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8. Air Quality

8.1 Introduction

8.1.1 This chapter of the Environmental Statement (ES) addresses the potential air quality effects of the Proposed Development.

8.1.2 Impacts during the construction, operation and decommissioning phases of the Proposed Development are assessed. In particular, the chapter considers potential impacts on identified human health and ecological receptors in terms of:

- dust generation during construction;
- emissions from mobile plant during construction;
- emissions from road traffic during construction and operation; and
- process emissions from the operational Proposed Development.

8.1.3 This chapter is supported by the Figures 8-1 to 8-9 (ES Volume II, Document Ref. 6.3) and Technical Appendices 8A: Air Quality – Construction Phase, 8B: Air Quality – Operational Phase and 8C: Air Quality – Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4).

8.2 Legislation and planning policy

Legislative Background

Air Quality Legislation

8.2.1 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 (the 2010 Regulations), which transpose the requirements of the European Ambient Air Quality Directive 2008 (European Commission, 2008) and the 2004 fourth Air Quality Daughter Directive (European Commission, 2004). The 2010 Regulations 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} (particulate matter of 10 micrometres (µm) diameter or less). The 2010 Regulations also include an exposure reduction objective for $PM_{2.5}$ (particulate matter of 2.5 µm diameter or less) in urban areas and a national target value for $PM_{2.5}$.

8.2.2 The Environment Act 1995 (the Environment Act) requires the UK Government to produce a National Air Quality Strategy (NAQS), last reviewed in 2007 (Department for Environment, Food and Rural Affairs (Defra), 2007), containing air quality objectives and timescales to meet those 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.

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

Pollutant	Source	Concentration ($\mu g/m^3$)	Measured as
Nitrogen dioxide (NO_2)	EU air quality limit value	40	Annual mean
		200	1-hour mean, not to be exceeded more than 18 times a year
Particulate matter (PM_{10})	EU air quality limit value	40	Annual mean
		50	24-hour mean, not to be exceeded more than 35 times a year
Particulate matter ($PM_{2.5}$)	EU air quality target value	25	Annual mean
Carbon monoxide (CO)	EU air quality limit value	10,000	Maximum daily running 8-hour mean

8.2.3 The Environment Act requires local authorities to undertake an assessment of local air quality to establish whether the NAQS objectives are being achieved, and to designate Air Quality Management Areas (AQMAs) if improvements are necessary to meet the objectives. Where an AQMA has been designated, the local authority must draw up an Air Quality Action Plan (AQAP) describing the measures that will be put in place to assist in achieving the objectives. Defra has responsibility for coordinating assessments and AQAPs for the UK as a whole.

8.2.4 No AQMAs have been declared for the Proposed Development site or the surrounding areas. The nearest AQMA is outside the Study Area (as detailed in paras 8.3.2 – 8.3.6 of this Chapter), approximately 19 kilometres (km) to the southeast of the Proposed Development site, in Staithes, and 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 Low Carbon Power Station.

8.2.5 The impact of emissions from the Proposed Development on sensitive ecological receptors are quantified within this assessment 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’.

8.2.6 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 (µg/m^3)	Measured as
Oxides of nitrogen (NO_x)	EU air quality limit value	30	Annual mean
	UK target value	75	Daily mean
Ammonia (NH_3)	UK target value for lichen and bryophytes	1	Annual mean
	UK target value	3	Annual mean

8.2.7 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). The critical load criteria adopted for the sensitive ecological receptors considered in the assessment are presented in Table 8B-13 of Appendix 8B: Air Quality – Operational Phase (ES Volume III, Document Ref. 6.4).

Industrial Emissions Directive

8.2.8 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 Combined Cycle Gas Turbine (CCGT) of the Proposed Development falls under the Large Combustion Plant (LCP) requirements (Chapter III) of the IED, since it will be greater than 50 MW thermal input in capacity.

8.2.9 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. The current version of the LCP BRef (European Commission, 2017) includes annual average BAT-AELs for oxides of nitrogen (NO_x) and an indicative value for carbon monoxide (CO) from CCGT plant which are more stringent than the ELVs included in the IED.

8.2.10 As an emerging technology, there is currently no finalised BRef or BAT guidance document available for carbon capture plant, and therefore no BAT-AELs have been defined for the activity to date. The Environment Agency are currently preparing BAT guidance for Post-Combustion Carbon Dioxide Capture using Amine-Based Technologies, which is due to be published in mid-2021, however this does not propose any BAT-AELs at this stage as it is intended that these will be developed once carbon capture plant becomes operational in the UK, and collated monitoring data can confirm suitable levels for which the BAT-AELs should be set.

8.2.11 The emission limits assessed for the Proposed Development are discussed in Technical Appendix 8B: Air Quality – Operational Phase (ES Volume III, Document Ref. 6.4).

Environmental Permitting Regulations

8.2.12 The Environmental Permitting (England and Wales) Regulations 2016 (EPR) apply to all new installations and transpose the requirements of the IED into UK legislation. Performance against the relevant ELVs or BAT-AELs, as defined in the IED and associated BRefs, would be regulated through an Environment Permit, issued by the Environment Agency.

8.2.13 Where legislative ambient air quality limits or objectives are not specified for the pollutant species potentially released from the Proposed Development, Environmental Assessment Levels (EALs), published in the EA's Risk Assessments for Specific Activities: Environmental Permits guidance 'EA guidance' (Defra and Environment Agency, 2016), can be used to assess potential health effects on human health. For this assessment, this includes an additional EAL for hourly concentrations of CO and annual average and hourly EALs for ammonia which can result from the operational CCGT plant.

8.2.14 As well as the combustion emissions from the operational CCGT plant, emissions of secondary & tertiary amines from the carbon capture unit and potentially their breakdown products could occur in the atmosphere. Such pollutant species are not included in the latest version of the Environment Agency's Risk Assessment guidance; however the Environment Agency has confirmed during consultation that a recommended EAL has recently undergone public consultation for Mono-ethanolamine (MEA). The consultation closed on the 7th February 2021 and therefore at the time of writing it is awaiting formal adoption. Although MEA has not been confirmed as the carbon capture solvent to be used in the operational Proposed Development, it is likely that this could form the basis of any solvent solution used, or could be used as an appropriate surrogate species. Therefore, in the absence of further information, this recommended EAL has been used for the assessment of the impacts of amine emissions from the Proposed Development.

8.2.15 It is also known that some amines can potentially degrade and form nitrosamines and nitramines (collectively referred to as N-amines) both during the carbon capture process itself and also in the environment following release. Therefore, the impacts of both directly released N-amines and N-amines produced through atmospheric degradation of released amines have also been considered in the assessment. Although there are currently no EALs for N-amines in the atmosphere for the United Kingdom, the Environment Agency have recently consulted on a proposed EAL for N-nitrosodimethylamine (NDMA) of 0.2 nanograms (ng)/m^3, which is awaiting formal adoption. It is understood that NDMA has been used for the EAL, as this is considered to be one of the most toxic nitrosamines, and therefore results in a conservative EAL. In addition, it is understood that the Environment Agency propose to compare the total nitrosamine concentration from plant emissions with the NDMA EAL, although it should be recognised that some of the degradation products will be less harmful, and therefore this is a very conservative assumption.

8.2.16 Other degradation products, such as aldehydes and acetic acid may also result from the Carbon Capture Unit, depending on the amine solvent used, and therefore these have also been included in the assessment.

8.2.17 The EALs applicable for this assessment for the protection of human health are presented in Table 8-3.

Table 8-3: Environmental Assessment Levels (EALs) – Human Health

Pollutant	Source of EAL	Concentration ($\mu g/m^3$)	Measured as
CO	EA Risk Assessment Guidance.	30,000	Hourly mean
NH_3	EA Risk Assessment Guidance.	180	Annual mean
		2,500	Hourly mean
Amines (as MEA)	Environment Agency proposed EAL	400	Hourly mean
		100	24-hour mean
Nitrosamines	Environment Agency proposed EAL.	0.2 ng/m^3	Annual mean
Acetaldehyde	EA Risk Assessment Guidance	9,200	Hourly mean
		370	Annual mean
Formaldehyde		100	Hourly mean
		5	Annual mean
Ketones		89,500	Hourly mean
		6,000	Annual mean
Acetic acid		3,700	Hourly mean
		250	Annual mean

[1] EAL for Methyl ethyl ketone used, as the lowest EAL of any ketone listed in the Environment Agency Risk Assessment Guidance, therefore ensuring a conservative assessment.

8.2.18 Throughout the remainder of this chapter and the associated technical appendices, NAQS objectives, Critical Levels and Environmental Assessment Levels are collectively referred to as Air Quality Assessment Levels (AQALs).

Sensitive Ecosystems

8.2.19 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 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

8.2.20 National Policy Statements (NPS) 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. The Overarching National Policy Statement on Energy EN-1 (NPS EN-1) (Department of Energy and Climate Change, 2011) states 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.

In considering an application for development consent, the IPC [Secretary of State] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC 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' (paragraphs 4.10.2-4.10.3).'

8.2.21 NPS 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 the Proposed Development project stages, including contributions from additional road traffic. 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.

8.2.22 The revised National Planning Policy Framework (NPPF) (Department for Communities and Local Government (DCLG), 2019) concisely sets out national policies and principles on land use planning. Paragraph 103 of the NPPF states that:

'The planning system should contribute to and enhance the natural and local environment by: …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…'

8.2.23 Air quality is considered as an important element of the natural environment. On conserving and enhancing the natural environment, Paragraph 170 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality…'

8.2.24 Air quality in the UK has been managed through the Local Air Quality Management regime using NAQS objectives. The effect of a 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 181 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. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. 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.'

8.2.25 The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

'The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.'

8.2.26 The Planning Practice Guidance (PPG) was updated on 1 November 2019 (Ministry of Housing, Communities & Local Government, 2018), with specific reference to air quality. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and/ or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition, dust can also be a planning concern, for example, because of the effect on local amenity.

8.2.27 When deciding whether air quality is relevant to a planning application, the PPG states that a number of factors should be taken into consideration including if the development will:

- Lead to changes (including any potential reductions) in vehicle related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;
- Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power (CHP) plant; centralised boilers plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;
- Expose people to existing sources of air pollutants, including dust. This could be by building new homes, workplaces or other development in places with poor air quality;
- Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations; and
- Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value.

8.2.28 Regarding how detailed an air quality assessment needs to be, the PPG states:

'Assessments should be proportionate to the nature and scale of the development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to locationally specific'.

Local Planning Policy

8.2.29 Similarly, local planning policy may be something which the Secretary of State considers is both important and relevant to the determination of the application for the Proposed Development.

8.2.30 Redcar and Cleveland Borough Council (RCBC) adopted its Local Plan in May 2018 (RCBC, 2018), which included 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…'

8.2.31 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…'

Other Guidance

8.2.32 Defra has published technical guidance LAQM TG (16) (Defra, 2016) to assist local authorities in fulfilling their duties in relation to Local Air Quality Management. Parts of this guidance, and associated tools, are also useful in assessing the impacts of individual developments within the planning process.

8.2.33 Highways England's (HE) publication the Design Manual for Roads and Bridges (DMRB) (HE, 2019) has been used to screen potential traffic air quality impacts to determine those impacts that may require more detailed assessment, and in the assessment of traffic air quality effects and the evaluation of significance.

8.2.34 The Institute of Air Quality Management (IAQM) has published several guidance documents relating to the potential effects of dust generation during construction works and development control (IAQM, 2014, 2016 and 2017).

Use of the Rochdale Envelope

8.2.35 A focused use of the Rochdale Envelope approach has been adopted to present a worst-case assessment of potential environmental effects of the different parameters of the Proposed Development that cannot yet be fixed. The parameters included within the Rochdale Envelope are described in Chapter 4: Proposed Development (ES Volume I, Document Ref. 6.2).

8.2.36 For this assessment, the preferred CCGT and post combustion amine technologies has not yet been made and will be subject to further detailed design and commercial engagement. Therefore, the emission parameters for the CCGT units and carbon capture plant proposed by the different technology licensors under consideration have been compared and although unlikely, the worst case emissions leading to the worst case predicted impacts has been used in the assessment, in order to ensure that it is conservative.

8.2.37 The operational Proposed Development site has been assumed to be running 24 hours a day for 8,760 hours per year at this stage, however it is likely that the plant may operate in dispatchable mode, with much lower running hours annually. Assuming continuous operation throughout the year is considered to lead to worst-case annual average impacts.

8.2.38 The building dimensions included within the assessment are the maximum dimensions under consideration. It is envisaged that should the actual buildings be smaller in size, specifically in height, than those used in the assessment, then this would have the potential to reduce the plume downwash effects associated with buildings in close proximity to a stack, therefore improving emission dispersion. This would lead to a reduction in the level of impact predicted in the assessment.

8.2.39 A range of stack heights were assessed at PEI stage, and in terms of the air quality impacts, the results obtained for the lowest stack height considered to be appropriate for the operational Proposed Development was reported.

8.2.40 The stack location has not been finalised. This and the plant design will be finalised at the FEED stage. Therefore, four assessment scenarios have been modelled, with the absorber stack separately assessed as being located at four corners of the proposed area in which carbon capture plant will be located within the PCC Site (see Work No. 1C on the Works Plans, Document Ref. 4.4). This does not affect the maximum results that occur anywhere, however it does affect the results at receptor locations. As such, the worst case results at any receptor have been reported in this assessment. This allows a robust assessment of air quality effects to be presented despite the detailed design of this "First Of A Kind" project not yet being completed.

Assessment Assumptions and Limitations

8.2.41 The data presented in this ES is based on the current understanding of emissions performance of the Proposed Development. The parameters and methodology used in the assessment of air quality impacts is detailed within this chapter and the supporting Technical Appendices 8A: Air Quality - Construction Assessment and Technical Appendix 8B: Air Quality - Operational Assessment (ES Volume III, Document Ref. 6.4).

8.2.42 The ADMS model (see paragraph 8.3.26) used for the assessment of operational emissions from the Proposed Development includes a specific amine chemistry module, for the assessment of emissions of amines used in the carbon capture process and their degradation products. The model calculates the rate of amine degradation following release from the emissions stack. The details of the amine chemistry and the assessment carried out of amine releases and their subsequent degradation products are detailed in Appendix 8C: Air Quality - Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4). This assessment is based on the Environment Agency approach set out in a technical memo prepared by AQMAU (Environment Agency, 2020) and further informed by the approach proposed to the EA by AECOM in a subsequent technical memo (AECOM, 2021).

8.2.43 The final stack height for the operational Proposed Development is still to be determined, however the results reported in this assessment are considered to be associated with the lowest stack height that could be used, if the maximum building heights used the assessment are representative of the final design, and therefore represent a worst case. Therefore, should the maximum building heights be reduced through detailed design, there may be potential to reduce the stack height accordingly, without increasing the predicted impacts. Any such reduction would be subject to further modelling to ensure that predicted impacts remained within those presented in this ES.

8.2.44 Air quality surveys, employing diffusion tubes for monitoring background NO_x concentrations, were carried out in the vicinity of the Proposed Development. Monitoring commenced in December 2019 and continued until March 2020, when it was then ceased due to the implementation of the National lockdown

for Covid-19. Where appropriate to the assessment, the use of this information is discussed in the relevant section.

8.2.45 Whilst ecological impacts are reported in this chapter, further information on the potential effects of the operational Proposed Development's emissions is discussed in Chapter 12: Terrestrial Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2).

8.3 Assessment Methodology

Overview

8.3.1 Details of the assessment methodologies are provided within Appendix 8A: Air Quality – Construction Assessment, Appendix 8B: Air Quality – Operational Assessment and Appendix 8C: Air Quality Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4). These technical assessments provide detailed descriptions of the sensitive human receptors, the ecological receptors and the methodology for assessing the impacts of construction dust, construction and operational traffic and the stack emissions of the operational Proposed Development.

Study Area

8.3.2 The Study Areas for the assessments carried out have been defined according to the appropriate guidance for the type of assessment being carried out (i.e. construction dust and Non-Road Mobile Machinery (NRMM), construction traffic and the operational Proposed Development), and therefore vary for the various assessments.

8.3.3 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 Site boundary and 50 m from the construction traffic route (up to 500 m from the Site entrances), for human health receptors; and
- up to 50 m from the Site boundary and construction traffic route (up to 500 m from the Site entrances) for ecological receptors.

8.3.4 The Study Area for the traffic assessment is defined in the screening criterion set out in the DMRB and the IAQM/EPUK guidance, 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.

8.3.5 The Study Area for the operational Proposed Development point source emissions extends up to 15 km from the Low Carbon Electricity Generating Station, in order to assess the potential impacts on ecological receptors, in line with the Environment Agency risk assessment methodology (Defra and Environment Agency, 2016)

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites and Sites of Special Scientific Interest (SSSIs) within 15 km; and

- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWS) and National and Local Nature Reserves (NNR and LNR)) within 2 km.

8.3.6 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

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

8.3.8 The potential pollutant concentrations resulting from the projected emissions arising from the construction and operational phases of the Proposed Development have been predicted using atmospheric dispersion modelling techniques where appropriate, which enabled the assessment of the impacts associated with the Proposed Development on the existing local ambient air quality and in particular on the identified sensitive receptors. The assessment methodology for each type of emission is outlined below, with further detail being provided in the accompanying technical appendices (Appendix 8A: Air Quality – Construction Assessment, Appendix 8B: Air Quality – Operational Assessment and Appendix 8C: Air Quality Assessment of Amine Degradation Products, ES Volume III, Document Ref. 6.4).

8.3.9 The process and traffic emissions assessments will be made with reference to the relevant AQALs defined in Tables 8-1 to 8-3.

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 which is detailed further in Mitigation and Enhancement Measures of this Chapter.

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 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 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 considered the significance of potential impacts 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 Site boundary;
- 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 impacts on receptors occurring as a result of the magnitude of impact and the sensitivity of the area, assuming no additional mitigation (beyond the identified development design and impact avoidance measures) is applied;
- Determine the level of mitigation required based on the level of risk, to reduce potential impacts at receptors to insignificant or negligible; and
- Summarise the potential residual effects of the mitigated works.

8.3.14 The criteria for assessment of magnitude, sensitivity, and risk are summarised in Appendix 8A: Air Quality – Construction Assessment, Tables 8A-1 to 8A-9 (ES Volume III, Document Ref. 6.4).

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

8.3.15 The construction phase for the Proposed Development is anticipated to last around four years, between Q4 2022 to 2026.

8.3.16 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.'

8.3.17 The screening criterion in the DMRB (HE, 2019) and IAQM/EPUK (IAQM, 2017) states that only properties and habitat sites within 200 m of roads should be considered in traffic assessments. This is considered appropriate

to use for determining the potential for impacts from NRMM associated with the Proposed Development on sensitive receptors. A qualitative assessment of the potential for impact from NO_2 and PM_{10} emissions from NRMM on identified receptors has therefore been made based on the criteria outlined in the DMRB guidance.

Construction and Operational Phase - Road Traffic Assessment

8.3.18 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 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 oxides of nitrogen, 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.

8.3.19 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 this Proposed Development. This is because the released concentrations of these pollutants are low enough so as to not give rise to significant effects. In addition, no areas within the administrative boundaries of the relevant councils are considered to be at risk of exceeding the relevant objectives for these pollutants, therefore the risks to the attainment of the relevant air quality objectives in the vicinity of the Proposed Development are considered negligible. Emissions of SO_2, CO, benzene, and 1,3-butadiene from road traffic are therefore not considered further within this assessment.

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

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

- Annual Average Daily Traffic (AADT) flows of more than 1,000 vehicles;
- 200 Heavy Duty Vehicles (HDV, 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.

8.3.22 Guidance published by the IAQM proposes a lower threshold in AADT flow to warrant a detailed air quality assessment;

- 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.

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

8.3.24 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 only appropriate metric to determine if a detailed air quality assessment is necessary in this instance is the AADT flow.

8.3.25 In order to conduct a more conservative 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.

8.3.26 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.

8.3.27 The details of the current assessment of construction and operational traffic are presented in Chapter 16: Traffic and Transportation (ES Volume I, Document Ref. 6.2).

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

- 2019 Baseline Scenario (for model verification process) (Base);
- 2024 Construction Year Base (for long term trends calculations) (Future Base);
- 2024 Future Construction Year Base + Committed Development Scenario (Do Minimum); and
- 2024 Future Construction Year Base + Committed + Peak Construction Scenario (Do Something).

8.3.29 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.

8.3.30 Data in the form of traffic flows, composition (percentage heavy goods vehicles), and speed is used in modelling of emissions from road traffic during the construction phase.

8.3.31 Consideration has also been given within the assessment to the potential cumulative traffic emissions from the construction of the Proposed Development as well as the contribution from traffic associated with other committed schemes in the area. This is discussed further in Chapter 16: Traffic and Transportation (ES Volume I, Document Ref. 6.2).

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 below the DMRB and IAQM screening criteria for requiring such assessment.

Operational Phase – Process Emissions from the Operational Plant

8.3.33 Emissions from the Proposed Development, assumed to be operational in 2026, have been assessed using the Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2017), in order to identify where proposed emissions can be screened out as being unlikely to cause significant effects. 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. These concentrations have been compared with the defined AQALs for each pollutant species, as summarised in Tables 8-1 to Table 8-3.

8.3.34 Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use. Technical Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) details the full model inputs for the assessment, with further details on the amine assessment presented in Appendix 8C: Air Quality Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4).

8.3.35 The assessment has been based on one CCGT unit and its associated carbon capture unit being constructed and then operated continuously, as this is considered to represent the worst-case scenario in terms of the annual average operational emissions.

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, as they will be dependent on the amine solvent used. Whilst the emission concentration may be higher, the gas flow rate will be lower than that 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 adsorber and not or 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 FEED process and confirmed during commissioning.

8.3.37 In addition to the CCGT there may be provision of a number of auxiliary boilers to provide steam for plant start up. Auxiliary boiler(s) will be of small output capacity and are expected to be used for less than 2 hours at a time and only periodically (once every several days). Good design practice (e.g. maintaining the emission velocity above 15 m/s and use of suitable stack heights) and their limited use mean that the auxiliary boiler(s) are not expected to give rise to significant impacts at receptor locations. These have therefore not been included in the assessment.

8.3.38 The first year of operation (referred to as 'opening') of the Proposed Development is assumed to be 2026 for the purpose of this assessment, which is the earliest date that the Proposed Development could realistically start to operate.

8.3.39 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 have 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 Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2017).

8.3.40 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_2 and NH_3 concentrations at the identified Ecological sites, 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. Further information is presented in Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) and the Habitats Regulation Assessment Report (Document Ref. 5.13)

8.3.41 Potential increases in acidity on designated ecological receptors from depositional contributions of NO_2 and NH_3 have also been 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 (KqN_{eq}/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 feature.

8.3.42 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. These include Local Wildlife Sites and Local Nature Reserves. For these sites, there is little data available with regards to habitat types present and therefore the relevant critical loads class to be applied, and therefore process contributions have been considered against an assumed appropriate critical load determined for the appropriate habitat type as informed by Chapter 12: Terrestrial Ecology and Nature Conservation (ES Volume I, Document Ref 6.2).

8.3.43 An assessment of cumulative impacts with other proposed developments that could interact with the operational impacts and effects of the Proposed Development has been carried out and is presented in Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) and summarised in Chapter 24 Cumulative and Combined Effects (ES Volume I, Document Ref. 6.2). The impact of cumulative operational emissions of nutrient nitrogen deposition on habitats is also considered in the Habitat Regulations Assessment Report (Document Ref. 5.13).

Evaluation of Significance – Construction Phase Dust Assessment

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

8.3.45 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 impacts on receptors. The guidance indicates that application of appropriate mitigation should ensure that residual effects will normally be 'not significant'. Such control measures are proposed to be included in the Construction Environmental Management Plan (Appendix 5A, ES Volume III, Document Ref. 6.4).

Evaluation of Significance – Traffic and Operational Emissions Assessment

8.3.46 The evaluation of the significance of air quality effects from the traffic and operational point sources has been based on the criteria referenced in IAQM/EPUK guidance (IAQM, 2017), and in the Environment Agency's EPR Risk Assessment guidance (Defra and Environment Agency, 2017). The predicted changes in pollutant concentrations are compared to AQALs to determine the magnitude of change.

8.3.47 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 (Table 8-4) of such impacts. This terminology has been changed where appropriate in order to maintain consistency with the rest of this ES – where the IAQM uses 'substantial' this has been changed to 'major', and 'slight' has been changed to 'minor'.

Table 8-4: Air Quality Impact Descriptors for Long Term Changes in Ambient Pollutant 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)

8.3.48 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, it indicates further that 'negligible' impacts are likely to lead to effects that are 'not significant' and 'major' impacts describe the potential for 'significant' effects. The judgment of significance of effects adopted within this assessment is discussed below.

8.3.49 The Environment Agency 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.

8.3.50 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.

8.3.51 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 Environment Agency.

8.3.52 The IAQM guidance indicates that the Environment Agency 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 Environment Agency 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 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.

8.3.53 The impact of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, has been evaluated using the

Environment Agency and Natural England insignificance criterion of 1% of the long-term objective, as above.

8.3.54 Where emissions are not screened as insignificant (negligible), the descriptive terms for the air quality effect outlined in Table 8-4 above have been applied.

Evaluation of Significance – Proposed Development as a Whole

8.3.55 Following the assessment of each individual air quality effect (construction dust, traffic and operational plant), the significance of all the reported effects is then 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 are considered if relevant, but the principal focus is 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).

8.3.56 In terms of the significance of the effects (consequences) of any adverse impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'major' this is deemed to be 'significant' for EIA purposes. Effects found to be 'minor' or 'negligible' are considered to be 'not significant'.

Sources of Information/ Data

8.3.57 The physical parameters for the modelling of emissions from the Proposed Development's stack have been sourced from concept design data provided by the Applicants, and the pollutant mass emission rates have been calculated by AECOM, based on licensor data, the relevant emission limits or BAT-AELs. They are summarised in Appendix 8B: Air Quality – Operational Assessment, Tables 8B-2 and Table 8B-3 (ES Volume III, Document Ref. 6.4).

8.3.58 The dispersion modelling of point source emissions has taken 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 (2015-2019) from a representative meteorological station (Durham Teesside Airport) have been used; and
- Inclusion of buildings, structures and local topography that could affect dispersion from the source into the modelling scenarios.

Consultation

8.3.59 Consultation for the Proposed Development has been ongoing and commenced at the EIA Scoping Stage with the preparation of the EIA Scoping Opinion Report which was submitted in February 2019 and Scoping Opinion

was received from the Planning Inspectorate in April 2019. (Appendix 1A in ES Volume III, Document Ref. 6.4).

8.3.60 The Applicants also undertook a formal Section 42 and Section 47 consultation, which commenced at the same time as the publication of the Preliminary Environmental Information (PEI) Report in early July 2020 and ended in September 2020. The issues that have been raised through consultation, and how these have been considered and addressed within the design evolution of the Proposed Development and the EIA is set out where relevant within each of the topic chapters in the ES and where relevant in Chapter 6: Alternatives and Design Evolution (ES Volume I, Document Ref. 6.2).

8.3.61 Table 8-5 provides a summary of how comments raised by stakeholders to date in relation to traffic and transportation have been considered and actioned where appropriate.

Table 8-5: Consultation Summary Table

Consultee	Matter raised	Key response
PINS	Paragraph 6.20 of the Scoping Report states that dispersion modelling will be used to determine the most appropriate height for the generating station stacks. To ensure a robust assessment of likely significant effects, the ES should confirm the maximum number, height and diameter of the stacks. It should be clear what assumptions have been made in the relevant ES assessments regarding the placement of the stacks, particularly with regards to the air quality modelling and the landscape and visual assessment.	The information requested on stack number, height and locations is provided in Technical Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) together with the assumptions used in the assessment.
PINS	The Inspectorate notes from paragraph 6.100 of the Scoping Report that during operation there would be a work force of approximately 100 people travelling to and from site on a shift basis, that fuel would be delivered by pipeline and other operational and maintenance consumables would be kept as low as reasonably practicable. On this basis, the Inspectorate considers that emissions to air from operational phase traffic are unlikely to result in significant effects and as such this matter can be scoped out of the assessment. However, the ES should assess any likely significant cumulative impacts.	An assessment of construction traffic has been carried out and demonstrates that the impacts of additional traffic is not significant. As the operational traffic numbers are lower than those during the construction phase, these have been screened from requiring assessment. Cumulative impacts have been assessed and are presented in Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) and summarised in ES Chapter 24: Cumulative and Combined Effects (ES Volume I, Document Ref. 6.2).
PINS	**Receptors** The Applicant proposes to determine baseline air quality from available local authority monitoring data (including an RCBC continuous monitoring station and RCBC diffusion tubes) and Defra background air quality maps. The Scoping Report	Monitoring data for RCBC from 2018 supplemented by additional diffusion tube monitoring carried out between December 2019 and March 2020 and Defra background mapping from 2017 baseline

Consultee	Matter raised	Key response
	refers to RCBC NO_2 monitoring data from 2014 and 2015 and Defra background air quality maps from 2016 (however the footnote to Table 6.1 states that the data is from 2013). The Applicant should ensure that the most recent and relevant monitoring data available is presented within the ES. The ES should identify the locations of the local authority monitoring stations and diffusion tubes on a plan.	has been used in the assessment presented. Figure 8-1: Air Quality Study Area Human Health Receptors and Monitoring (ES Volume II, Document Ref. 6.3) shows the locations of the local authority monitoring stations and diffusion tubes referenced in the assessment.
PINS	**Baseline** The Applicant has not proposed to undertake any site-specific monitoring to determine the baseline of nitrogen dioxide (NO_2) and nitrogen oxides (NO_x). However, it is noted that RCBC monitoring data largely relates to the monitoring of roadside NO_2 emissions. The Applicant should make effort to discuss the adequacy of the available baseline data with the relevant consultation bodies to ensure it is robust and representative of the baseline conditions (in particular the RCBC continuous monitoring station and diffusion tube data). Any monitoring data available from STBC should be used in addition to the RCBC data. If the available data is not considered to be robust, the Applicant should make effort to discuss and agree a proportionate approach to establishing the baseline with the relevant consultation bodies. If necessary, the Applicant should undertake site-specific monitoring. The ES should fully justify the approach taken.	Site specific monitoring using a number of NO_2 diffusion tubes in the Study Area in order to supplement the available data and to aid traffic model validation has been completed. The diffusion tube survey commenced on 17th December 2019 and ceased in March 2020 due to the National Lockdown. The locations of all the monitoring sites (automatic and diffusion tubes) used in the assessment are shown in Figure 8-1: Air Quality Study Area Human Health Receptors and Monitoring (ES Volume II, Document Ref. 6.3). The monitoring data for the diffusion tubes managed by AECOM are detailed in Table 8-8.
PINS	**Other Aspect Study Areas** The Scoping Report states that SCR could potentially be applied to the Proposed Development and could result in emissions of ammonia and/or amines and amine degradation products. The Applicant should make effort to agree Best Available Technology (BAT) with the Environment Agency and should follow the advice set out in the Planning Inspectorate's Advice Note 11 (see Annex D) regarding parallel-tracking of the environmental permit and DCO applications. If the Applicant has not determined whether SCR would be utilised by the point of application, the ES should identify and assess the worst case scenarios for NO_x and ammonia both with and without SCR	The carbon capture process requires lower NO_x concentrations than current CCGT technology can achieve without SCR abatement, and therefore emissions of ammonia have been included in the assessment. SCR may also be required for the CCGT to meet the emission levels associated with the use of BAT depending on the technology provider to be used. Amine emissions have been assessed, as have N-amine degradation products, although at this stage only a screening assessment has been carried out. A full assessment of amine degradation products will be carried out for the final ES.

Consultee	Matter raised	Key response
		The Applicants continue to consult with the Environment Agency on the determination of BAT for carbon capture plant and the required Environmental Permit application, and it is intended that these will be parallel-tracked to assist the DCO determination process.
PINS and Environment Agency	**Stack Height and Diameter** A stack height assessment will be conducted and included as part of the ES. Model sensitivity will be assessed using the design Rochdale Envelope against design building dimensions.	A stack height assessment has been conducted and included as part of the ES (see Appendix 8B: Air Quality – Operational Assessment, ES Volume III, Document Ref. 6.4).
Environment Agency	Requested that the distance in metres between the identified receptors and the Proposed Development were provided in Table 8-6.	The distances to the receptors are provided in Appendix 8A: Air Quality – Construction Assessment or Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) only. Some of the receptors are relevant for both construction and operational impacts, but the distance between the source and receptor varies for the two assessment. It was therefore considered that adding this additional detail to Table 8-6 may lead to confusion, and so it was considered more appropriate to detail the distance to receptor only in the relevant appendix.
	Provide the details of the MWth, typical emissions and location of the auxiliary boilers.	This information is not available, however any auxiliary boilers could be up to 50 MWth, but would only be used for less than 2 hours at a time and only periodically (once every several days).
	In-combination impact assessments to include the Redcar Energy Centre and Port Clarence RDF plants and the Tees REP.	In-combination effects, including these proposed developments, have been considered as part of the ES and are detailed in Appendix 8B: Air Quality – Operational Assessment.

Consultee	Matter raised	Key response
	Commercial confidentiality	This subject is still under review with the Environment Agency and BEIS.
	Depending on the CO_2 compression technology, an OCGT may be required and may need an Environmental Permit.	An OCGT will not be used for CO_2 compression, this will be powered either by the Proposed Development when in operation, or from grid electricity if not.
	The Applicant must ensure that the design and layout of the stack monitoring point is fully compliant with the EAs M1 Guidance.	Stack monitoring arrangements will be detailed in the Environmental Permit application for the Proposed Development and will take account of all relevant guidance.
Public Health England	The applicant should ensure that the emissions, including solvent by-products, of the carbon dioxide removal process are adequately characterised and a risk assessment carried out.	Details of the assessment of solvent by-products is presented in Appendix 8C: Air Quality Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4).
Natural England	The proposal will directly and indirectly impact the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site during construction and operation and has the potential to indirectly impact several other internationally designated sites during operation.	A meeting was held with Natural England on 14th December 2020 to discuss the sensitivity of this site to the operational impacts, with specific reference to the Nitrogen Depositional impacts. Further discussions have been held regarding the potential cumulative effects with Redcar Energy Centre. The approach discussed during the meetings and subsequently agreed with Natural England has been used in the assessment presented in this ES.
National Parks Authority	Alterations in the levels of air pollution during construction, operation and decommissioning of the site could impact NYM SAC/SPA. Need to take into consideration emissions of nitrous compounds (NO_2 and NH_3 etc) produced by vehicles, machinery and the plant itself and other associated operations which could impact the conservation status of the designated sites and so will need to be assessed as part of the development.	The impacts of the Proposed Development at the NYM SAC/ SPA are detailed in Appendix 8A: Air Quality – Construction Assessment and Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4)
STDC	Requested to be informed of the assessment into the significance of visible plumes prior to DCO submission. The Air Quality Chapter has not assessed any human health receptors within the North Industrial Zone and therefore requested that potential effects	An assessment of visible plumes has been carried out and is detailed in Appendix 8B: Air Quality – Operational Assessment.

Consultee	Matter raised	Key response
	on employees within the Teesworks Master Plan area are assessed. Recognised that the Human Health Risk Assessment would be carried out to assess the potential health impact due to changes in amines and N-amines and requested receptors within the Teesworks Master Plan area are assessed. Noted that the final stack height was still to be determined and that a requirement of the DCO may be for further assessment to be undertaken once the stack height is determined.	The PEI Report assessment detailed impacts at the worst-case location anywhere, which would include all receptors within the Teesworks Master Plan area. However, at the request of STDC, a specific receptor has also been added within the Teesworks Master Plan area, as detailed in Table 8-6.

8.4 Baseline Conditions

Existing Baseline

Sensitive Receptors

8.4.1 Based on IAQM guidance (IAQM, 2014), during the construction phase 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 site.

8.4.3 Receptors potentially affected by operational emissions from the Proposed Development including local residential and amenity receptors have been identified through site knowledge, desk study of local mapping, and consultation. Through the dispersion modelling, isopleth figures of pollutant concentration dispersion have been examined, to identify the receptors that will receive the highest point source contributions so that the assessment of impact 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: Terrestrial Ecology and Nature Conservation, Volume I, Document Ref. 6.2). Statutory designated sites including SACs, SPAs, Ramsar sites and SSSIs up to 15 km from the Site have been considered. Several non-statutory designated sites including Local Nature Reserves (LNRs) and Local Wildlife Sites (LWSs) within 2 km have also been considered. Further details of these sites and reasons for designations are provided in Chapter 12: Terrestrial Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2).

8.4.5 Identified receptors are detailed in Table 8-6 below, for construction (Traffic Receptor ‘TR’) and operational phases (Operational Receptor ‘OR’) and are shown in Figures 8-1: Air Quality Study Area, Human Health Receptors and

Monitoring and 8-2: Air Quality Study Area Ecological Receptors (ES Volume II, Document Ref. 6.3). The distances to the receptors from the Proposed Development are provided in the relevant Technical Appendices (Appendix 8A: Air Quality – Construction Assessment or Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4).

Table 8-6: Identified Receptors with Potential for Air Quality Impacts from the Proposed Development

ID	Receptor name	Receptor type	Grid reference		Assessed for impacts during:	
			X	Y	Construction	Operation
TR1	Saltview Terrace, Stockton	Residential	450068	521631	X	-
TR2			450049	521620	X	-
TR3	High Clarence Primary	School	449463	521974	X	-
TR4	Fieldview Close, Stockton	Residential	449092	522334	X	-
TR5	Keepersgate, Eston	Residential	456153	518576	X	-
TR6	Moorgate, Middlesbrough	Residential	456240	519019	X	-
TR7	High Street, Middlesbrough	Residential	456477	519134	X	-
TR8	Broadway, Middlesbrough	Residential	455429	520571	X	-
TR9	Eversham Road, Middlesbrough	Residential	455434	520610	X	-
TR10	Grangetown Primary	School	455189	520409	X	-
TR11	Bolckow Road, Grangetown	Residential	455306	520890	X	-
TR12	St Nicholas Close, Grangetown	Residential	454846	520708	X	-
TR13	North Lodge, Wilton	Residential	458240	520240	X	-
TR14	Wilton Primary, Lazenby	School	457463	519589	X	-
TR15	Grange Estate, Middlesbrough	Care Home	457559	519861	X	-
TR16	Brookfield, High Street, Lazenby,	Residential	457455	519763	X	-
TR17	Chestnut Close, Middlesbrough	Residential	457311	519649	X	-
TR18	Police House, Eston Road, Lazenby	Residential	457016	519403	X	-
TR19	Kirkleatham Lane, Redcar	Residential	459216	524569	X	-
TR20	Corporation Road, Redcar	Residential	459262	524598	X	-

ID	Receptor name	Receptor type	Grid reference		Assessed for impacts during:	
			X	Y	Construction	Operation
OR1	Houses at Warrenby	Residential	457950	525045	-	X
OR2	Cleveland Golf Links	Recreational	458090	525550	-	X
OR3	South Gare Fishermans Association	Recreational	455680	527395	-	X
OR4	Marine Club	Recreational	455550	527345	-	X
OR5	Caravan Park	Recreational	458675	525415	-	X
OR6	Houses at Dormanstown	Residential	457895	523735	-	X
OR7	Houses at Coatham	Residential	458900	525060	-	X
OR8	Dormanstown Primary	School	458250	523585	-	X
OR9	Coatham C of E	School	459195	524980	-	X
OR10	South Tees Development Site	Occupational, added at the request of STDC through Stage 2 consultation	456640	525880	X	X
E1	Teesmouth and Cleveland Coast	Ramsar, SPA, SSSI	Adjacent		X	X
E2	North York Moors	SAC, SPA, SSSI	463315	514190	-	X
E3	Northumbria Coast	Ramsar, SPA	448259	537470	-	X
E4	Durham Coast	SAC, SSSI	449520	536190	-	X
E5	Lovell Hill Pools	SSSI	459860	519100	-	X
E6	Saltburn Gill	SSSI	467000	521265	-	X
E7	Coatham Marsh	LWS	457860	524990	X	X
E8	Wilton Woods	LWS	457032	518922	X	-
E9	Eston Pumping Station	LWS	456369	523889	X	X

8.4.6 In addition, there are three further SSSIs within 15 km of the Proposed Development (Roseberry Topping, Cliffe Ridge and Lanbaurgh Ridge), which are designated due to their geological features. It is therefore considered that these sites will not be affected by emissions from the Proposed Development, as the Critical Levels and Critical Loads assigned to such sites are for the protection of vegetation and ecosystems only, and therefore they have been screened from further assessment.

Baseline Air Quality

8.4.7 Existing air quality conditions in the vicinity of the 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 and that have potentially elevated background concentrations from other sources are oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), carbon monoxide (CO), ammonia, and Particulate Matter (PM_{10} and $PM_{2.5}$), therefore the assessment of baseline conditions within this chapter considers these pollutants only.

8.4.8 Baseline concentrations of the other pollutants such amines, nitrosamines and nitramines are considered in Appendix 8C: Air Quality - Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4). It was agreed with the Environment Agency that no background monitoring of these species would be undertaken at this stage due to the absence of accredited methods.

8.4.9 There are no Air Quality Management Areas (AQMAs) designated within the administrative boundary of Redcar and Cleveland Borough Council (RCBC), or the adjoining local authority areas of Hartlepool Borough Council and South Tees Borough Council. As the closest AQMA is 19 km southeast of the PCC Site, it is considered that the Proposed Development will not impact upon the air quality within any AQMA.

8.4.10 RCBC has one continuous monitoring station at Dormanstown focusing on the 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.

8.4.11 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.

8.4.12 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.

8.4.13 The monitoring data for the diffusion tubes that are considered to be relevant for the Study Area are detailed in Table 8-7, together with the annual mean NO_2 recorded at the Dormanstown monitoring site for 2019.

8.4.14 AECOM has deployed a number of NO_2 diffusion tubes in the Study Area in order to supplement the available data and to aid traffic model validation. The diffusion tube survey commenced on 17th December 2019 and ceased in March 2020 due to the National Lockdown.

8.4.15 The locations of all the monitoring sites (automatic and diffusion tubes) used in the assessment are shown in Figure 8-1: Air Quality Study Area Human Health Receptors and Monitoring (ES Volume II, Document Ref. 6.3).

Table 8-7: RCBC Nitrogen Dioxide Diffusion Tube Monitoring

Site ID	Monitoring location	Site type	Grid reference		2019 Annual mean concentration (µg/m^3)
			X	Y	
R17	Dormanstown	Suburban	458379	523486	17.4
R18	Dormanstown	Suburban	458379	523486	16.5
R19	Dormanstown	Suburban	458379	523486	15.2
R26	South Bank Trunk Road	Roadside	453142	520836	19.5
R27	West Lane, Grangetown	Roadside	454712	520678	24.8
R33	Zetland Primary School	Roadside	460818	524938	18.6*
R40	Keilder Close	Roadside	459909	522873	11.8
R41	Mersey Road	Roadside	459695	524553	19.4

* Data from 2018, as no data for 2019 available.

8.4.16 The monitoring data for the diffusion tubes managed by AECOM are detailed in Table 8-7. The AECOM diffusion tube data shows that NO_2 concentrations in urban background locations were found to be generally lower that the RCBC Dormanston data, and that NO_2 concentrations at the roadside locations were well within the annual average AQAL.

8.4.17 Background data has also been obtained from Defra published maps (Defra, n.d.) for the locations of likely maximum impact from point source emissions from the Proposed Development, and at identified sensitive receptor locations.

8.4.18 For the construction (2024 peak construction year) baseline, background mapping data for 2024 was used alongside LTT Gap Analysis as outlined in DMRB guidance (DMRB, 2019) which accommodates for discrepancies between roadside NO_2 projections and vehicle fleet emission projections. More information regarding this process can be found in Appendix 8A: Air Quality – Construction Phase (ES Volume III, Document Ref. 6.4). This is considered to be a robust approach in dealing with the uncertainty in future year conditions for road traffic emissions assessments.

8.4.19 Background mapping data for 2018 (based on 2018 background maps) is assumed to be representative of the opening (2026) baseline; as general trends are showing a reduction in both NO_2 and PM_{10} concentrations over time, this is therefore considered to be a conservative assumption.

8.4.20 Table 8-8: AECOM Nitrogen Dioxide Diffusion Tube Monitoring

Site ID	Monitoring location	Site type	Grid reference		2020 Annual mean concentration (µg/m^3)
			X	Y	
DT1	A1085 South of roundabout with W Coatham Lane	Roadside	457399	523651	18.9
DT2	A1085 North of roundabout with W Coatham Lane	Roadside	457662	523955	23.5
DT3	North-west corner of Coatham Marshes	Urban background	459068	524863	14.4
DT4	A1085 near Grangetown	Roadside	455452	520617	13.9
DT5	A1053 near Grangetown	Roadside	455432	520970	10.6
DT6	A1085 North of A1053	Roadside	455941	521327	26.6
DT7	Eston Road off A174	Roadside	457131	519559	18.1
DT8	High Street in Lackenby	Roadside	456466	519123	13.3
DT9	Woodlands Drive in Eston	Urban Background	455142	517500	11.9
DT10	Garsbeck Way in Ormesby	Urban Background	453906	517392	8.8
DT11	Seaton Common Nature Reserve	Ecological	453307	528178	14.58

8.4.21 Background data assumed for the maximum impact location from the point source emissions is provided in Table 8-9 and indicates NO_2, CO, PM_{10} and $PM_{2.5}$ concentrations within the vicinity of the Site are consistently well below the relevant AQALs.

Table 8-9: Defra Background Air Quality Data (Annual Mean) – 2018

Location	Pollutant	2018 (µg/m^3) Data
PCC Location (NGR 456500,525500)	NO_2	14.7
	NO_x	20.5
	CO	110.9
	PM_{10}	10.2
	$PM_{2.5}$	6.9

Based on 2018 background-mapping except CO which is based on the 2001 background map, with the appropriate adjustment factors applied

8.4.22 The Defra NO_2 background mapping data is higher than the automatic monitoring data from the Dormanstown site, whereas the Defra PM_{10} concentration is lower.

8.4.23 The background data selected for the assessment is detailed and justified within the accompanying appendices to this chapter (Appendix 8A: Air Quality – Construction Phase and 8B: Air Quality – Operational Phase, ES Volume III, Document Ref. 6.4).

8.4.24 Baseline pollutant concentrations at human health receptors show that concentrations of all pollutants are well below all AQALs for all pollutants, indicating that there are no potential breaches of the standards in the vicinity of the Proposed Development.

8.4.25 The baseline NO_x pollutant concentrations and acid and nutrient nitrogen deposition rates at the identified statutorily designated ecological receptors have been obtained from APIS (2017-2019 dataset) and are provided in Appendix 8B: Air Quality – Operational Phase (ES Volume III, Document Ref. 6.4).

Future Baseline

8.4.26 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 are used for the future operational assessment scenarios, assuming no decrease in background concentrations. For future construction assessment scenarios LTT Gap Analysis was used to provide a robust prediction of pollutant concentrations in the future.

8.5 Development Design and Impact Avoidance

Construction

Construction Environmental Management Plan

8.5.1 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 embedding measures in the CEMP. A Framework CEMP is included in the Application (Appendix 5A, ES Volume III, Document Ref. 6.4).

8.5.2 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 Phase, ES Volume III, Document Ref. 6.4)), 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.

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

- Minimise vehicle and plant idling;
- where possible, locating static plant away from sensitive boundaries or receptors; and,
- Minimise operating time outside of normal working hours/ daylight hours.

Operation

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

8.5.4 The Proposed Development will be designed such that process emissions to air comply with the ELV requirements specified in the IED, or, if tighter, the LCP BRef. This will be regulated by the Environment Agency through the Environmental Permit required for the operation of the Proposed Development.

Stack Height(s)

8.5.5 The absorber stack height for the Proposed Development has 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 worst case massings of the main structures of the Proposed Development.

8.5.6 Dispersion modelling has been undertaken to determine the optimum absorber stack height 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.

8.5.7 At the detailed design stage, should the final building dimensions be reduced from those assessed in this ES, lower stack heights may be able to be used to achieve the same level of effect as presented in this chapter.

8.5.8 In addition, there would be a stack from the HRSG associated with the CCGT plant, which would only be operational when the Proposed Development is operating in an unabated mode (i.e. combustion emissions only, with no carbon capture taking place). Emissions form the CCGT stack have not been assessed, as it is considered that this will lead to lower impacts than emission from the carbon capture absorber. The combustion emissions (NO_x and CO, including NH_3 from the SCR) would be subject to the same emission limits as HRSG and therefore the associated release rates would be comparable. The unabated emissions from the CCGT plant only however would be released at a higher temperature than from the absorber and will therefore have improved thermal buoyancy, and consequentially dispersion, resulting in a level of impact for the unabated CCGT operation that is no worse than for the carbon capture mode of operation. The CCGT stack would be sized appropriately to ensure that this is the case.

Emissions Control

8.5.9 The impact assessment is based on emissions performance from the carbon capture plant that licensors have confirmed is achievable through a combination of solvent selection and process control techniques. Emissions of NO_x from the CCGT are assumed to be controlled through the use of Selective Catalytic Reduction (SCR) so as to minimise NO_x carry over into the carbon capture plant.

8.5.10 Emissions of amines will be controlled in accordance with the use of Best Available Techniques through the use of water wash stages prior to the flue gas exiting the stack; the use of water wash enables solvent that is carried over in the flue gas to be captured and returned to the process for re-use.

8.5.11 Emissions of ammonia may need to be controlled through the use of an acid wash stage after the water wash. This uses sulphuric acid to remove the ammonia from the flue gas; this may be required to meet the proposed ELVs so as to not give rise to unacceptable nitrogen deposition effects. The use of an acid wash may represent BAT depending on the nature of the solvent used. It may also further reduce the release of amine from the stack, thereby reducing the formation of amine degradation products.

8.5.12 Another measure that helps improve dispersion from the stack is the use of reheat to raise the stack gas temperature from around 35°C to around 60°C.

8.5.13 The air assessment has assessed either the use of acid wash or the use of reheat and presented the results; the decision as to whether either control technique is required will depend on the emissions associated with the chosen licensors proprietary solvent, and therefore will be made at the FEED stage.

Decommissioning

8.5.14 Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP), proposed to be secured by a Requirement in the draft DCO (Document Ref. 2.1); no additional mitigation for decommissioning of the Proposed Development beyond such best practice is considered necessary at this stage. The predicted air quality effects of eventual 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 area sensitive to dust soiling and PM_{10} health effects has been assessed, as detailed in Appendix 8A: Air Quality – Construction Phase (ES Volume III, Document Ref. 6.4) from the sensitivity of receptors and the proximity of the Proposed Development activities to these receptors. Identified sensitive receptors to dust soiling and PM_{10} effects from construction works are detailed in Appendix 8A, Table 8A-7 (ES Volume III, Document Ref. 6.4).

8.6.2 A number of residential receptors (high sensitivity), and two ecological receptors (Teesmouth and Cleveland Coast SSSI, SPA and Ramsar and Coatham Marsh LWS) have been identified within 350 m of the site boundary or site exit (Appendix 8A, Table 8A-7). The assessment has considered risks from earthworks, construction and trackout (of mud to the road) and, based on the potential scale of activities and the sensitivity of the receptor area (as defined in Appendix 8A: Air Quality – Construction Phase, ES Volume III, Document Ref. 6.4), unmitigated dust impacts are considered to be 'low to medium risk' for human health receptors, and 'medium to high risk' for ecological receptors. Therefore, mitigation measures appropriate to the scale of perceived risk would be applied as part of the CEMP.

Assessment of Construction Traffic

8.6.3 Appendix 8A: Air Quality – Construction Phase, Table 8A-15 (ES Volume III, Document Ref. 6.4) shows the predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$; and number of exceedances of the 24-hour 50 µg/m^3 PM_{10} objective for the Do Something scenario at the worst-case receptor.

8.6.4 Appendix 8A: Air Quality – Construction Phase, Table 8A-16 and 8A-17 (ES Volume III, Document Ref. 6.4) show the relevant information and assessment results for the significance of construction traffic impacts.

8.6.5 The impact at all human receptors can be considered negligible as both the change between the Do Minimum and Do Something scenarios for all receptors is less than 1% of the AQAL and all receptors are below 75% of the AQAL.

8.6.6 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 Site with the road network where there are no adjacent human receptors.

8.6.7 The significance of the effect of construction traffic is therefore negligible and not significant.

Assessment of Emissions from Construction Site Plant (NRMM)

8.6.8 The assessment has identified no sensitive human receptors within 200 m of the Site and therefore the potential for NRMM emissions within the Site to result in air quality impacts on local human health receptors is considered negligible with reference to the IAQM/EPUK screening criterion. The effect of NRMM emissions on human health receptors is therefore considered to be not significant.

8.6.9 The ecologically sensitive Teesmouth and Cleveland Ramsar, SPA and SSSI is located within 100 m from the Site boundary. However, whilst the final construction design is still under consideration, the SSSI is likely to be over 100 m from the nearest source of emissions associated with site plant and NRMM for most of the time. Due to the phased nature of the construction works, site plant and NRMM will only be required to be operational at that nearest location for a limited duration over the overall construction period, and only operational on an 'as and when required' basis during that particular phase. Emissions from site plant and NRMM will also be controlled by measures set out in the CEMP to reduce emissions associated with this source, including restriction of their operation within designated areas only, prohibiting of idling, the enforcement of a minimum engine emissions standard and enforcement of maximum site speed limits. Due to the limited number of site plant and NRMM anticipated to be in use on the works section of the site closest to the Ramsar, SPA and SSSI, the limited number and intermittent hours of operation, and the distance between them and SSSI, it is considered that the any impact experienced on the Ramsar, SPA and SSSI as a result of site plant and NRMM emissions is likely to be negligible and not significant.

Operation

Assessment of Operation Point Source Emissions

8.6.10 The impact of point source emissions at human health receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at discrete receptor locations.

8.6.11 The maximum hourly, daily and annual mean predicted concentrations have been compared with the relevant AQALs, as summarised in Table 8-10.

8.6.12 The results have been initially presented as the maximum concentration that occurs anywhere, whether this corresponds to an identified receptor location or not. Where this cannot be screened as negligible, the predicted concentration at the worst effected identified receptor has been reported. The detailed concentrations at all identified receptor locations are provided in Appendix 8B: Air Quality – Operational Phase Tables 8B-13 to 8B-15 (ES Volume III, Document Ref. 6.4).

8.6.13 The methodology and the result of the assessment of N-amines is provided in Appendix 8C: Air Quality Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4).

8.6.14 Isopleth figures showing the maximum predicted annual and short-term process contributions of NO_2, NO_x and N-deposition are provided in Figures 8-5 to 8-9 (ES Volume II, Document Ref 6.3).

8.6.15 The dispersion modelling includes a number of conservative assumptions in combination, including:

- Reporting of the worst-case results from the five years of meteorological data modelled;
- Maximum building sizes within the assessed Rochdale Envelope;
- Maximum annual operation for the plant configuration assessed (8,760 hours, assuming the plant is used for base loading as a worst case);
- Operation of the plant at proposed emission limits, when annual average emissions are likely to be below these;
- Presentation of the worst-case impacts from assessment of the absorber stack being in four locations within the PCC Site; and,
- Conservative estimates of background concentrations for the commencement of operation at the receptor locations.

Table 8-10: 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)	200	7.0	3%	Insignificant	29.5	36.4	18%	Negligible adverse
Maximum NO_2 annual mean	40	0.8	2%	Low	14.7	15.5	39%	Negligible adverse
Maximum CO 1-hour mean (as the 100th percentile)	30,000	84.9	0.3%	Imperceptible	222	306.8	1.0%	Negligible adverse
Maximum CO 8-hour rolling average	10,000	75.2	0.8%	Imperceptible	222	297.0	3.0%	Negligible adverse
Maximum NH_3 1-hour mean	2,500	1.7	0.1%	Insignificant	1.3	3.0	0.1%	Negligible adverse
Maximum NH_3 annual mean	180	0.2	<0.1%	Imperceptible	0.6	0.7	0.4%	Negligible adverse
Maximum amines (as MEA) 1-hour mean (as the 100th percentile)	400	4.5	1%	Insignificant	-	4.5	1%	Negligible adverse
Maximum amines (as MEA) Annual mean	100	0.2	0.2%	Imperceptible	-	0.2	0.2%	Negligible adverse
Maximum Acetaldehyde 1-hour mean (as the 100th percentile)	9,200	4.8	0.1%	Insignificant	-	4.8	0.1%	Negligible adverse
Maximum Acetaldehyde	370	0.2	<0.1%	Imperceptible		0.2	<0.1%	Negligible adverse

Species	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
Annual mean								
Maximum Formaldehyde 1-hour mean (as the 100th percentile)	100	0.4	0.4%	Insignificant	-	0.4	0.4%	Negligible adverse
Maximum Formaldehyde Annual mean	5	0.02	0.3%	Imperceptible	-	0.02	0.3%	Negligible adverse
Maximum Ketones 1-hour mean (as the 100th percentile)	89,500	4.8	<0.1%	Insignificant	-	4.8	<0.1%	Negligible adverse
Maximum Ketones Annual mean	6,000	0.2	<0.1%	Imperceptible	-	0.2	<0.1%	Negligible adverse
Maximum amines Acetic Acid 1-hour mean (as the 100th percentile)	3,700	1.0	<0.1%	Insignificant	-	1.0	<0.1%	Negligible adverse
Maximum amines Acetic Acid Annual mean	250	0.04	<0.1%	Imperceptible	-	0.04	<0.1%	Negligible adverse

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

8.6.16 The impacts of all pollutant species released from the operational Proposed Development are predicted to result in negligible adverse effects at all receptors within the Study Area.

8.6.17 Impact of NO_2, CO, NH_3 and amines can therefore be considered to be not significant at all human health receptors.

8.6.18 As stated previously, at this stage in the design process, information on the potential for higher short term emissions during start-up is not available. However, it should be noted that the predicted effects of short-term emissions when assessed against long term average emissions are well below the criteria to show insignificance against the short term AQALs, so in the event that start-up emissions are higher, there is sufficient headroom in the assessment before significant effects would be realised.

8.6.19 The effects of amine degradation products are discussed in Appendix 8C: Air Quality Assessment of Amine Degradation Products (ES Volume III, Document Ref. 6.4). The representative assessment of degradation products shows that the effects from the Proposed Development are well below the proposed EAL for N-amines.

8.6.20 The impact of point source emissions at ecological receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at the discrete receptor locations.

8.6.21 The maximum daily and annual mean predicted concentrations have been compared with the relevant AQALs, as summarised in Table 8-11. The full results for each receptor are provided in Appendix 8B: Air Quality – Operational Phase, Tables 8B-17 to 8B-18 (ES Volume III, Document Ref. 6.4).

Table 8-11: Results of Operational Impact Assessment for Worst Case Ecological Receptor Impacts

Species	AQAL ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC/AQAL %	BC ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/AQAL %	Significance of effect
Worst case receptor NO_x daily mean (as the 100th percentile)	75	15.5	21%	29.1	44.6	59.5%	Not significant
Worst case receptor NO_x annual mean	30	0.8	2.6%	19.4	20.2	67.3%	Not significant
Worst case receptor NH_3 annual mean	3	0.05	1.5%	0.89	0.9	31.7%	Insignificant

8.6.22 The worst effected ecological receptor from the emissions from the Proposed Development is the Teesmouth and Cleveland Coast Ramsar, SPA and SSSI, located adjacent to the Low Carbon Electricity Generating Station. The annual average impacts of NO_x is under the threshold to be determined insignificant (70%), given that the PEC is 67.3% of the relevant critical level.

8.6.23 The annual average impacts of NH_3 is below the 70% threshold and therefore can be considered insignificant.

8.6.24 The daily NO_x concentration cannot be considered insignificant, given that the PC is greater than the 10% screening criteria, however the PEC of 59.5% indicates that, in addition to background NO_x levels, the PC is unlikely to result in an exceedance of the daily critical level and therefore it is considered that the predicted daily NO_x impacts are not significant.

8.6.25 The depositional impacts of nutrient-nitrogen and acid are provided in Appendix 8B: Air Quality – Operational Phase, Tables 8B-19 and 8B-20 (ES Volume III, Document Ref. 6.4). The significance of the effects are discussed in Chapter 12: Terrestrial Ecology and Nature Conservation, Chapter 15: Ornithology (both ES Volume I, Document Ref 6.2) and the Habitat Regulations – Appropriate Assessment Report (Document Ref. 5.13)

8.7 Mitigation and Enhancement Measures

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 CEMP, and through the application of appropriate mitigation according to the risk of dust emissions from Site activities as identified in this assessment.

8.7.2 The environmental effects from construction of the Proposed Development have been identified as not significant, therefore no specific additional mitigation has been identified as necessary for the construction phase of the Proposed Development other than the measures outlined in the Assessment of Likely Impacts and Effects Section development design and impact avoidance.

8.7.3 The air quality assessment of operational impacts has assumed 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. The environmental effects from operation of the Proposed Development have been identified as not significant at all human health receptors for the operation of the Proposed Development.

8.7.4 Detailed modelling of predicted impacts at ecological receptors indicates that potential effects at ecological receptors against the critical levels can be considered to be not significant. The depositional impacts presented in Appendix 8B: Air Quality – Operational Phase (ES Volume III, Document Ref. 6.4) and not be screened as insignificant against the screening criteria at the adjacent Teesmouth and Cleveland Coast SPA, however further assessment of the predicted effects at ecological receptors and the determination of the significance of these effects is detailed in Habitat Regulations Assessment Report (Document Ref. 5.13).

8.7.5 No specific additional mitigation has been identified as necessary for the decommissioning phases of the Proposed Development other than the embedded mitigation measured outlined in Section 8.6: Likely Impacts and Effects.

8.8 Limitations and Difficulties

8.8.1 Until the preferred technology provider is selected, there will be some degree of uncertainty in the operational emissions used in the assessment. Therefore, in order to minimise the likelihood of under-estimating the predicted impacts for the operational emissions, a number of conservative assumptions have been made in the assessment. The conservative assumptions used in the assessment are detailed in Appendix 8B: Air Quality – Operational Phase, Section 8.7 (ES Volume III, Document Ref. 6.4).

8.8.2 There is also uncertainty associated with any modelling assessment, due to the inherent uncertainty of the dispersion modelling process itself. Despite this, the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from industrial sources.

8.9 Cumulative Effects

8.9.1 An assessment of cumulative impacts with other proposed developments that could interact with the impacts and effects of the Proposed Development has been carried out and is presented in Appendix 8B: Air Quality – Operational Assessment (ES Volume III, Document Ref. 6.4) and summarised in Chapter 24: Cumulative and Combined Effects (ES Volume I, Document Ref. 6.2). The impact of cumulative operational emissions on nutrient nitrogen deposition on habitats is also considered in the Habitat Regulations Assessment Report (Document Ref. 5.13).

8.10 Residual Effects and Conclusions

Construction and Decommissioning

8.10.1 The air quality assessment of construction impacts assumes that the measures outlined within the Development Design and Impact Avoidance section of this Chapter would be incorporated into the design of the Proposed Development, as they are standard best practice measures that are routinely applied across UK construction sites. No additional mitigation has been identified as necessary for the construction phase of the Proposed Development. For this reason, the residual effects would be as reported within Section 8.6 of this Chapter (i.e. not significant).

8.10.2 Consistent with construction mitigation, it has been assumed that relevant best practice mitigation measures would be in place during any decommissioning works. No additional mitigation has been identified as necessary for the decommissioning phase of the Proposed Development.

Operation

8.10.3 The air quality assessment of impacts at opening has assumed that the BAT-AELs will be met for the operational plant as required and in accordance with

use of BAT under the environmental permitting regime. The use of acid wash and reheat has been identified as potentially necessary for the opening phase of the Proposed Development. For this reason, the residual effects would be as reported within the Mitigation and Enhancement Measures Section of this chapter.

8.11 References

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