Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, Special Protection Areas (SPAs) and provisional SPAs (pSPAs) classified under the Birds Directive. Specific provisions of the European Directives are also applied to SACs and candidate SACs (cSACs) which requires these sites to be given special consideration, and for further assessment to be undertaken for any development which is likely to lead to a significant effect upon them. Consideration has also been given to Ramsar sites, designated as wetlands of international importance.

Planning Policy Context

National Planning Policy

National Policy Statement EN-1

8.2.17 National Policy Statements (NPSs) are, where in place, the primary basis for the assessment and determination of applications for Nationally Significant Infrastructure Projects (NSIPs) such as the Proposed Development.

8.2.18 The Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011) requires the consideration of significant air emissions, their mitigation and any residual effects, the predicted absolute emission levels after application of mitigation, the relative change in air quality from existing concentrations and any potential eutrophication impacts as a result of a proposed development's project stages, including contributions from additional road traffic. All the above is covered in the within the air quality assessment for the Proposed Development. Where a project could result in deterioration in air quality in an area where national air quality limits are not being met or may lead to a new area breaching national air quality limits, or where substantial changes in air quality concentrations are predicted, such effects would be expected to be given substantial weight in consideration of the acceptability of the proposal. Where a project is likely to lead to a breach of statutory air quality limits, the developer should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed.

8.2.19 The UK Government is currently reviewing and updating the energy NPSs. It is doing this to reflect its policies and strategic approach for the energy system that is set out in the Energy White Paper (December 2020), and to ensure that the planning policy framework enables the delivery of the infrastructure required for the country's transition to net zero carbon emissions. As part of the NPS review process, the

government published a suite of revised draft NPSs for new energy infrastructure on 6 September 2021. A further update was published in March 2023 by the Department for Energy Security & Net Zero (DESNZ, 2023). The 2023 Draft EN-1 states at paragraph 4.11.2 that:

"The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest… Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health".

8.2.20 Paragraph 4.11.9 and 4.11.10 state:

"*In considering an application for development consent the Secretary of State should focus on whether the development itself is an acceptable use of the land or sea, and the impact of that use, rather than the control of processes, emissions or discharges themselves".*

"The Secretary of State should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes…will be properly applied and enforced by the relevant regulator".

National Policy Statement EN-4

8.2.21 NPS EN-4 sets out planning policy specific to gas supply infrastructure and gas an oil pipeline (DECC, 2011b). The NPS states that the effect of gas emissions and specific effects on flaring and venting gas should be assessed and makes particular reference to EN-1 in regard to assessing the potential effects. EN-4 does not introduce any additional requirements for air quality assessments, and relevant emissions from the Proposed Development are included within this assessment.

8.2.22 As for EN-1, an updated draft of EN-4 was release for consultation in 2023 (DESZT, 2023b). As for the extant EN-4, the update does not introduce any additional requirements for assessment of emissions to air that are not included within EN-1.

National Policy Statement EN-5

8.2.23 NPS EN-5 sets out planning policy specific to gas supply infrastructure and gas an oil pipeline (DECC, 2011c). The NPS does not include any policies specific to emission to air. The updated draft (DESNZ, 2023c) also does not include any policies specific to emissions to air.

The National Planning Policy Framework (NPPF) (2023)

8.2.24 The NPPF (Ministry of Housing, Communities and Local Government, 2023) concisely sets out national policies and principles on land use planning. Paragraph 174 of the NPPF states that:

"*Planning policies and decisions should contribute to and enhance the natural and local environment by… e) preventing new and existing development from contributing*

to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"

8.2.25 The effect of the Proposed Development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities when making decisions for individual planning applications. Paragraph 186 of the NPPF states that:

"*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas… Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.*"

Planning Practice Guidance (PPG) for Air Quality (2021)

8.2.26 The National Planning Practice Guidance (NPPG) (Department for Communities and Local Government, 2021) was first launched on 6th March 2014. It was last updated on 24th June 2021 and provides a web-based guidance resource in support of the NPPF. It provides a summary of the air quality issues set out in the NPPF and goes on to note that assessments of the impact of a proposed development on air quality should include the following information:

- the existing air quality in the study area (existing baseline);
- the future air quality without the development in place (future baseline); and
- the future air quality with the development in place (with mitigation).

8.2.27 The PPG then advises that a planning application should proceed to decision with appropriate planning conditions or planning obligations, if the proposals (including mitigation) would not lead to an unacceptable risk from air pollution and prevent sustained compliance with EU limit values.

Local Planning Policy

8.2.28 Local air quality planning policy may be something which the SoS considers is both important and relevant to the determination of the application for the Proposed Development. Local air quality planning policy has been presented for those authorities within which the Proposed Development is located and authorities which are included within the air quality study area.

Redcar and Cleveland Borough Council Local Plan (2018)

8.2.29 Redcar and Cleveland Borough Council (RCBC) adopted its Local Plan in May 2018 (RCBC, 2018), which includes Policy SD 4: General Development Principles, which states that:

"All development must be designed to a high standard. Development proposals will be expected to…:

n. minimise pollution including light and noise and vibration levels to meet or exceed acceptable limits…"

8.2.30 Policy LS 4: South Tees Spatial Strategy, states that:

"The Council and its partners will aim to….:

l. encourage clean and more efficient industry in the South Tees area to help reduce carbon dioxide emissions and risk of environmental pollution…"

Stockton-on-Tees Borough Council Local Plan (2019)

8.2.31 Stockton-on-Tees Borough Council (STBC) adopted its Local Plan in January 2019 (STBC, 2019), which includes Policy SD5: Natural, Built and Historic Environment, which states that:

"To ensure the conservation and enhancement of the environment alongside meeting the challenge of climate change the Council will:

1. Conserve and enhance the natural, built and historic environment through a variety of methods including:…

l. Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of ground, air, water, light or noise pollution or land instability. Wherever possible proposals should seek to improve ground, air and water quality."

8.2.32 Policy ENV7: Ground, Air, Water, Noise and Light Pollution states that:

"1. All development proposals that may cause groundwater, surface water, air (including odour), noise or light pollution either individually or cumulatively will be required to incorporate measures as appropriate to prevent or reduce their pollution so as not to cause unacceptable impacts on the living conditions of all existing and potential future occupants of land and buildings, the character and appearance of the surrounding area and the environment.

2. Development that may be sensitive to existing or potentially polluting sources will not be sited in proximity to such sources. Potentially polluting development will not be sited near to sensitive developments or areas unless satisfactory mitigation measures can be demonstrated.

3. Where development has the potential to lead to significant pollution either individually or cumulatively, proposals should be accompanied by a full and detailed assessment of the likely impacts. Development will not be permitted when it is considered that unacceptable effects will be imposed on human health, or the environment, taking into account the cumulative effects of other proposed or existing sources of pollution in the vicinity. Development will only be approved where suitable mitigation can be achieved that would bring pollution within acceptable levels."

Hartlepool Borough Council Local Plan (2018)

8.2.33 Hartlepool Borough Council (HBC) adopted its Local Plan in May 2018 (HBC, 2018), which includes Paragraph 9.49, which states that:

"Residents and visitors should not suffer from pollution (noise, dust, fumes or odour) or poor air and water quality. The location and design of development should have

due regard to minimising the impacts of pollution both on existing land uses and the future proposed land use."

8.3 Assessment Methodology and Significance Criteria

Study Area

8.3.1 The air quality Study Areas for the preliminary assessments carried out have been defined according to the appropriate guidance for the type of assessment being undertaken (i.e., construction dust, construction traffic and the operational Proposed Development), and therefore these vary for the various types of air quality assessments.

8.3.2 The Study Area for the construction dust and NRMM emissions has been applied in line with IAQM guidance (IAQM, 2014), extending:

- up to 350 m beyond the Proposed Development Site and 50 m from the construction traffic routes (up to 500 m from the Proposed Development Site entrances), for human health receptors; and
- up to 50 m from the Proposed Development Site and construction traffic routes (up to 500 m from the Proposed Development Site entrances) for ecological receptors.

8.3.3 The Study Area for the traffic assessment is defined in the screening criterion set out in the Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality (Highways England, 2019) and the IAQM/Environmental Protection UK (EPUK) guidance (EPUK/IAQM, 2017), which states that only properties and habitat sites within 200 m of affected roads (roads that experience a change in traffic flow above a certain criteria) should be considered in road traffic emissions assessments.

8.3.4 The Study Area for the operational Proposed Development point source emissions extends up to 10 km from the emission sources to assess the potential impacts on ecological receptors, in line with the EA risk assessment methodology (Defra and Environment Agency, 2016) and considers:

- SPAs, SACs, Ramsar sites and Sites of Special Scientific Interest (SSSIs) within 10 km of the Proposed Development Site; and
- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWSs) and National and Local Nature Reserves (NNRs and LNRs)) within 2 km of the Proposed Development Site.

8.3.5 In terms of human health receptors, impacts from the operational Proposed Development become negligible well within 2 km and therefore sensitive receptors for the human health impacts only are concentrated within a 2 km Study Area.

Impact Assessment Methodology

8.3.6 The potential emissions to air from construction and operation of the Proposed Development have been determined or estimated, and key local receptors have been identified, together with the current local ambient air quality.

8.3.7 Impacts arising from the construction and operational phases of the Proposed Development have been predicted, which has enabled the preliminary assessment of the impacts associated with the Proposed Development on the existing local ambient air quality and particularly on the identified sensitive receptors.

8.3.8 The assessment methodology for construction phase emissions is outlined below, with further details provided in the accompanying technical appendix (Appendix 8A: Air Quality – Construction Assessment (PEI Report, Volume III)).

8.3.9 The process and traffic emissions assessments refer to the relevant AQALs as defined in Tables 8-1 to 8-2.

Construction Phase – Construction Dust Assessment

8.3.10 The movement and handling of soils and spoil during construction activities for the Proposed Development is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate and depends heavily upon the meteorological and ground conditions at the actual time and location of the work, and the nature of the activity being carried out.

8.3.11 At present, there are no statutory UK or EU standards relating to the assessment or control of dust. The emphasis of the regulation and control of construction dust, therefore, is through the adoption of Best Practicable Means (BPM) when working on-site to mitigate any potential impacts. It is intended that significant adverse environmental effects are avoided at the design stage and through embedded mitigation where possible, including the use of good working practices to minimise dust formation – refer to Section 8.5.

8.3.12 The IAQM provides guidance for good practice and for qualitative assessment of risk of dust emissions from construction and demolition activities (IAQM, 2014). The guidance considers the risk of dust emissions from unmitigated activities to cause human health impacts (associated with PM_{10}), dust soiling impacts, and ecological impacts (such as physical smothering and chemical impacts, for example from the deposition of alkaline materials). The appraisal of risk is based on the scale and nature of activities and on the sensitivity of receptors, and the outcome of the appraisal is used to determine the level of good practice mitigation required for adequate control of dust.

8.3.13 The preliminary assessment undertaken for the Proposed Development is consistent with the overarching approach to the assessment of the impacts of construction, and the application of example descriptors of impact and risk set out in IAQM guidance. It considers the significance of potential effects with no mitigation and recommends mitigation measures appropriate to the identified risks to receptors. The steps in the assessment are to:

- identify receptors within the appropriate Study Area from the Proposed Development Site;
- identify the magnitude of impact through consideration of the scale, duration and location of activities being carried out (including demolition, earthworks,

construction and trackout, where construction vehicles could carry mud onto the public highway);

- establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- determine the risk of significant effects on receptors occurring as a result of the magnitude of impact and the sensitivity of the receptors;
- determine the level of mitigation required based on the level of risk, to reduce potential effects at receptors to levels that are insignificant or negligible; and
- summarise the potential residual effects of the mitigated works.

8.3.14 The criteria for the assessment of impact magnitude, receptor sensitivity and risk are summarised in Appendix 8A: Air Quality – Construction Assessment (PEI Report, Volume III).

Construction Phase - Construction Site Plant Non-Road Mobile Machinery Assessment

8.3.15 Construction of Phase 1 is likely to last approximately two years. Phase 2 works will commence thereafter (approximately late 2027/early 2028) and last a further two to three years, with construction expected to be completed by late 2029 or early 2030.

8.3.16 The duration of the Phase 2 construction might be extended when compared to Phase 1 due to potential overlaps in Phase 1 commencement of operation and construction activities for Phase 2, requiring management of simultaneous operations and minimisation of risks and impacts.

8.3.17 There are likely to be emissions to air during construction activities arising from on-site construction plant or NRMM. The IAQM guidance (IAQM, 2014) states:

"Experience of assessing the exhaust emissions from on-site plant … and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/ vehicles and their operating hours and locations to assess whether a significant effect is likely to occur."

8.3.18 Emissions from NRMM associated with the Proposed Development will be temporary and localised and will be controlled via the application of appropriate emissions standards and through best-practice mitigation measures – refer to Section 8.5. For that reason, effects associated with construction phase NRMM emissions are highly unlikely to be significant and, therefore, have been scoped out of this assessment. This approach is in line with Appendix 1B: Scoping Opinion (PEI Report, Volume III) for the Proposed Development.

Construction and Operational Phase - Road Traffic Assessment

8.3.19 The incomplete combustion of fuel in vehicle engines results in the presence of combustion products of CO, PM_{10}, and $PM_{2.5}$ in exhaust emissions as well as hydrocarbons (HC) such as benzene and 1,3-butadiene. Similarly, but to a lesser

extent, any sulphur in the fuel can be converted to SO_2 that is then released to the atmosphere. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form NO_x, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle across the UK vehicle fleet in the long term.

8.3.20 Although SO_2, CO, benzene, and 1,3-butadiene are present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of the Proposed Development. This is because the released concentrations of these pollutants are low enough to not give rise to significant effects due to the numbers of anticipated vehicles associated with either the construction or operation of the Proposed Development. In addition, no areas within the administrative boundaries of the relevant councils are considered at risk of exceeding the relevant objectives for these pollutants, and therefore the risks to the attainment of the relevant air quality objectives in the vicinity of the Proposed Development Site are considered to be negligible. Emissions of SO_2, CO, benzene and 1,3-butadiene from road traffic are, therefore, not considered further within this preliminary assessment.

8.3.21 The exhaust emissions from road vehicles that do have the potential to affect ambient concentrations of pollutants are NO_2, PM_{10} and $PM_{2.5}$. Therefore, the preliminary assessment of the significance of road traffic air quality effects only considers these pollutants.

8.3.22 DMRB LA105 (Highways England, 2019) sets out criteria to establish the need for an air quality assessment from road traffic. The standard considers the following changes in anticipated traffic as a result of a development in order to identify the need for further evaluation:

- Annual Average Daily Traffic (AADT) flows of more than 1,000 vehicles;
- 200 Heavy Duty Vehicles (HDVs - all vehicles greater than 3.5 tonnes gross weight, including buses);
- a change in the speed band; or
- a change in carriageway alignment by >5 m.

8.3.23 Guidance published by the IAQM proposes a lower threshold in AADT flow to warrant a detailed air quality assessment, namely:

- a change of 500 Light Duty Vehicles (LDV, all vehicles less than 3.5 tonnes gross weight) or 100 HDV when outside of an AQMA.

8.3.24 For changes in traffic below these criteria, significant changes in air quality are not expected.

8.3.25 Considering that the Proposed Development does not include any modifications to road carriageways and that there is no indication that there will be any change in average traffic speed due to the Proposed Development, the appropriate metric to

determine if a detailed air quality assessment is necessary in this instance is the AADT and HDV flow criteria.

8.3.26 In order to conduct a worst-case assessment of the air quality impacts of construction traffic, the lower IAQM screening criteria has been applied for this assessment. The AADT associated with the construction phase of the Proposed Development, therefore, requires detailed air quality modelling.

8.3.27 This assessment has used the latest version of dispersion model software 'ADMS-Roads' (v5.0.0.1) to quantify baseline pollution levels at selected receptors due to road traffic emissions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies.

8.3.28 The details of the preliminary assessment of construction and operational traffic are presented in Chapter 15: Traffic and Transport (PEI Report, Volume I).

8.3.29 The traffic data used in this preliminary assessment includes the following scenarios:

- 2019 Baseline Scenario (for model verification process) (Base);
- 2025 Future Construction Year Base (Future Baseline); and
- 2025 Future Construction Year Base + Peak Construction Scenario (month 17 of construction) (Future Year with Proposed Development).

8.3.30 The future decommissioning baseline scenario is not included, as it is considered that the effects would be comparable to or lower than construction impacts, particularly given the expected improvements in vehicle fleet emissions over that time.

8.3.31 Data in the form of traffic flows, composition (percentage Heavy Goods Vehicles (HGVs)) and speed has been used in modelling of emissions from road traffic during the construction phase.

Operational Phase – Operational Traffic Assessment

8.3.32 No detailed assessment of operational traffic emissions has been made as the numbers of additional vehicles associated with the operational phase of the Proposed Development are predicted to be below the DMRB and IAQM screening criteria for requiring assessment. Significant air quality effects are, therefore, not expected to be associated with the Proposed Development's operational traffic flows. This is in line with the Planning Inspectorate's ('the Inspectorate's') EIA Scoping Opinion at ID 3.1.1 (The Inspectorate, 2023).

Operational Phase – Process Emissions from the Operational Plant

8.3.33 Emissions from the Proposed Development, assumed to be operational in 2028 (Phase 1) and 2030 (Phase 2) have been assessed using the Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2016) to identify where proposed emissions can be screened out as being unlikely to cause significant air quality effects. In line with EA Guidance (EA, 2023) detailed dispersion modelling using the atmospheric dispersion model ADMS (currently ADMS 5.2.2) has been used to calculate the concentrations of pollutants at identified receptors. The pollutants

assessed from operational combustion sources include NO_x (ecosystems only), nitrogen deposition (ecosystems only) and acid deposition (ecosystems only), NO_2, CO, SO_2 (ecosystems and human health), PM_{10} and $PM_{2.5}$. These concentrations will be compared with the defined AQALs for each pollutant species as summarised in Table 8-1 and Table 8-2. There will be no emissions to air of amines and amine degradation products during normal operation, as the carbon dioxide capture process is a closed loop system.

8.3.34 Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model to be employed has been developed for UK regulatory use. Further details of the operational air quality modelling can be found in Appendix 8B: Air Quality – Operational Assessment (PEI Report, Volume III).

8.3.35 Modelling will be undertaken assuming that the Proposed Development is operated continuously as this is considered to represent the worst-case scenario in terms of the annual average operational emissions. The worst result from five years of meteorological data, assuming phases 1 and 2 are operational, from either Case A or Case B have been presented and evaluated within this chapter.

8.3.36 It is recognised that during start-up and shut down there may be short periods where emission concentrations are higher than those assessed for the annual average. At this stage in the design process there is limited data on the duration and release concentration of these emissions. Whilst the emission concentration may be higher, the gas flow rate will be lower than that to be modelled, therefore resulting in mass emissions that are likely to be reasonably comparable with steady state operation. Furthermore, the peak emission concentrations will be limited to the transient period, during which the flue gas is introduced into the absorber and not for the full duration of a start-up condition. It is therefore considered that this will have a minimal impact on the short-term impacts from the Proposed Development. It is anticipated that detail on start-up emissions will become available during the Front End Engineering Design (FEED) process and confirmed during commissioning, the impact of short-term emissions of this type will therefore be addressed in detail as part of the Environmental Permit application process. Additionally, an initial assessment has been provided within this PEIR with the information currently available for both start up and emergency conditions are presented in Appendix 8B.

8.3.37 The first year of full operation (referred to as ‘opening’) of the Proposed Development, including Phase 1 and Phase 2, is assumed to be 2030 for the purpose of this preliminary assessment.

8.3.38 The assessment of worst-case long-term (annual mean) and short-term (daily and hourly mean) emissions resulting from the operation of the Proposed Development has been undertaken by comparison of the maximum predicted process contributions at identified sensitive receptors with the annual mean and hourly mean AQALs, taking into consideration the baseline air quality, in accordance with the EA’s Risk Assessment methodology (Defra and Environment Agency, 2016).

8.3.39 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_2 concentrations at ecological sites (selected in conjunction with biodiversity specialists), determined through dispersion modelling, to calculate nitrogen deposition rates (expressed as kilograms per hectare per year, Kg/ha/yr). These deposition rates have then been compared to the Critical Loads for nitrogen published by UK Air Pollution Information System (APIS) (Centre for Ecology and Hydrology and APIS, 2016), taking into consideration the baseline air quality.

8.3.40 Potential increases in acidity on designated ecological receptors from depositional contributions of NO_2 have also be considered. Acid deposition is derived from nitrogen deposition modelling values using standard conversion factors and expressed as kilograms of nitrogen equivalent per hectare per year (KqNeq/ha/yr). The process contribution acid deposition rates and baseline deposition rates have been used within the APIS Critical Load Function Tool (Centre for Ecology and Hydrology and APIS, 2016) to determine whether the contribution will result in exceedance of the defined acidity Critical Loads for the most sensitive features.

8.3.41 Several non-statutory habitat sites have been assessed for both nutrient nitrogen and acid deposition, due to the proximity of these sites to the Proposed Development Site. These include LWSs and LNRs. For these sites, there is no data available on APIS with regards to habitat types present and therefore the relevant critical loads class to be applied, and therefore process contributions will be considered against an appropriate critical load determined for the appropriate habitat type as informed by Chapter 12: Ecology and Nature Conservation (PEI Report, Volume I).

8.3.42 An assessment of cumulative impacts with other proposed developments that could interact with the operational impacts and effects of the Proposed Development will be carried out – this will be reported in the Environmental Statement (ES) in the cumulative and combined effects assessment. This may change the total concentration of pollutants in the ES relative to those reported herein.

Significance Criteria

Evaluation of Significance – Construction Phase Dust Assessment

8.3.43 For potential amenity effects, such as those related to dust deposition, the aim is to bring forward a Proposed Development that includes mitigation measures as necessary, that minimises the potential for amenity, human health and ecological impacts as a result of the construction works.

8.3.44 The IAQM guidance (IAQM, 2014) does not provide a method for the evaluation of impacts on receptors from construction dust, rather a means to determine the level of mitigation required to avoid significant effects on receptors. The guidance indicates that application of appropriate mitigation (refer to Section 8.5) should ensure that residual effects will normally be Not Significant.

Evaluation of Significance – Traffic and Operational Emissions Assessment

8.3.45 The evaluation of the significance of air quality effects from the traffic and operational point sources is based on the criteria referenced in IAQM/EPUK guidance

(IAQM, 2017), and in the EA Risk Assessments for Your Environmental Permit guidance (Defra and Environment Agency, 2016). The predicted changes in pollutant concentrations can be compared to AQALs to determine the magnitude of change.

8.3.46 For a change of a given magnitude, the IAQM publication Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017) has published recommendations for describing the magnitude of long-term impacts at individual receptors and describing the significance (refer to Table 8-3) of such impacts. This terminology has been changed where appropriate to maintain consistency with the rest of this PEI Report – where the IAQM uses 'substantial' this has been changed to 'Major', whilst 'slight' has been changed to 'Minor'.

Table 8-3: Air Quality Impact Descriptors for Long Term Changes in Ambient Concentrations

LONG TERM AVERAGING CONCENTRATION AT RECEPTOR	PERCENTAGE CHANGE IN ANNUAL MEAN CONCENTRATIONS (%)				
	UP TO 0.5% IMPERCEPTIBLE	0.5 – 1% VERY LOW	2-5% LOW	6-10% MEDIUM	>10% HIGH
75% or less of AQAL	Negligible	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Negligible	Minor	Moderate	Moderate	Major
103-109% of AQAL	Negligible	Moderate	Moderate	Major	Major
110% or more of AQAL	Negligible	Moderate	Major	Major	Major
AQAL = Air Quality Assessment Level (NAQS objective or EU Limit Value or Environmental Assessment Level)					

8.3.47 The IAQM guidance (IAQM, 2017) is not explicit in the identification of whether any of the above impact descriptors should be considered 'Significant' or 'Not Significant' effects, rather it indicates that the descriptors should be applied to individual receptors and a 'Moderate' adverse impact at one receptor may not mean that the overall impact has a 'Significant' effect; other factors need to be considered. However, the guidance does indicate that 'Negligible' impacts are likely to lead to effects that are 'Not Significant' and that 'Major' impacts describe the potential for 'Significant' effects. The judgment of significance of effects adopted within this assessment is discussed below.

8.3.48 The EA EPR Risk Assessment screening criteria for comparison of Process Contributions (PCs) with AQAL states that an emission may be considered insignificant (or negligible) where:

- short term PC <=10% of the AQAL; and
- long term PC <=1% of the AQAL.

8.3.49 Where an emission cannot be screened out as insignificant, the second stage of screening considers the PCs in the context of the existing background pollutant concentrations; the predicted environmental concentration (PEC) is considered acceptable where:

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

8.3.50 Where the PEC is not predicted to exceed the AQAL, and the proposed emissions comply with the BAT associated emission levels (or equivalent requirements), the emissions are considered acceptable by the EA.

8.3.51 The IAQM guidance indicates that the EA threshold criterion of 10% of the short term AQAL is sufficiently small in magnitude to be regarded as having an 'insignificant' effect. The IAQM guidance deviates from the EA guidance (discussed below) with respect to the background contribution; the IAQM guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the PC is used to measure the impact, not the overall concentration at a receptor. The peak short-term PC from an elevated source is described as follows:

- PC <=10% of the AQAL represents an 'insignificant' (Negligible) impact;
- PC 11-20% of the AQAL is small in magnitude representing a 'slight' (Minor) impact;
- PC 21-50% of the AQAL is medium in magnitude representing a Moderate impact; and
- PC >51% of the AQAL is large in magnitude representing a 'substantial' (Major) impact.

8.3.52 The impact of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, can be evaluated using the EA and Natural England insignificance criterion of 1% of the long-term objective, as above.

8.3.53 Where emissions are not screened as insignificant (Negligible), the descriptive terms for the air quality effect outlined in Table 8-4 above can be applied. Additionally, where air quality effects cannot be screened as insignificant at designated ecosystem sites then further evaluation is required by biodiversity specialists. It is understood that this will be provided within Chapter 12: Ecology and Nature Conservation of the ES.

Evaluation of Significance – Proposed Development as a Whole

8.3.54 Following the assessment of each individual air quality effect (construction dust, traffic and operational plant (Phases 1 and 2, Cases A and B)), the significance of all the reported effects can then be considered for the Proposed Development in overall terms, recognising that construction dust and traffic will occur in the same time period, but operational effects would occur at a later date. The potential for the Proposed Development to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality will be considered if relevant, but the principal focus will be any change to the likelihood of future achievement of the air quality standards (which also relate to compliance with local authority goals for local air quality management and objectives are set for the protection of human health).

8.3.55 In terms of the significance of the effects (consequences) of any adverse impacts, an effect will be reported as being either 'Not Significant' or 'Significant'. If the overall effect of the development on local air quality or on amenity at sensitive sites (e.g., residential location) is found to be 'Moderate' or 'Major' this will be deemed to be 'Significant' for EIA purposes. Effects found to be 'Minor' or 'Negligible' will be considered to be 'Not Significant'.

Sources of Information/Data

8.3.56 The physical parameters for the modelling of emissions from the Proposed Development's point sources have been sourced from the concept design data.

8.3.57 The dispersion modelling of point source emissions takes into consideration the sensitivity of predicted results to model input variables, and to ultimately identify the realistic worst-case results for inclusion in the assessment. These variables include:

- meteorological data, for which five years' recent data (2018-2022) from a representative meteorological station (Durham Teesside Airport) will be used; and
- inclusion of buildings, structures and local topography that could affect dispersion from the source into the modelling scenarios.

Consultation

8.3.58 An EIA Scoping Opinion was requested from the Planning Inspectorate (the Inspectorate) in April 2023. A response was received on 17th May 2023. A high-level summary of responses to the Scoping Opinion relevant to air quality is provided in Table 8-4.

Table 8-4: Responses to Scoping Comments

CONSULTEE	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
The Inspectorate	It is agreed that operational traffic can be scoped out of the air quality assessment providing that supporting evidence of low traffic generation can be provided.	Noted. As outlined in Chapter 15: Traffic and Transportation (PEI Report, Volume I), traffic generation will be low for the operational phase. This will be confirmed within the ES.
The Inspectorate	It is agreed that NRMM emissions can be scoped out and that best practice mitigation measures will be utilised to control these emissions. It is also noted that this mitigation should be secured in the draft DCO (dDCO).	It is agreed that suitable mitigation will be secured in the dDCO. This will be confirmed within the ES.
The Inspectorate	It is not yet agreed that operational emissions of water vapour, N_2, O_2, H_2, CH_4 and CO_2 can be scoped out of the ES.	Further information on the volumes of these pollutants will be provided in the ES, to support the scoping out approach proposed for the air quality assessment.
The Inspectorate	It is agreed that emissions from the connection corridors can be scoped out of the ES.	Noted.
The Inspectorate	Public and private amenity areas should be considered	Public and private amenity areas have been considered in the construction dust assessment in Appendix 8A (PEI Report, Volume III).
The Inspectorate	The assessment of road traffic emissions from the construction phase should utilise Natural England guidance (NEA001).	This guidance will be considered in the ES.

Use of the Rochdale Envelope

8.3.59 To ensure a robust assessment of the likely significance of the environmental effects of the Proposed Development, the EIA is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate in line with the Inspectorate's Advice Note 9 (The Planning Inspectorate, 2018). This involves assessing the

maximum (or where relevant, minimum)/worst case parameters for the elements where flexibility needs to be retained (for example, building dimensions or operational modes).

8.3.60 For the operational assessment, the plant will be subject to further detailed design. Worst case emissions leading to the worst case predicted impacts will be used in the assessment to be reported in the ES to ensure that it comprises a conservative assessment.

8.3.61 The operational Proposed Development will be assumed to be running 24 hours a day for 8,760 hours per year. Assuming continuous operation throughout the year is considered to lead to worst-case annual average air quality impacts.

8.3.62 The building dimensions included within the assessment are based on available information within the concept design for the Proposed Development, including Phase 1 and 2 buildings.

8.4 Baseline Conditions

Existing Baseline

Sensitive Receptors

8.4.1 Based on IAQM guidance (IAQM, 2014), receptors potentially affected by dust soiling and short-term concentrations of PM_{10} generated during construction activities are limited to those located within 350 m of the nearest construction activity, and/or within 50 m of a public road used by construction traffic that is within 500 m of the construction site entrances. Ecological receptors are limited to those located within 50 m of the nearest construction activity and/or within 50 m of a public road used by construction traffic that is within 500 m of the construction site entrances.

8.4.2 Receptors potentially affected by the exhaust emissions associated with construction phase vehicle movements are those located within 200 m of a public road used by construction traffic to access the Proposed Development Site.

8.4.3 Receptors potentially affected by operational emissions from the Proposed Development including local residential and amenity receptors that have been identified through site knowledge, desk study of local mapping and consultation. Through the dispersion modelling, gridded outputs of pollutant concentrations have been examined to identify the receptors that will receive the highest point source contributions so that the assessment of impacts can be made at these receptors.

8.4.4 Ecological receptors potentially affected by operational emissions have been identified through a desk study of Defra Magic mapping (Defra, n.d.) and consultation (see Chapter 12: Ecology and Nature Conservation (PEI Report, Volume I)). Statutory designated sites including SACs, SPAs, Ramsar sites and SSSIs up to 10 km from the Proposed Development Site have been considered. Several non-statutory designated sites including LNRs and LWSs within 2 km have also been considered. Further details of these sites and reasons for their designations are provided in Chapter 12: Ecology and Nature Conservation (PEI Report, Volume I).

8.4.5 Identified receptors are detailed in Table 8-5, for construction (Road Traffic Receptor 'R') and operational phases (Operational Receptor 'O') and these are shown in Figures 8-1: Air Quality Study Area – Human Health Receptors, Monitoring, 8-2: Air Quality Study Area – Ecological Receptors and 8-3: Air Quality Study Area – Construction (PEI Report, Volume II). The distances to the receptors from the Proposed Development Site as associated with the construction phase are provided in Appendix 8A: Air Quality – Construction Assessment (PEI Report, Volume III).

Table 8-5: Selected Receptors

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE (BRITISH NATIONAL GRID)	
			X	Y
R_001	Saltview Terrace, Stockton-on-Tees	Residential	450068	521631
R_002			450049	521620
R_003	High Clarence Primary School. Port Clarence Road	School	449463	521974
R_004	2 Fieldview Close, Stockton-on-Tees	Residential	449092	522334
R_005	87 Broadway, Middlesbrough	Residential	455429	520571
R_006	51 Eversham Road, Middlesbrough	Residential	455434	520610
R_007	Grangetown Primary School, St Georges Rd W, Middlesbrough	School	455189	520409
R_008	139 Bolckow Road, Grangetown,	Residential	455306	520890
R_009	8 St Nicholas Close, Grangetown,	Residential	454846	520708
R_010	2 Kirkleatham Lane, Redcar	Residential	459216	524569
R_011	4 Corporation Road, Redcar	Residential	459262	524598
R_012	2 Keepersgate, Eston,	Residential	456153	518576
R_013	19 Moorgate, Middlesbrough,	Residential	456240	519019
R_014	19 Gaisdale Close, Middlesbrough	Residential	456043	518989
R_015	239 Wychgate, Middlesbrough	Residential	456119	518963
R_016	23 High Street, Middlesbrough,	Residential	456477	519134

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE (BRITISH NATIONAL GRID)	
			X	Y
R_017	North Lodge, Wilton, Lazenby, Redcar	Residential	458240	520240
R_018	Wilton Primary School, 12 High Street, Lazenby	School	457463	519859
R_019	2 Grange Estate, Middlesbrough	Residential	457559	519861
R_020	Brookfield Care Home, High Street, Lazenby	Care Home	457455	519763
R_021	10 Chestnut Close, Middlesbrough	Residential	457311	519649
R_022	Police House, Eston Road, Lazenby	Residential	457016	519403
O1	Marsh Farm House, Warrenby Road, Redcar	Residential	457950	525045
O2	Cleveland Golf Links, Redcar	Recreational	458090	525550
O3	South Gare Fishermans Association, Redcar	Recreational	455680	527395
O4	Marine Club, Redcar	Recreational	455550	527345
O5	Tingdene Beach Caravan Park, Redcar	Recreational	458675	525415
O6	120 Broadway W, Dormanstown, Redcar	Residential	457895	523735
O7	68 York Rd, Coatham, Redcar	Residential	458900	525060
O8	Dormanstown Primary Academy, Redcar	School	458250	523585
O9	Coatham Church of England School, Redcar	School	459195	524980
RE001	Teesmouth and Cleveland Coast SSSI and SPA	Ecological	450640	523527
RE002	Teesmouth and Cleveland Coast SSSI and SPA and Coatham Marsh LWS	Ecological	458966	524537
RE003	Teesmouth and Cleveland Coast SSSI	Ecological	457334	525348
RE004	Charlton's Pond LNR	Ecological	446972	523081

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE (BRITISH NATIONAL GRID)	
			X	Y
RE005	Teesmouth and Cleveland Coast SSSI and SPA	Ecological	450050	521413
RE006	Teesmouth and Cleveland Coast SSSI, RAMSAR and SPA	Ecological	450744	522993
RE007	Teesmouth and Cleveland Coast SSSI, RAMSAR and SPA	Ecological	450758	522995
RE008	Teesmouth and Cleveland Coast SSSI and SPA	Ecological	450997	523670
RE009	Teesmouth and Cleveland Coast SSSI and SPA	Ecological	450050	521413
RE010	Wilton Woods Complex LWS	Ecological	456441	518679
OE1a	Teesmouth and Cleveland Coast Ramsar, SPA and SSSI	Ecological	457283	526000
OE1b	Teesmouth and Cleveland Coast Ramsar, SPA and SSSI	Ecological	456579	526306
OE1c	Teesmouth and Cleveland Coast Ramsar, SPA and SSSI	Ecological	456127	526339
OE1d	Teesmouth and Cleveland Coast Ramsar, SPA and SSSI	Ecological	455726	526273
OE2a	Teesmouth and Cleveland Coast SPA and SSSI	Ecological	456300	526098
OE2b	Teesmouth and Cleveland Coast SPA and SSSI	Ecological	456849	525878
OE2c	Teesmouth and Cleveland Coast SPA and SSSI	Ecological	455587	524856
OE3	Coatham Marsh LWS and Teesmouth and Cleveland Coast SPA and SSSI	Ecological	457860	524991
OE4	Eston Pumping Station LWS	Ecological	456474	523797
OE5a	Teesmouth NNR	Ecological	454525	527129
OE5b	Teesmouth NNR	Ecological	453980	526143
OE6	Teesmouth and Cleveland Coast SSSI	Ecological	455835	526155

Baseline Air Quality

8.4.6 Existing air quality conditions in the vicinity of the Proposed Development Site have been evaluated through a review of local authority air quality management reports, Defra published data and other sources. The key pollutants of concern resulting from construction and operation of the Proposed Development are NO_x, NO_2, CO, SO_2, and PM (PM_{10} and $PM_{2.5}$), and therefore the assessment of baseline conditions only considers these pollutants. Data on NH_3 is not presented as this is associated with the start-up process only and as this is a short term event that is not considered to have a significant long term effect on designated ecosystem sites described in paragraph 8.3.36.

8.4.7 There are no AQMAs designated within the administrative boundary of RCBC or the adjoining local authority areas of HBC and STBC. As the closest AQMA is 20 km to the south-east of the Proposed Development Site (in Staithes), it is considered that the Proposed Development will not impact upon the air quality within any AQMA.

8.4.8 RCBC has one continuous monitoring station at Dormanstown focusing on emissions from the industrial complexes located along the River Tees. The monitor is located in the grounds of Dormanstown Primary School, in an area of relevant public exposure, and is regarded as a key site within the Tees Valley for industrial pollution monitoring.

8.4.9 The annual means for NO_2 and NO_x for 2019 at the Dormanstown monitor were 9 µg/m^3 and 13 µg/m^3 respectively, indicating that background concentrations are well within the annual average AQAL. The annual mean for PM_{10} was 14 µg/m^3.

8.4.10 In addition, RCBC undertook NO_2 diffusion tube monitoring at 16 sites during 2019, including a number of co-located tubes at the Dormanstown continuous monitor. Apart from the Dormanstown site tubes, which are classified as suburban, the remaining 15 sites are located at roadside locations. The results of the diffusion tube monitoring indicate that air quality in the borough is of a good quality, and well below the annual AQAL.

8.4.11 A number of NO_2 diffusion tubes were deployed in the air quality Study Area in order to supplement the available data and to aid traffic air quality model verification. The diffusion tube survey commenced in July 2022 and ceased in October 2022. A further period of three months data collection has also recently been undertaken and the results of this will be included in the ES.

8.4.12 The locations of all the monitoring sites (diffusion tubes) used in the assessment are shown in Figure 8-1: Air Quality Study Area – Human Health Receptors and Monitoring (PEI Report, Volume II). Data from the diffusion tube survey are presented in Table 8-6.

Table 8-6: Air Quality Monitoring Survey Data

SITE ID	SITE TYPE	GRID REFERENCE (BRITISH NATIONAL GRID)		2019* ANNUAL MEAN CONCENTRATION (µG/M^3)
		X	Y	
DT1	Roadside	457401	523654	29.7
DT2	Roadside	457667	523958	**44.3**
DT3	Urban Background	459008	524872	18.2
DT4	Roadside	455455	520616	20.9
DT5	Roadside	455431	520975	21.8
DT6	Roadside	455949	521326	**49.7**
DT7	Roadside	457131	519556	29.7
DT8	Roadside	456466	519123	21.8
DT9	Urban Background	455100	517473	16.2
DT10	Urban Background	453905	517394	12.2
DT11	Urban Background	455488	519463	14.5
DT12	Urban Background	457237	519877	11.4
DT13	Co-location	458147	523551	19.3
DT14	Ecological	453310	528182	15.1
DT15	Ecological	457341	525680	20.7
DT16	Ecological	456650	525953	18.8
DT17	Ecological	456323	526112	19.9
DT18	Roadside	449399	522028	25.3
DT19	Urban Background	449091	522434	16.5
DT20	Ecological	450821	525066	19.2
DT21	Roadside	449943	521663	25.3

Note: Bold denotes an exceedance of an air quality objective value. *Concentrations are provided for 2019 to match the year of the baseline traffic assessment, the annualisation process is detailed in Appendix 8A.

8.4.13 Annual mean NO_2 concentrations when annualised back to 2019 resulted in two exceedances of the annual mean NO_2 objective of 40 µg/m^3, recorded at DT2 and DT6, with concentrations of 44.3 µg/m^3 and 49.7 µg/m^3, respectively. Both locations

are near industrial areas, therefore high concentrations are expected due to the increased vehicle movements of HGVs which are associated with greater NO_2 emissions compared to other vehicles. There are no relevant human exposure receptors at these locations.

8.4.14 In addition to specific air quality monitoring data in the air quality study area for some pollutants further background data is also available for NO_x, NO_2, CO SO_2, and PM (PM_{10} and $PM_{2.5}$) from Defra. Further details of this data are presented in Appendix 8B: Air Quality – Operational Phase (PEI Report, Volume III). Local concentrations of NO_2 are discussed in detail above, baseline concentrations of the other pollutants within the study area are well within their respective AQALs.

Future Baseline

8.4.15 Background concentrations of pollutants are expected to decrease in the future due to changes in technology and the types of emission sources. However, to provide a conservative prediction of pollutant concentrations in the future, the current baseline background concentrations will be used for the future operational assessment scenarios, assuming no decrease in background concentrations. Similarly, for the assessment of the construction phase, current background concentrations have been used.

8.5 Proposed Development Design and Impact Avoidance

8.5.1 The EIA process aims to avoid, prevent, reduce or offset potential environmental effects through design and/or management measures. These are measures that are inherent in the design and construction of the Proposed Development (also known as 'embedded measures').

8.5.2 The following impact avoidance measures have either been incorporated into the design or are standard construction or operational practices. These measures have, therefore, been taken into account during the impact assessment and will be secured through the draft DCO.

Construction

8.5.3 A Framework Construction Environmental Management Plan (CEMP) will be included alongside the ES which will accompany the DCO Application which will set out the key measures to be employed during the Proposed Development's construction phase, to control and minimise the impacts on the environment – including the minimisation of air quality impacts. A Final CEMP will be prepared by the construction contractor in accordance with the Framework CEMP prior to construction. The submission, approval, and implementation of the Final CEMP will be secured by a Requirement of the draft DCO.

8.5.4 Emissions of dust and particulates from the construction phase of the Proposed Development will be controlled in accordance with industry best practice, through incorporation of appropriate control measures according to the risks posed by the activities undertaken, as determined through this assessment process. The management of dust and particulates and application of adequate mitigation measures will be enforced through the CEMP.

8.5.5 Based on an initial assessment of the area, of its sensitivity to dust impacts and the likely risk of impacts arising from each of the key construction activities (earthworks, construction and 'trackout' of material onto roads (see Appendix 8A: Air Quality – Construction Assessment (PEI Report, Volume III)), appropriate embedded measures to be implemented during construction (good site techniques drawn from the 'high risk' site schedule in IAQM guidance) that have been identified are:

- avoid mechanical roughening or grinding of concrete surfaces, where appropriate;
- store sand and aggregates in bunded areas and store cement powder and fine materials in silos, where appropriate;
- use water suppression and regular cleaning to minimise mud on roads, and control dust during earth moving activities;
- cover vehicles leaving the construction site that are carrying waste materials or spoil;
- employ wheel wash systems at site exits;
- restrict where practicable the use of unmade road accesses;
- minimising duration of storage of topsoil or spoil during pipeline construction; and
- prohibit open fires on-site.

8.5.6 Good practice will also be employed for the siting and operation of NRMM to control associated emissions, including:

- minimise vehicle and plant idling; and
- where possible, locating static plant away from sensitive boundaries or receptors.

Operation

IED/ BAT-AEL Emission Limit Value (ELV) Compliance

8.5.7 The Production Facility will require an Environmental Permit and will comply with this under the Environmental Permitting (England and Wales) Regulations 2016. In addition, the Proposed Development will be operated in line with appropriate standards, whilst the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Proposed Development Site is operating to the appropriate standard.

8.5.8 The Proposed Development will be designed such that process emissions to air comply with the ELV requirements as agreed in the environmental permit, as per the emerging techniques for hydrogen production with carbon capture guidance. This will be agreed as part of the Environmental Permit Application with the EA. The EA will then regulate the operation of the Proposed Development.

Stack Heights

8.5.9 The fired heater, auxiliary boiler and flare stack heights for the Proposed Development have been assessed as a worst case, with consideration given to minimisation of ground-level air quality impacts and the visual impacts of taller stacks based on the current potential layout of the main structures of the Proposed Development.

8.5.10 Dispersion modelling has been undertaken to determine the optimum stack heights at the current stage of design, through comparison of the maximum impacts at human health and ecological receptors, to ensure that the impacts at sensitive receptors will be considered to be acceptable.

8.5.11 Details of the stack height determination results are presented in Appendix 8B: Air Quality – Operational Phase (PEI Report, Volume III).

Decommissioning

8.5.12 At the end of its design life decommissioning of the Proposed Development will see the removal of all above ground equipment down to ground level and the ground remediated to enable future re-use. It is assumed that all underground infrastructure will remain in-situ; however, all connection and access points will be sealed or grouted to ensure disconnection.

8.5.13 A Decommissioning Environmental Management Plan (DEMP) will be produced and agreed with the EA pursuant to a DCO Requirement at the appropriate time. The DEMP will consider in detail all potential environmental risks and contain guidance on how risks can be removed, mitigated or managed.

8.5.14 The predicted air quality effects of decommissioning of the Proposed Development are considered to be comparable to, or less than, those assessed for construction activities.

8.6 Likely Impacts and Effects

Construction

Assessment of Construction Dust

8.6.1 The impact on local air quality from Proposed Development construction and demolition activities has used a sensitivity assessment methodology to assess the likelihood and scale of dust impact on sensitive receptors located in the vicinity of the Proposed Development Site (including consideration of nearby amenity areas). Further details of the assessment can be found in Appendix 8A: Air Quality – Construction Assessment (PEI Report, Volume III). Demolition and site clearance of the Main Site will be undertaken prior to the main works, and these do not form part of this assessment.

8.6.2 The evaluation of expected dust arisings from the proposed construction and demolition works has shown that without mitigation there could be a short-term Low to Medium impact of dust emissions associated with the construction phase on human health and a potential High impact on ecological receptors, resulting in a

potential Significant effect. However, appropriate mitigation measures for managing these risks will be set out in the Framework CEMP in accordance with the IAQM guidance. Such measures will be formalised in the Final CEMP to be prepared by the construction contractor and then implemented for the duration of the construction phase. Through the implementation of these measures, dust effects on sensitive receptors are considered to be Not Significant.

Assessment of Construction Traffic

8.6.3 Appendix 8A: Air Quality – Construction Assessment, Tables 8-18 to 8-20 (PEI Report, Volume III) shows the predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptors along routes anticipated to be utilised by construction traffic. Please see Table 8-5 and Figures 8-1 and 8-3 for further details of the receptors modelled and Chapter 15: Traffic and Transportation (PEI Report, Volume I) for further details of construction traffic movements.

8.6.4 The construction traffic air quality assessment is based on Peak Construction Scenario (month 17 of construction) indicates that the impact at all human receptors can be considered Negligible. This is as both the change between the with and without the Proposed Development scenarios for all receptors is less than 1% of the AQAL and all receptors are below 75% of the AQAL.

8.6.5 Despite there being some sensitive human receptors along roads where construction traffic will be present, the largest change in AADT flow occurs on the unnamed road that connects the Proposed Development Site with the road network where there are no adjacent human receptors.

8.6.6 The effect of construction traffic on air quality is therefore Negligible and Not Significant.

Operation

8.6.7 The impact of point source emissions at human health receptors has been determined from model outputs at discrete receptor locations.

8.6.8 The maximum hourly, daily and annual mean predicted concentrations at human health receptors have been compared with the relevant AQALs, as summarised in Table 8-7: Results of Operational Impact Assessment for Human Health Impacts

8.6.9 The results have been initially presented as the maximum concentration that occurs at sensitive receptors. The predicted concentrations at locations within the Study Area have been reported in Appendix 8B: Air Quality – Operational Phase Tables 8B-13 to 8B-15 (PEI Report, Volume III), as well as the detailed concentrations at all identified receptor locations for each year modelled.

8.6.10 The impacts of all species released from the operational Proposed Development are predicted to result in negligible adverse effects at all human health receptors within the study area, and these are considered to be not significant.

Table 8-7: Results of Operational Impact Assessment for Human Health Impacts

SPECIES	AQAL ($\mu G/M^3$)	PC ($\mu G/M^3$)	PC/AQAL (%)	MAGNITUDE OF IMPACT	BC ($\mu G/M^3$)	PEC ($\mu G/M^3$)	PEC/AQAL (%)	SIGNIFICANCE OF EFFECT
Maximum NO_2 hourly mean (as the 99.79th percentile) – Normal Operation	200	11.7	5.9	Insignificant	26.6	38.4	19.2	Insignificant
Maximum NO_2 annual mean	40	1.7	4.4	Low	13.3	15.1	37.6	Insignificant
Maximum PM_{10} 24 Hour Mean (as the 90.41th percentile) – Normal Operation	50	0.8	1.6	Insignificant	19.2	20.0	40.0	Insignificant
Maximum PM_{10} Annual Mean	40	0.3	0.7	Imperceptible	9.6	9.9	24.6	Insignificant
Maximum $PM_{2.5}$ Annual Mean	20	0.3	1.3	Very Low	6.3	6.6	32.7	Insignificant
Maximum CO 8-hour rolling average – Normal Operation	10,000	14.2	0.1	Insignificant	110.9	125.1	1.3	Insignificant
Maximum SO_2 24-hour mean (as the 99.18th percentile) – Normal Operation	125	2.6	2.0	Insignificant	4.0	6.6	5.3	Insignificant

SPECIES	AQAL ($\mu G/M^3$)	PC ($\mu G/M^3$)	PC/AQAL (%)	MAGNITUDE OF IMPACT	BC ($\mu G/M^3$)	PEC ($\mu G/M^3$)	PEC/AQAL (%)	SIGNIFICANCE OF EFFECT
Maximum SO_2 1-hour mean (as the 99.73th percentile) – Normal Operation	350	5.0	1.4	Insignificant	4.0	9.1	2.6	Insignificant
Maximum SO_2 15-minute mean (as the 99.9th percentile) – Normal Operation	260	8.2	3.2	Insignificant	4.0	12.3	3.5	Insignificant
PC = Process Contribution, AQAL = Air Quality Assessment Level, BC = Background Concentration, PEC = Predicted Environmental Concentration								

Table 8-8: Results of Operational Impact Assessment for Designated Habitats

SPECIES	AQAL (µG/M3)	PC (µG/M3)	PC/AQAL (%)	BC (µG/M3)	PEC (µG/M3)	PEC/AQAL (%)	SIGNIFICANCE OF EFFECT
Worst case receptor NO_x daily mean (as the 100th percentile)	75	16.6	22.1	35.4	51.9	69.2	Cannot be screened out as Not Significant at this stage
Worst case receptor NO_x annual mean	30	2.49	8.3	17.7	20.2	67.3	Not Significant

8.6.11 Operational air quality results for the worst affected ecological receptor (Teesmouth and Cleveland Coast SPA, SSSI and Ramsar site, located adjacent to the Main Site) are presented in Table 8-8.

8.6.12 The annual average impacts of NO_x can be considered insignificant, given that the PEC remains below 70% of the relevant critical levels.

8.6.13 The daily NO_x concentration cannot be considered insignificant, given that the PC is greater than the 10% screening criteria, and is greater than 20% of the relevant critical level. The depositional impacts of nutrient-nitrogen and acid are provided in Table 8B-19 and 8B-20.

8.6.14 The significance of the effects for daily NO_x, nutrient nitrogen and acid deposition will be discussed in further detail in Chapter 12: Terrestrial Ecology and Nature Conservation of the ES.

Decommissioning

8.6.15 The predicted air quality effects during decommissioning of the Proposed Development are considered to be comparable to, or less than, those assessed associated with construction activities. As such, air quality effects at sensitive receptors are anticipated to be Not Significant.

8.7 Mitigation and Enhancement Measures

Construction

8.7.1 The management of construction phase emissions, including dust and particulates, and the application of adequate mitigation measures will be enforced through the Final CEMP – refer to Section 8.5.

8.7.2 As the environmental effects from Proposed Development construction have been identified as being Not Significant, no specific additional mitigation measures have currently been identified as being necessary.

Operation

8.7.3 The air quality assessment of operational impacts assumes that the ELVs will be met for the operational plant as required under the IED and in accordance with use of BAT under the environmental permitting regime. Details regarding operational phase air quality mitigation measures will be further investigated and reported in the ES.

Decommissioning

8.7.4 No specific additional mitigation measures (other than those identified in Section 8.5) have been identified as being necessary during Proposed Development decommissioning.

8.8 Limitations and Difficulties

Construction

8.8.1 The preliminary construction phase air quality assessment is based on the information available at the time of the assessment. Further details regarding

construction methods will become available as the Proposed Development design further develops. As such, the results from this preliminary assessment will be updated and reported in the ES.

15.1.1 In addition, at this preliminary stage, the assessment does not include a cumulative assessment of the Net Zero Teesside (NZT) development or any other specific developments for either point sources or traffic. Traffic data that accounts for committed developments will be available for the assessment to be included in the ES, which will be inherently cumulative. Regardless, as any traffic associated with such committed developments will be included with both the with and without construction scenarios, the inclusion of traffic from committed developments is not currently anticipated to alter the assessment findings.

Operation

8.8.2 Information regarding the Production Facility is still in development and thus it is not currently possible to undertake air quality modelling of emissions from the Proposed Development. Such information is in development and will become available such that a full assessment of human health and ecological effects will be reported in the ES.

Decommissioning

8.8.3 There are no significant limitations associated with the decommissioning phase air quality assessment.

8.9 Residual Effects and Conclusions

Construction

8.9.1 The preliminary air quality assessment of construction impacts assumes that the measures outlined within Section 8.5 will be fully implemented via the Final CEMP. For this reason, effects associated with construction dust are anticipated to be Not Significant.

8.9.2 Despite there being some sensitive human receptors along roads where construction traffic will be present, effects of construction traffic on air quality are predicted to be Not Significant.

Operation

8.9.3 Operational phase traffic flows are below applicable screening criteria, and therefore, significant air quality effects are not anticipated.

8.9.4 The design of the Production Facility is still in development and will be refined for the EIA. However, it has been possible to undertake a preliminary operational assessment using available concept design information. This has predicted that air quality effects on human health receptors are Not Significant. Additionally, guidance on Emerging techniques for hydrogen production with carbon capture has been released (EA, 2023). This will form the basis for discussions with the EA to agree appropriate BAT and AELs. This will be done as the environmental permit required for the operation of the Proposed Development is developed. The permit application is being made

generally in parallel with this DCO submission. This will manage air quality emissions from the Proposed Development. Air quality modelling of air quality effects during Proposed Development operation will be re-confirmed in the ES.

8.9.5 Air quality effects during Proposed Development operation on nearby ecological receptors have also been predicted. This has shown that daily NO_x concentrations, nitrogen deposition and acid deposition require further evaluation in the ES. The significance of the effects for daily NO_x, nutrient nitrogen and acid deposition will be discussed in Chapter 12: Ecology and Nature Conservation of the ES.

Decommissioning

8.9.6 It is assumed that relevant best practice mitigation measures will be in place during Proposed Development decommissioning works via the DEMP. With the implementation of such mitigation measures, the predicted air quality effects during decommissioning are considered to be comparable to, or less than, those assessed associated with construction activities, and thus Not Significant.

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