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8.0 AIR QUALITY

8.1 Introduction

8.1.1 This chapter of the Preliminary Environmental Information (PEI) Report 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:

- impacts of construction dust;
- construction traffic; and
- the operational stack emissions of the Proposed Development.

8.1.3 This chapter is supported by the **Figures 8-1 to 8-8** (PEI Report, Volume III) and Technical **Appendix 8A**: Air Quality – Construction Phase and **Appendix 8B**: Air Quality – Operational Phase (PEI Report, Volume II).

8.2 Legislation and Planning Policy Context

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 transposes 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 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_{10}, which is particulate matter of 10 micrometres (µm) diameter or less). The Regulations also include an exposure reduction objective for $PM_{2.5}$ in urban areas and a national target value for $PM_{2.5}$ ($PM_{2.5}$ is particulate matter of 2.5µm diameter or less).

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 and the objectives that are applicable to this assessment are set out in Table 8.1 in relation to human health.

Table 8.1: National Air Quality Strategy objectives (NAQS) – Protection of Human Health

Pollutant	Source	Concentration (µg/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 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.

8.2.4 The critical levels for the protection of vegetation and ecosystems are set out in Table 8.2 and apply regardless of the habitat type 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 to be 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

8.2.5 Critical load criteria for the deposition of nutrient nitrogen and acidifying species are dependent on the habitat type and species present and are specific to the sensitive receptors considered within the assessment. The critical loads are set out on the Air Pollution Information System website (Centre for Ecology and Hydrology and APIS,

2017). The critical load criteria adopted for the sensitive ecological receptors considered by the assessment are presented in the **Section 8.6** of this report.

8.2.6 The Environment Act requires local authorities to undertake an assessment of local air quality to establish whether the objectives are being achieved, and to designate Air Quality Management Areas (AQMA) 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.

8.2.7 No AQMA have been declared for the Proposed Development Site or surrounding nearby areas. The nearest is within the study area, approximately 7km to the east of the Proposed Development Site in Scunthorpe 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 Proposed Development Site.

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 (ELV) 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 50MW thermal input in capacity. The CCGT and associated carbon capture plant will therefore be regulated under the IED and will require an Environmental Permit for its operation.

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 Best Available Technique (BAT) reference documents ('BRefs') are published for each industrial sector under the IED, and they include BAT-Associated Emission Levels (BAT-AEL) which are expected to be met through the application of BAT. These levels may be the same as those published in the IED, or they may be more stringent. The current (2017) version of the LCP BRef (European Commission, 2017) includes annual average BAT-AEL for oxides of nitrogen and carbon monoxide from gas turbines which are more stringent than the ELV included in the IED.

8.2.10 There is currently no BRef or BAT guidance document available for carbon capture plant, and therefore no BAT-AEL have been defined for the activity to date. It is understood that the Environment Agency are currently preparing a BAT review for Post-Combustion Carbon Dioxide Capture using Amine-Based Technologies, which is due to be published in early 2021.

8.2.11 For the purposes of this air quality impact assessment, the emission limits assessed for the Proposed Development are discussed in Technical **Appendix 8B**: Operational Assessment (PEI Report Volume II).

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. Both combustion activities and carbon capture and storage activities are listed activities under the EPR, and therefore they require an Environmental Permit to operate, issued by the Environment Agency. Performance against the relevant ELV or BAT-AEL, as defined in the IED and associated BRefs, would be regulated through the Environment Permit.

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 Environment Agency's Risk Assessments for Specific Activities: Environmental Permits guidance, referred to as the 'Agency's guidance' (Defra and Environment Agency, 2016) can be used to assess potential health effects on the general population. 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 amines and their breakdown products could occur from the Carbon Capture Unit. Not all of the pollutant species that this could include are listed in the latest version of the Agency's guidance; however, the Environment Agency has confirmed during consultation that a recommended EAL is currently undergoing review by Public Health England for Monoethanolamine (MEA). 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. Therefore, in the absence of further information at this PEI Report stage, 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 amines degrade into nitrosamines and nitramines (collectively referred to as N-amines) both during the carbon capture process itself and also in the ambient air following release, and therefore their impacts have also been considered. Although there are currently no EALs for N-amines in the atmosphere for the United Kingdom, the Environment Agency are due to consult on a proposed EAL, based on the toxicity of N-nitrosodimethylamine (NDMA), of 0.2 nanograms (ng)/m^3. This is comparable to the Norwegian Institute of Public Health (NIPH) (NIPH, 2009) annual average environmental standard for nitrosamines (0.3ng/m^3) which has previously been used in similar studies for proposed carbon capture in the UK. It is understood that although based on the toxicity of NDMA (known to be one of the most harmful N-amines) this proposed EAL will be applied as total N-amines, even though the majority of N-amines are less toxic than NDMA. This is therefore considered to be very conservative.

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 (EAL) – human health

Pollutant	Concentration (µg/m^3)	Measured as	Source of EAL
CO	30,000	Hourly mean	EA Risk Assessment Guidance.
NH_3	180	Annual mean	
	2,500	Hourly mean	
Amines (as MEA)	400	Hourly mean	Recommended EALs currently being considered for publication by the Environment Agency and Public Health England.
	100	Annual mean	
Nitrosamines	0.2ng/m^3	Annual mean	Recommended EAL currently being considered for publication by the Environment Agency.
Acetaldehyde	9,200	Hourly mean	EA Risk Assessment Guidance.
	370	Annual mean	
Formaldehyde	100	Hourly mean	
	5	Annual mean	
Acetic acid	3,700	Hourly mean	
	250	Annual mean	

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 (AQAL).

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 (SAC) designated pursuant to the Habitats Directive, Special Protection Areas (SPA) and provisional SPA (pSPA) classified under the Birds Directive. Specific provisions of the European Directives are also applied to SACs, and candidate SAC (cSAC), 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. Special consideration within the air quality chapter has also been given to SPAs, pSPA and 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 (NSIP), 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 24 July 2018 (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:

- significantly affect traffic in the immediate vicinity of the Proposed Development Site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed 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; adds to turnover in a large car park; or result in 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; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass

boilers or biomass-fuelled Combined Heat and Power (CHP) plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;

- expose people to existing sources of air pollutants. 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
- affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.

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 level of concern about air quality... Mitigation options where necessary will be locally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented*.'

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 The North Lincolnshire Local Plan was adopted in 2003 (NLC, 2003), and a number of the policies have been replaced by the Core Strategy, adopted in 2011 (NLC, 2011). A number of policies from the Local Plan were not directly replaced and have been saved. These include:

8.2.31 Policy DS1 – General Requirements states:

'*A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:*

…

Amenity

iii) No unacceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or other nuisance, or through the effects of overlooking or overshadowing; and

…

v) no pollution of water, air or land should result which poses a danger or creates detrimental environmental conditions.'

8.2.32 Policy DS11 – Polluting Activities states:

'*Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas.*'

8.2.33 From the Core Strategy, Spatial Objective 7: Efficient Use and Management of Resources states:

'*To ensure the efficient use of resources, maximising recycling of minerals and waste products, minimising pollution, maintaining and improving air, soil and water quality, and employing sustainable building practices in new development*.'

8.2.34 While there are no policies that are specifically targeted at air quality and pollution, pollution is considered in several other policies, namely:

- Spatial Objective 10: Creating A Quality Environment; and
- CS5: Delivering Quality Design in North Lincolnshire

8.2.35 Pollution is also considered as part of the section covering transport and the environment.

Other guidance

8.2.36 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.

8.2.37 The Highways England 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.

8.2.38 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

8.2.39 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 of this PEI Report.

8.2.40 In the case of this assessment, at this stage the selection of 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

vendors under consideration have been compared and the units considered to lead to the worst case predicted impacts has been used in the assessment.

8.2.41 The building dimensions included within the assessment are the maximum dimensions under consideration. It is considered 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 the stacks, therefore improving emission dispersion. This would lead to a reduction in the level of impact predicted in the assessment.

8.2.42 A range of stack heights have been assessed, and in terms of the air quality impacts, the lowest stack height considered to be appropriate for the operational Proposed Development (based on the building sizes assessed within the Rochdale envelope) has been used as the basis of the reported assessment. Any reduction in the building heights assessed would lead to a reduction in the level of impact reported in this assessment, which could in turn result in a lower stack height being possible.

8.2.43 In addition, different locations for the absorber tower and stack have been assessed and were found to have very little effect on the resulting predicted concentrations. In terms of the results reported in this assessment, the stack location is considered to be representative of the worst-case impacts.

Assessment assumptions and limitations

8.2.44 The data presented in this PEI Report is preliminary at the time of writing and is subject to change as the design develops following the consultation period. The assessed parameters and methodology for the assessment of air quality impacts due to the Proposed Development is detailed within this chapter and the supporting Technical **Appendix: 8A**: Construction Assessment and Technical **Appendix: 8B**: Operational Assessment (PEI Report Volume II) including any available data that is known at the time of writing. Where data is outstanding or under development, this has been noted, as appropriate.

8.2.45 The ADMS model 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. However, in order to generate meaningful results using the amine module, information on the specific amines present in the amine solution is required to generate the necessary model input parameters. As the specific amine solution has yet to be determined, this is not possible at this stage and therefore, the amines module has not been used for the PEI Report.

8.2.46 In addition, there are concerns over the validity of the amine chemistry module across a range of conditions, in that there are only reaction rate constants for a limited number of amine species and as there are important aspects of the degradation process that are not built into the module. Its relevance for use in the assessment will therefore continue to be assessed as more information becomes available from the Licensors, and the Environment Agency's Air Quality Modelling Assessment Unit (AQMAU) are currently being consulted on the applicability of the use of the amines chemistry module for such assessments.

8.2.47 Should it be considered appropriate, the assessment presented in the final ES will use the ADMS amines chemistry module to assess amine emissions and their degradation products, however at PEI stage a preliminary screening approach has been taken to assess N-amine impacts, until further information is available for the final ES report.

8.2.48 Whilst ecological impacts are considered in this chapter, further information on the potential effects of the operational developments emissions is discussed in **Chapter 11:** Biodiversity and Nature Conservation of this PEI Report.

8.3 Assessment methodology

Overview

8.3.1 Details of the assessment methodology are provided within **Appendix 8A**: Construction Assessment and **Appendix 8B**: Operational Assessment (PEI Report Volume II). 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 traffic and the operational stack emissions of the Proposed Development.

Study area

8.3.2 Study areas for the assessments carried out for the different potential air quality effects associated with the Proposed Development have been defined according to the appropriate guidance for the type of assessment being carried out, and therefore vary for the various assessments.

8.3.3 The study area for the construction dust and Non-Road Mobile Machinery (NRMM) emissions has been applied in line with IAQM guidance (IAQM, 2014), extending:

- up to 350m beyond the Proposed Development Site boundary and 50m from the construction traffic route (up to 500m from the Proposed Development Site entrance), for human health receptors; and
- up to 50m from the Proposed Development Site boundary and construction traffic route (up to 500m from the Proposed Development Site entrance) 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 200m 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 15km from the Proposed Development Site, in order to assess the potential impacts on sensitive human health and ecological receptors, in line with the Environment Agency risk assessment methodology (Defra and Environment Agency, 2016). However, in practice the predicted impacts for human health receptors become negligible within a much smaller distance from the operational Proposed Development (circa 2km) and extending the study area for human health receptors beyond this would not identify any additional potential effects that would not be insignificant.

8.3.6 The assessment of air quality impacts on sensitive ecological sites is conducted in line with the risk assessment methodology published by the Environment Agency:

- SPA, SAC, Ramsar sites and Sites of Special Scientific Interest (SSSI) within 15km; and,
- Local Nature Sites (including ancient woodlands, LWS and National and Local Nature Reserves (NNR and LNR)) within 2km.

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**: Construction Assessment and **Appendix 8B**: Operational Assessment, PEI Report Volume II).

8.3.9 The process and traffic emissions assessments will be made with reference to the relevant AQAL defined in Table 8.1 to Table 8.3 in **Section 8.2** of this Chapter.

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 time and location of the work, and the nature of the actual 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. 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 this chapter is consistent with the overarching approach to the assessment of the impacts of construction, and the application of example descriptors of impact and risk set out in IAQM guidance. It considers the significance of potential 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 screening distance of the Proposed Development Site;
- identify the magnitude of impact through consideration of the scale, duration and location of activities being carried out (including demolition, earthworks, construction and trackout, where construction vehicles could carry mud onto the public highway);
- establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- determine the risk of significant 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 for construction dust are summarised in **Tables 8A 1 – 8A 6 Appendix 8A**: Construction Assessment (PEI Report Volume II).

Construction phase - construction site plant (Non-Road Mobile Machinery (NRMM) Assessment

8.3.15 As described in **Chapter 5**: Construction Programme and Management, subject to being granted development consent and following a final investment decision, it is anticipated that construction could commence in Q3 2022 and last approximately three years, followed by a period of commissioning (i.e. 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 200m of roads should be considered in traffic assessments. This has been considered in 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. NO_2 is associated with adverse effects on human health. 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 be likely to 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, these pollutants are the focus of the assessment of the significance of road traffic air quality impacts.

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 traffic anticipated as a result of a development, to identify the need for further evaluation or assessment:

- 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 >5m.

8.3.22 In addition, guidance published by the IAQM/EPUK (IAQM, 2017) sets out criteria as 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. For changes in traffic below these criteria, significant changes in air quality are not expected.

8.3.23 As described in **Chapter 5**: Construction Programme and Management (PEI Report Volume I), subject to ongoing feasibility assessments, junction improvements at the A18 junction with the access road may be undertaken. Works may include carriageway widening along the north and/ or south of the existing carriageway alignment. Associated land is therefore included in the indicative Order Limits (refer to **Figure 3.2** in PEI Report Volume III). It is not envisaged that carriageway widening would exceed the screening threshold above.

8.3.24 The Proposed Development may therefore include minor modifications to the existing A18 road carriageway and may also propose a reduction in the speed limit at the Proposed Development Site junction from 60mph to 40mph, consistent with the temporary restriction in place for the Keadby 2 Power Station construction project. At this stage, only the AADT flow is appropriate to be used as a metric to determine if a detailed air quality assessment is necessary. The proposed change in junction and speed limits under consideration will be assessed once the design has been finalised, and the assessment will be updated as appropriate in the ES.

8.3.25 Guidance published by the IAQM proposes a lower threshold in AADT flow to warrant a detailed air quality assessment. In order to conduct a more conservative assessment of the air quality impacts of the construction traffic the IAQM screening methodology has been chosen for this assessment warranting detailed air quality modelling for the study area.

8.3.26 The details of the current assessment of traffic are presented in **Chapter 10**: Traffic and Transportation of this PEI Report. This assessment has used the latest version of dispersion model software 'ADMS-Roads' (v4.1.1) 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 traffic data for use in this assessment includes the following scenarios:

- 2020 Baseline Scenario (for model verification process) (2020 Base);
- 2031 Future Baseline Scenario (for Long Term Trends Calculations) (2031 Future Base);
- 2031 Future Construction Year Base + Committed Development Scenario (2031 Base); and
- 2031 Future Construction Year Base + Committed + Peak Construction Scenario (2031 Construction Peak).

8.3.28 The future decommissioning baseline scenario is not included, as it is considered that the effects would be comparable to construction impacts.

8.3.29 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.

8.3.30 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 10**: Traffic and Transportation of this PEI Report.

Operational phase – operational traffic assessment

8.3.31 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

8.3.32 Emissions from the Proposed Development, assumed to be operational in 2025, has 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 AQAL for each pollutant species, as summarised in Table 8.1 to Table 8.3 of this Chapter.

8.3.33 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.

8.3.34 The assessment has been based on a single CCGT unit and its associated carbon capture unit being operated continuously, as this is considered to represent the worst-case scenario in terms of the operational emissions.

8.3.35 The first year of operation (referred to as opening) of the Proposed Development is assumed to be 2025/6 for the purpose of this assessment, which is the earliest date that the Proposed Development could realistically start to operate.

8.3.36 The assessment of worst-case long-term (annual mean) and short-term (daily and hourly mean) emissions resulting from operation of the Proposed Development have been undertaken by comparison of the maximum process contributions at identified sensitive receptors with the annual mean and hourly mean AQAL taking into consideration the baseline air quality, in accordance with the Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2017).

8.3.37 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 Statutory Habitat 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.

8.3.38 Potential increases in acidity on designated ecological receptors from depositional contributions of NO_2 and NH_3 from the process contribution 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.

8.3.39 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 LWS and LNR. For these sites, there is little data available with regards to habitat types present and therefore the relevant Critical Loads Classes to be applied, and therefore process contributions have been considered against an assumed appropriate Critical Load determined for the appropriate habitat type where this is known.

Evaluation of significance – construction phase assessment

8.3.40 For potential amenity effects, such as those related to dust deposition, the aim is to minimise the potential for amenity, human health, and ecological impacts as a result of the Proposed Development construction works, using control and mitigation measures as necessary.

8.3.41 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'.

8.3.42 The evaluation of the significance of air quality effects from the construction traffic has been based on the criteria referenced in IAQM/EPUK guidance (IAQM, 2017). The predicted changes in pollutant concentrations are compared to AQAL to determine the magnitude of change.

Evaluation of significance – traffic and operational emissions assessment

8.3.43 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 Agency's guidance (Defra and Environment Agency, 2017). The predicted change in pollutant concentrations are compared to AQAL to determine the magnitude of change.

8.3.44 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 PEI Report – 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)

8.3.45 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.

8.3.46 The Environment Agency's guidance screening criteria for comparison of PC 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.

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

8.3.48 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 typically considered acceptable by the Environment Agency.

8.3.49 The IAQM guidance indicates that the Environment Agency's 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 Agency's 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 process contribution (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.

8.3.50 The impact of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, has been evaluated using the Environment Agency's insignificance criterion of 1% of the long-term objective, as above.

8.3.51 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

8.3.52 Following the assessment of each individual air quality effect (construction dust, traffic and operational plant), the significance of all of the reported effects is then considered for the Proposed Development in overall terms. 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).

8.3.53 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

8.3.54 The physical parameters for the modelling of emissions from the Proposed Development stacks have been sourced from concept design data provided by design studies prepared for the Proposed Development, and the pollutant mass emission rates have been calculated by AECOM, based on the relevant emission limits or BAT-AEL. They are summarised in **Appendix 8B**: Operational Assessment (PEI Report Volume II), Table 1 - Table 3.

8.3.55 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

8.3.56 A Scoping Opinion for the Proposed Development was received from The Planning Inspectorate (PINS) in June 2020 and set out the formal response to the submitted Scoping Report (PINS, 2020). The Opinion contained a number of comments with regard to air quality, and these are outlined in Table 8.5.

Table 8.5: Consultation Responses

Consultee	Matter raised	Key response
PINS	Concern over the large distance between the automatic air quality monitoring stations used by North Lincolnshire Council and the Proposed Development site, and their ability to be representative of background concentrations in the vicinity of the Proposed Development.	Discussion of the available baseline monitoring data, and its applicability for the assessment is carried out in Section 8.4. Further discussion of specific data for the construction and operational assessments is provided in the relevant appendices; **Appendix 8A and Appendix 8B** (PEI Report Volume III).
PINS	Justification of the suggested 2km Study Area for Human Health receptors should be provided, and a figure depicting this area should be provided.	The justifications for the selected Study Areas is provided in Section 8.3. The Study Area is shown in **Figure 8.5** (PEI Report Volume III).
PINS	Requested that the number and height of stacks should be stated.	A description of the number and height of stacks is provided in **Appendix 8A** (PEI Report Volume III. (PEI Report Volume III).
PINS	The ES should clearly state which pollutants have been addressed in the assessment.	The pollutants assessed are detailed in Tables 8.1 – 8.3 of this chapter. Further discussion on the relevant pollutants is provided in **Appendix 8A and Appendix 8B** (PEI Report Volume III).
PINS	The ES should describe the baseline air quality conditions with the area likely to	Discussion of the available baseline monitoring data, and its

Consultee	Matter raised	Key response
	experience impacts from the Proposed Development.	applicability for the assessment is carried out in **Section 8.4**.
PINS	The methodology for the assessment should state how significant effects will ne determined. Consider using IAQM Assessment of dust from demolition and construction 2014 when assessing the impacts from dust and particulate matter during construction/ decommissioning.	The determination of significance is described in **Section 8.3** of this Chapter, specifically within Table 8.4**.** The IAQM guidance referenced has been used in the assessment of construction dust in **Appendix 8A** (PEI Report Volume III.
PINS	The air quality impacts on ecology (e.g. nitrogen deposition) should be assessed.	The air quality impacts on ecology receptors within 15km of the main emission sources within the Proposed Development have been assessed. The full results at ecology receptors, including those for deposition, are provided in **Appendix 8B** (PEI Report Volume III.
Natural England	Assessment should take account of the risks of air pollution and how these can be managed or reduced.	Covered throughout this Chapter.
Doncaster Council	Raised concern over the already high NO_2 levels in Thorne and requested that this be considered in the assessment.	The assessment carried out in this Chapter considers NO_2 impacts at the worst impacted location, which occurs in very close proximity to the operational Proposed Development Site. The impacts at this worst-case location have been demonstrated to be negligible adverse (see Table 8.10), therefore it is considered that impacts at Throne (over 8km from the operational Proposed Development Site) would be considerably less.
Keadby with Althorpe Parish Council	Expressed concern over amine emissions and the potential harm to local residents.	Emissions of amines have been assessed and compared against the proposed EAL and found to be negligible adverse at the most impacted location (see Table 8.10).

Consultee	Matter raised	Key response
		It is therefore considered there is no risk of potential harm to local residents from emissions of amines.

8.3.57 In addition to the formal comments received in Table 8.5, discussions are currently ongoing with the Environment Agency over the development of BAT for carbon capture operations. The Environment Agency's Air Quality Modelling and Assessment Unit (AQMAU) are also being consulted over the application of the ADMS amines chemistry module.

8.4 Baseline conditions

Existing baseline

Sensitive receptors

8.4.1 During the construction phase, based on IAQM guidance (IAQM, 2014), receptors potentially affected by dust soiling and short-term concentrations of PM_{10} generated during construction activities are limited to those located within 350m of the nearest construction activity, and/ or within 50m of a public road used by construction traffic that is within 500m of the construction site entrances. Ecological receptors are limited to those located within 50m of the nearest construction activity and/ or within 50m of a public road used by construction traffic that is within 500m 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 200m 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 desk study of Defra Magic mapping (Defra, 2020a) and consultation (see **Chapter 11**: Biodiversity and Nature Conservation of this PEI Report). Statutory designated sites including SACs, SPA, Ramsar sites and SSSI up to 15km from the Proposed Development Site have been considered. Several non-statutory designated sites including LNR and LWS within 2km have also been considered. Further details of these sites and reasons for designations are provided in **Chapter 11**: Biodiversity and Nature Conservation of this PEI Report.

8.4.5 Identified receptors are detailed in Table 8.6 below and are shown in **Figures 8.1** and **8.2** (PEI Report Volume III). (TR = Traffic Receptor (for human health impacts), TE = Traffic Ecology, OR = Operational Receptor (for human health impacts), OE = Operational Ecology).

Table 8.6: Identified receptors with potential for air quality impacts from the Proposed Development

ID	Receptor name	Designation	Grid reference	
			X	Y
TR1	Pilfrey Farm, A18	Residential	480758	409985
TR2	Property on Crowle Bank Road	Residential	482615	409594
TR3	Property on Kelsey Lane	Residential	483281	409791
TR4	Property on Old School Lane, Keadby	Residential	483863	410649
TR5	Property on Station Road, Keadby	Residential	483724	410668
TR6	Property on Station Road, Keadby	Residential	483691	410790
TR7	Property on Station Road, Keadby	Residential	483548	411238
TR8	Blacksmiths Cottage (former Trentvale Prep School), Keadby	Residential	483511	411611
TR9	Property on Trent Side, Keadby	Residential	483527	411804
TR10	Little Hurst Cottages, A161	Residential	478181	409792
TR11	Hirstwood Farm, A161	Residential	478347	409479
TR12	Property at Mosswood Court, A161	Residential	478457	409228
TE1	Hatfield Waste Drain - North of A18	LWS	479055	410252
TE2	Hatfield Waste Drain - South of A18	LWS	478651	410338
TE3	North Engine Drain, Belton	LWS	479110	410221
TE4	River Torne	LWS	479108	410198
TE5	Three Rivers - South	LWS	480922	409925
TE6	South Engine Drain, Belton	LWS	480957	409898
TE7	Three Rivers - North	LWS	483532	411259
TE8	Stainforth and Keadby Canal Corridor	LWS	483434	411422
TE9	Keadby Wetland	LWS	483338	411379

ID	Receptor name	Designation	Grid reference	
			X	Y
TE10a – j[1]	Humber Estuary	Ramsar, SSSI and SAC	483561 - 483748	411266 - 411338
TE11a – j[1]	Humber Estuary	Ramsar, SSSI and SAC	484102 – 484065	410665 – 410865
TE12	Hatfield Chase Ditches	SSSI	478707	410333
TE13a – j[1]	Crowle Borrow Pits	SSSI	479020 - 479056	410284 – 410468
OR1	Holly House	Residential	483036	411882
OR2	1 Trent Side	Residential	483368	411284
OR3	North Pilfrey Farm	Residential	480853	411403
OR4	Keadby Grange	Residential	481565	410909
OR5	Pharon-Ville	Residential	484057	411661
OR6	Boskeydyke Farm	Residential	483860	413348
OR7	Grange Cottage	Residential	484708	412315
OR8	Pilfrey Farm	Residential	480769	409994
OE1 - 5[2]	Humber Estuary	Ramsar, SSSI and SAC	483573 - 483951	411823 - 412817
OE6	Crowle Borrow Pits	SSSI	479102	410825
OE7	Hatfield Chase Ditches	SSSI	478769	410293
OE8	Eastoft Meadow	SSSI	478772	414311
OE9	Belshaw	SSSI	476961	406079
OE10	Thorne Moor	SAC, SPA and SSSI	475934	414720
OE11	Epworth Turbary	SSSI	475690	404195
OE12	Risby Warren	SSSI	491180	413564
OE13	Hatfield Moor	SAC, SPA and SSSI	471828	408178
OE14	Messingham Heath	SSSI	487748	403574
OE15	Tuetoes Hills	SSSI	484361	401698
OE16	Haxey Turbary	SSSI	475107	401866
OE17	Rush Furlong	SSSI	478141	400564
OE18	Hewson's Field	SSSI	478493	399614
OE19	Messingham Sand Quarry	SSSI	491394	404065
OE20	Manton and Twigmoor	SSSI	492895	405918
OE21	Scotton and Laughton Forest Ponds	SSSI	485863	399966

ID	Receptor name	Designation	Grid reference	
			X	Y
OE22	Broughton Far Wood	SSSI	495776	410821
OE23	Broughton Alder	SSSI	495914	409994
OE24	Scotton Beck Field	SSSI	487885	399177
OE25	Scotton Common	SSSI	486951	398641
OE26	Laughton Common	SSSI	483534	397224
OE27	Stainforth and Keadby Canal Corridor	LWS	482055	411529
OE28	Hatfield Waste Drain	LWS	480864	409988
OE29	North Engine Drain, Belton	LWS	480884	409952
OE30	Keadby Wetland	LWS	482773	411433
OE31	River Torne	LWS	480904	409901
OE32	Keadby Wet Grassland	LWS	482785	411409
OE33	Three Rivers	LWS	482956	411068
OE34	South Engine Drain Belton	LWS	480964	409897
OE35	Gunness Common	LWS	484845	411588
OE36	Ash Tip	N/A	481797	412068

[1] Assessed along a transect at approximately 20m intervals to determine rate of decrease in pollutant.
[2]Locations along the shoreline closest to the Proposed Development to determine likely area of maximum impact.

8.4.6 It is noted that there are two additional SSSI within the screening distance, Conesby Quarry and Manton Stone Quarry, however these are designated for geological features only and are not considered to be sensitive to air quality impacts. These sites have therefore been excluded from the assessment of emissions to air from the Proposed Development.

8.4.7 Three LWS (Keadby Boundary Drain, South Soak Drain and Keadby Warping Drain) have not been included in the assessment as the relevant habitats are aquatic, and therefore not considered to be sensitive to air quality impacts.

Baseline Air Quality

8.4.8 Existing air quality conditions in the vicinity of the Proposed Development Site have been evaluated through a review of Local Authority air quality management reports, Defra published data and other sources. The key pollutants of concern resulting from construction and operation of the Proposed Development 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.

8.4.9 There is a single Air Quality Management Area (AQMA) designated within the administrative boundary of North Lincolnshire Council (NLC). The AQMA covers an area surrounding the steelworks to the east of Scunthorpe and was designated due to the exceedance of the PM_{10} 24 hour mean National Air Quality Objective.

8.4.10 NLC undertook automatic monitoring at 11 sites within their administrative area in 2018 and undertook monitoring for nitrogen dioxide using diffusion tubes at 22 locations.

8.4.11 The nearest automatic monitors are located approximately 7.5km from the Proposed Development site, within the AQMA on the eastern side of Scunthorpe. The main focus of these monitors is for PM_{10} due to the steelworks. Of the seven monitors within the study area, only two monitor nitrogen dioxide – CM1 (Scunthorpe Town AURN) and CM3 (Low Santon).

8.4.12 The annual means for NO_2 and PM_{10} for 2018 at CM1 monitor were 18µg/m^3 for both, and 20µg/m^3 and 25µg/m^3 for NO_2 and PM_{10} respectively at CM3. CM3 recorded 40 exceedances of the 24-hour mean PM_{10} objective.

8.4.13 There are three monitors located at Urban Background locations in Scunthorpe – CM2, CM4 and CM5. Annual mean concentrations of PM_{10} at these locations range from 18 - 21µg/m^3. A Rural monitoring site at Appleby (CM8, approximately 12.8km from the Main Site) recorded an annualised mean for PM_{10} of 15µg/m^3.

8.4.14 The nearest nitrogen dioxide diffusion tubes to the Proposed Development are approximately 4.5km to the east, located on Doncaster Road (DT3 and DT4) and Scotter Road (DT2, near junction with Doncaster Road). Doncaster Road is a major road from the A18 and M181 into the centre of Scunthorpe. Annual mean concentrations of nitrogen dioxide at these locations range between 19 - 24µg/m^3, well below the national objective value of 40µg/m^3.

8.4.15 The results of the monitoring indicate that air quality with NLC's administrative area is of a good quality, with only isolated short-term incidents of elevated concentration of PM_{10} due to the steelworks. The area surrounding the Proposed Development is not expected to experience these short-term incidents, and air quality at nearby receptors is expected to be good.

8.4.16 The data for the monitoring sites that are considered to be relevant for the study area of the Proposed Development are detailed in Table 8.7 and Table 8.8.

Table 8.7: NLC Nitrogen Dioxide Monitoring

Site ID	Monitoring location	Site type	Grid reference		2018 Annual mean concentration (µg/m^3)
			X	Y	
CM1	Scunthorpe Town AURN	Industrial	490320	410831	18
CM3	Low Santon	Industrial	492945	411931	20
DT2	Scotter Road	Roadside	487239	411259	24
DT3	B&Q	Roadside	486699	411110	19

Site ID	Monitoring location	Site type	Grid reference		2018 Annual mean concentration (µg/m^3)
			X	Y	
DT4	Hilton Avenue	Roadside	486928	411156	20

Table 8.8: NLC PM_{10} Monitoring

Site ID	Monitoring location	Site type	Grid reference		2018 Annual mean concentration (µg/m^3)
			X	Y	
CM2	East Common Lane	Urban Background	490663	409789	21
CM4	Redbourn Club	Urban Background	490002	410069	18
CM5	Lakeside	Urban Background	491750	408127	20
CM8	Appleby	Rural	495075	414767	15

8.4.17 Background data has also been obtained from Defra published maps (Defra, 2020b) 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 (2031 peak construction year) baseline, background mapping data for 2031 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**: Construction Assessment (PEI Report Volume II). 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) (Defra, 2020b) is conservatively assumed to be representative of the opening (2025) baseline; as general trends are showing a reduction in both NO_2 and PM_{10} concentrations over time, this is considered to be a conservative assumption.

8.4.20 Background data from the Defra background maps for the receptors in the vicinity of the Proposed Development and roads is provided in Table 8.9 and indicates NO_2, CO, PM_{10} and $PM_{2.5}$ concentrations within the vicinity of the Proposed Development are consistently well below the relevant AQAL. Short term background concentrations are assumed to be twice the annual mean, in line with the Agency's guidance, and are shown in brackets in Table 8.9.

Table 8.9: Defra Background Maps Pollutant Concentrations - 2018

Receptors	Grid Reference of Centre Point	Annual Mean Concentration (µg/m^3)				
		NOx	NO_2	CO[a]	PM_{10}	$PM_{2.5}$
TR1, OR8	480500, 409500	11.6 (23.2)	8.9 (17.8)	112.7 (225.3)	16.4 (32.8)	9.0 (18.1)
TR2	482500, 409500	11.6 (23.2)	8.9 (17.8)	114.4 (228.8)	16.4 (32.8)	9.0 (18.0)
TR3	483500, 409500	12.2 (24.3)	9.3 (18.6)	114.8 (229.7)	16.1 (32.3)	9.0 (18.1)
TR4, TR5, TR6	483500, 410500	12.7 (25.4)	9.7 (19.3)	111.8 (223.6)	15.7 (31.4)	9.0 (17.9)
TR7, TR8, TR9, OR1, OR2	483500, 411500	12.2 (24.3)	9.3 (18.6)	111.8 (223.6)	15.0 (30.0)	8.7 (17.4)
TR10, TR11, TR12	478500, 409500	11.9 (23.7)	9.1 (18.2)	113.5 (227.1)	16.6 (33.1)	9.1 (18.3)
OR3	480500, 411500	12.1 (24.2)	9.2 (18.5)	109.6 (219.2)	16.0 (32.1)	8.8 (17.7)
OR4	481500, 410500	11.2 (22.4)	8.6 (17.2)	110.5 (221)	16.1 (32.1)	8.8 (17.6)
OR5	484500, 411500	12.4 (24.7)	9.4 (18.8)	114.4 (228.8)	15.4 (30.8)	8.8 (17.5)
OR6	483500, 413500	10.9 (21.9)	8.4 (16.8)	110.1 (220.1)	16.0 (32.0)	8.8 (17.5)
OR7	484500, 412500	12.3 (24.5)	9.3 (18.7)	126.2 (252.3)	15.0 (29.9)	8.5 (17.1)

[a] Background concentrations of CO are from the 2001 background maps scaled to 2018 concentrations

8.4.21 The Defra NO_2 background mapping data is lower than the automatic monitoring data from the Urban Background monitoring locations in NLC's administrative area, whereas the Defra PM_{10} concentration is consistent with concentrations monitored at CM8 (a rural monitor).

8.4.22 The background data selected for the assessment is detailed and justified within the accompanying appendices to this chapter (**Appendix 8A**: Construction Assessment and **Appendix 8B**: Operational Assessment (PEI Report Volume II)).

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

8.4.24 The baseline NO_x pollutant concentrations and acid and nutrient nitrogen deposition rates at the identified statutory designation ecological receptors have been obtained

from APIS and are provided in **Appendix 8B**: Operational Assessment (PEI Report Volume II).

Future baseline

8.4.25 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 Long Term Trend (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 in the Construction Environmental Management Plan (CEMP). A Framework CEMP will be prepared as part of the final ES and the CEMP will be developed in accordance with the principles set out in the framework.

8.5.2 Based on an initial assessment of the Site and surrounding 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**: Construction Assessment (PEI Report Volume II)), 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. The Environmental Permit may also include additional ELV for species not covered under the IED or LCP BRef.

Stack height

8.5.5 The final stack heights for the Proposed Development will be determined at the detailed design stage and will be optimised with consideration given to minimisation of ground-level air quality impacts and the visual impacts of taller stacks. This will be dependent upon the final stack locations and building heights for the Proposed Development.

8.5.6 At PEI Report stage, dispersion modelling has been undertaken to determine the minimum stack height considered to be appropriate for the building sizes assessed within the Rochdale envelope, such that the impacts at sensitive receptors are considered to be acceptable. This will be refined further for the final ES, should building sizes or stack locations change.

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**: Construction Assessment (PEI Report Volume II), 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 **Table 7** in **Appendix 8A**: Construction Assessment (PEI Report Volume II). The construction dust assessment utilises the worst-case scenario of the Proposed Development being built in one construction phase.

8.6.2 A number of residential receptors (high sensitivity) and ecological receptors (low to medium sensitivity as they are local sites) have been identified within 350m of the site boundary or site exit (**Table 7** in **Appendix 8A**: Construction Assessment (PEI Report Volume II)). 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**: Construction Assessment, PEI Report Volume II), unmitigated dust impacts are considered to be 'low to medium risk' for human health receptors, and 'medium risk' for ecological receptors. Therefore,

mitigation measures appropriate to the scale of perceived risk would be applied as part of the Framework CEMP.

Assessment of construction traffic

8.6.3 Table 16 of **Appendix 8A**: Construction Assessment (PEI Report Volume II) 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 construction traffic at the worst-case receptor.

8.6.4 Table 17 and **Table 18 Appendix 8A**: Construction Assessment (PEI Report Volume II) show the relevant information and assessment results for the significance of construction traffic impacts on ecological receptors.

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 Air Quality Assessment Level; and all receptors are below 75% of the Air Quality Assessment Level.

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

8.6.7 The impacts at all ecological receptors are considered unlikely to give rise to significant effects as the change in pollutant concentrations are less than 1% of the relevant Critical Load or Critical Level is not exceeded

8.6.8 The effect of changes in traffic flows due to construction traffic on human health and ecological receptors is therefore negligible and not significant.

Assessment of emissions from construction site plant (NRMM)

8.6.9 The assessment has identified no sensitive human receptors within 200m of the Proposed PCC Site and therefore the potential for NRMM emissions within the Proposed Development 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 at the Proposed PCC Site is therefore considered to be not significant. An assessment of NRMM at other parts of the Proposed Development Site (e.g. in relation to Water Connection Corridor) will be made within the ES.

8.6.10 The ecologically sensitive Humber Estuary SSSI and SAC is located within the Proposed Development Site boundary. However, whilst the final construction design is still under consideration, the ecology site is likely to be well over 100m from the nearest source of emissions associated with site plant and NRMM, with Keadby 1 Power Station and Keadby 2 Power Station sites lying between the Main Site and the estuary. 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 Framework CEMP to reduce emissions associated with this source, including restriction of their operation within designated

areas only, prohibiting of idling, the enforcement 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 estuary, the limited number and intermittent hours of operation, and the setback distance between them and the SSSI/ SAC, it is considered that the any impact experienced on the SSSI/ SAC as a result of site plant and NRMM emissions is likely to be negligible and not significant.

Operational Phase – Process Emissions from the Operational CCU Plant

8.6.11 The impact of emissions from the CCU plant at human health receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at discrete receptor locations.

8.6.12 The maximum hourly, daily and annual mean predicted concentrations have been compared with the relevant AQAL, as summarised in Table 8.10.

8.6.13 The results have been initially presented as the maximum concentration that occurs anywhere, whether this corresponds to a receptor location or not. Where this cannot be screened as negligible, the predicted concentration at the worst effected receptor has also been reported. The detailed concentrations at all identified receptor locations are provided in **Appendix 8B**: Air Quality – Operational Phase Table 11 – Table 13 (PEI Report, Volume II).

8.6.14 Isopleth figures showing the maximum predicted annual and short-term process contributions of NO_2 and NO_x are provided in **Figures 8.5 – 8.8** (PEI Report, Volume III).

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;
- cumulative impacts with the adjacent Keadby 2 Power Station CCGT;
- 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 baseloading as a worst-case);
- operation of the plant at proposed emission limits, or maximum concentrations provided by all Licensors, when annual average emissions are likely to be below these;
- screening assessment of N-amines with very conservative assumptions on N-amine degradation assumed at this time; 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	20.1	10%	Insignificant	19.0	39.1	20%	Negligible adverse
Maximum NO_2 annual mean	40	1.2	3%	Low	9.5	10.7	27%	Negligible adverse
Maximum CO 1-hour mean (as the 100th percentile)	30,000	445	1%	Insignificant	252	697	2%	Negligible adverse
Maximum CO 8-hour rolling average	10,000	184	2%	Insignificant	252	437	4%	Negligible adverse
Maximum NH_3 1-hour mean	2,500	7.7	0.3%	Insignificant	3	10.7	0.4%	Negligible adverse
Maximum NH_3 annual mean	180	0.14	0.1%	Imperceptible	1.5	1.6	1%	Negligible adverse
Maximum amines (as MEA) 1-hour mean (as the 100th percentile)	400	22.3	6%	Insignificant	-	22.3	6%	Negligible adverse
Maximum amines (as MEA) Annual mean	100	0.19	0.2%	Imperceptible	-	0.2	0.2%	Negligible adverse
Maximum N-amines Annual mean	0.20 ng/m^3	0.10	48%	High	-	0.10	48%	Moderate adverse
Worst-case Receptor N-amine Annual mean	0.20 ng/m^3	0.04	19%	High	-	0.04	19%	Moderate adverse

Species	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
Maximum Acetaldehyde 1-hour mean (as the 100th percentile)	9,200	23.6	0.3%	Insignificant	-	23.6	0.3%	Negligible adverse
Maximum Acetaldehyde Annual mean	370	0.20	0.1%	Imperceptible	-	0.20	0.1%	Negligible adverse
Maximum Formaldehyde 1-hour mean (as the 100th percentile)	100	2.2	2.2%	Insignificant	-	2.2	2.2%	Negligible adverse
Maximum Formaldehyde Annual mean	5	0.02	0.4%	Imperceptible		0.02	0.4%	Negligible adverse
Maximum Acetic acid 1-hour mean (as the 100th percentile)	3,700	4.8	0.1%	Insignificant	-	4.8	0.1%	Negligible adverse
Maximum 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, except for N-amines (based on the initial screening assessment undertaken).

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 Although a moderate adverse impact of N-amines is predicted at the worst case receptor location, it should be noted that this is largely as a result of the highly conservative screening assessment carried out on N-amines at this early stage in the Proposed Development's design. Even based on the conservative assumptions used, the impacts are not predicted to exceed the proposed EAL. It is considered that when further information is available on the propriety amine solvent to be used in the carbon capture process, the assessment of N-amines can be refined, and the amine specific module within ADMS can be employed enabling a more robust assessment of the amine degradation process for the final ES.

8.6.19 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.

8.6.20 The maximum daily and annual mean predicted concentrations have been compared with the relevant AQAL, as summarised in Table 8.11. The full results for each ecological receptor are provided in **Appendix 8B**: Air Quality – Operational Phase, **Tables 14 - 15** (PEI Report, Volume II).

8.6.21 Depositional impacts are presented in **Appendix 8B**: Air Quality – Operational Phase, **Tables 16 - 17** (PEI Report, Volume II).

Table 8.11: Results of operational impact assessment for ecological 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
Worst case receptor NO_x daily mean (as the 100th percentile)	75	17.9	24%	Medium	20.0	37.9	51%	Moderate adverse
Worst case receptor NO_x annual mean	30	1.2	4.3%	Low	14.3	15.5	52%	Negligible adverse
Worst case receptor NH_3 annual mean	3	0.10	3.5%	Low	1.9	2.0	67%	Negligible adverse
Worst case receptor NH_3 annual mean	1	0.017	1.7%	Very Low/ Low	2.9	2.9	288%	Moderate/ Major adverse

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

8.6.22 The impacts of daily NO_x at the worst-case receptor is identified as moderate adverse, however it is considered that the PEC value shows that an exceedance of the daily critical level is very unlikely, with impact at 51% of the critical level. It is therefore considered that this is not significant.

8.6.23 Annual average impacts of NO_x at the worst-case receptor are considered to have a negligible adverse impact and therefore are considered to be not significant. This is also the case for NH_3 impacts for the worst-case site that is assigned the higher NH_3 critical load value.

8.6.24 Annual average impacts of NH_3 impacts for the worst-case sites that are assigned the lower NH_3 critical level value have a very low/ low magnitude of impact, however as the background concentration of NH_3 at this site is already exceeding the critical level the significance criteria used indicates that this represents a moderate to major adverse magnitude of impact.

8.6.25 Further discussion is required on the relevance of the use of the lower critical level at these sites, as there is minimal information to justify the use of this level on APIS. If the higher critical level was applied, the impacts at these sites would be the PC would only be 0.6% of the critical level, and therefore would be considered to be insignificant.

8.6.26 The significance of this impact is considered further in **Chapter 11:** Biodiversity and Nature Conservation of this PEI Report.

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 Framework 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 traffic associated with 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 **Sections 8.5 and 8.6** of this report.

8.7.3 The air quality assessment of operational impacts has assumed that the ELV 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, except for N-amines, which have only been subject to a screening assessment at this stage.

8.7.4 Detailed modelling of predicted impacts at ecological receptors indicates that potential effects at ecological receptors as a result of the operation of the Proposed Development cannot be completely screened out as insignificant. Further assessment of the predicted effects at ecological receptors and the determination of the significance of these effects will therefore be assessed further in **Chapter 11**: Biodiversity and Nature Conservation of the PEI Report.

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

8.8 Limitations of 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 **Section 6** of **Appendix 8B**: Operational Assessment (PEI Report, Volume II).

8.8.2 There is also uncertainty associated with any dispersion 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 Residual effects or conclusions

Construction and decommissioning

8.9.1 The air quality assessment of construction impacts assumes that the measures outlined within **Section 8.6** 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).

8.9.2 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

8.9.3 The air quality assessment of impacts at opening has assumed that the ELV will be met for the operational plant as required and in accordance with use of BAT under the environmental permitting regime. No specific additional mitigation has been identified as 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.

Cumulative Effects

8.9.4 An assessment of cumulative impacts with other proposed developments that could interact with the impacts and effects of this Proposed Development will be carried out in the final ES, when the short-list of other developments has been finalised, as detailed in **Chapter 19**: Cumulative and Combined Effects of this PEI Report.

8.10 References

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