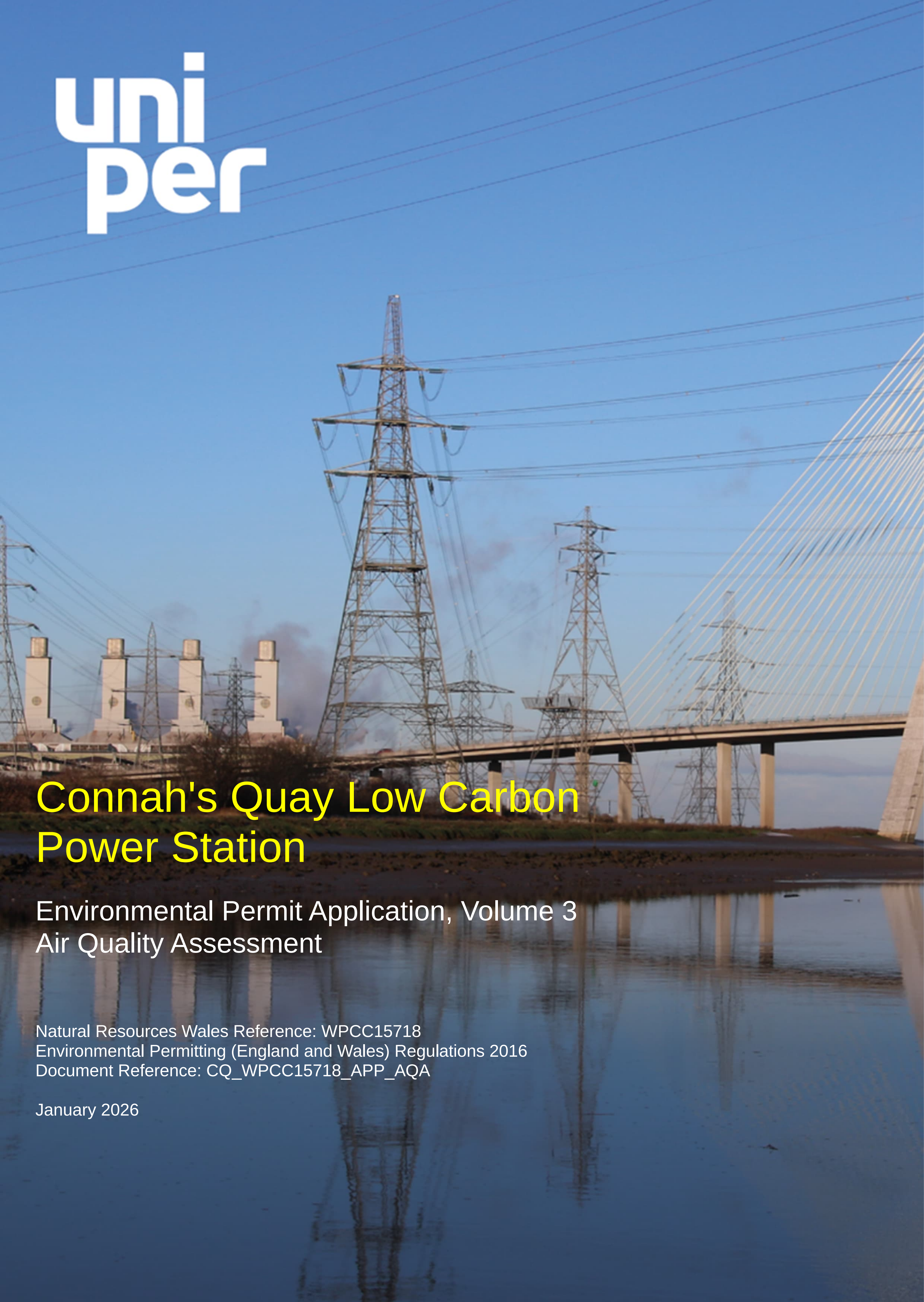

Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 3
Air Quality Assessment

Natural Resources Wales Reference: WPCC15718
Environmental Permitting (England and Wales) Regulations 2016
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1.1.2 The magnitude of air quality impacts at sensitive human and ecological receptors has been quantified through detailed dispersion modelling of the pollutants emitted from the stacks associated with the Proposed Installation and the existing Connah's Quay Power Station. The impact of emissions on human health receptors has been considered in the context of the relevant Air Quality Standards and Environmental Assessment Levels. The magnitude of air quality impacts at sensitive ecological receptors has been considered in the context of relevant critical levels and critical loads for designated and non-designated ecological sites.

1.1.3 The assessment has considered emissions from the Proposed Installation during normal operational conditions only. Non routine emissions, such as those which may occur during the commissioning process or other abnormal short-term events (OTNOC) would typically only occur on an infrequent basis, would be detected by the process control systems and be rectified within a short time period. The plant's operation would be regulated by Natural Resources Wales (NRW) through an Environmental Permit required for the operation of the Proposed Installation including notification requirements for any malfunction, breakdown or failure of equipment or techniques which may cause significant pollution. For plant start-up and shut-down periods, although there may be an increase in some pollutant concentrations, the overall mass release of pollutant would not increase over those assessed, as the stack volumetric flow rate would be lower during such times.

1.1.4 The operation of the existing Connah's Quay Power Station is currently regulated by NRW through an Environmental Permit. The existing Connah's Quay Power Station would not operate at its full installed capacity concurrently with the Proposed Installation.

1.1.5 **Annex A** of this Appendix provides details on assessment of amine degradation products.

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1.2 Scope

Operational Process Emissions

1.2.1 The study area for the operational Proposed Installation's point source emissions extends up to 15 km from the location of the stacks, in order to assess the potential impacts on ecological receptors, in line with the Risk Assessment methodology (Ref 1) adopted by NRW. This includes:

- Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar sites and Sites of Special Scientific Interest (SSSI) within 15 km of the Main Development Area; and
- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWS) and National and Local Nature Reserves (NNR and LNR) within 2 km of the Main Development Area.

1.2.2 The details of the assessment of ecological impacts are presented in Section 1.5 of this appendix.

1.2.3 In terms of human health receptors, maximum impacts from the operation of the Proposed Installation are within 2 km from the emissions sources and therefore sensitive receptors for the human health impacts are concentrated within a 2 km study area.

1.2.4 A number of dispersion modelling scenarios have been considered in this assessment, namely:

- operation of two CCGT Trains in unabated mode with the Front End Engineering Design (FEED) 1 Design, referred to as the "Unabated FEED 1 scenario". In this mode emissions would occur via the Heat Recovery Steam Generator (HRSG) stacks (abnormal temporary operating scenario e.g. periods when the CO_2 transport and storage system is not available);
- operation of two CCGT Trains in unabated mode with the Front End Engineering Design (FEED) 2 Design, referred to as the "Unabated FEED 2 scenario". In this mode emissions would occur via the Heat Recovery Steam Generator (HRSG) stacks (abnormal temporary operating scenario e.g. periods when the CO_2 transport and storage system is not available);
- operation of two CCGT Trains with Absorber trains for Carbon Capture with the FEED 1 Design, referred to as the "Abated FEED 1 scenario". In this mode emissions would occur via the Absorber stacks; and
- operation of two CCGT Trains with Absorber trains for Carbon Capture with the FEED 2 Design, referred to as the "Abated FEED 2 scenario". In this mode emissions would occur via the Absorber stacks.

1.2.5 Full results for each scenario leading to the highest impacts are presented in Section 5 of this appendix.

Existing Emissions

1.2.6 To assess the change in pollutant concentrations in the Study Area in more detail, a baseline scenario considering emissions from the existing Connah's Quay Power Station CCGTs under normal operating conditions, with all sources assumed to be operating for 21% of the year[1], has been included in this assessment. As this does not represent a worst-case scenario but a more realistic one, it has only been considered where emissions from the Proposed Installation alone are above the relevant screening criteria (which is based on a percentage of the Air Quality Environmental Standards (ESs).

1.2.7 Combustion emissions from the existing Combined Cycle Gas Turbines (CCGT) occur from the Gas Turbines (GT) 1 to 4. At present, the emissions from these sources are released to air via four stacks, which are 85 m above ground level.

1.2.8 In order to determine the impacts associated with the existing emissions these sources have been modelled at the existing emission parameters and emission limit values, as detailed in the Environmental Permit for the Site (Ref 2). Both annual average and hourly average emission limits are provided in the Environmental Permit and therefore the appropriate limit values have been used for the corresponding averaging times within the dispersion modelling assessment.

Operational Proposed Installation's Emissions (Future Assessment)

1.2.9 As with the Baseline Assessment, the Future Assessment has considered the impact of the future operational processes for the Proposed Installation to determine the change to local air quality, as a result of the CCGTs being operational and the flue gas being abated by the Carbon Capture Plants (CCP).

1.2.10 The Future Assessment assumes normal operating conditions, with the CCP operating for 8,760 hours per year. The assessment considers impacts from all listed scenarios, in the earliest year in which full capacity operation of both Trains of the Proposed Installation is due to commence operation, 2036.

1.2.11 The predicted model output concentrations (Process Contributions (or PCs)) of the Baseline Assessment have been compared to the PCs from the Future Assessment in order to determine the change between the predicted impacts of the Baseline Assessment and Future Assessment.

1.2.12 The emissions from the Proposed Installation's GTs are set based on information provided by the applicant's design team. As a minimum requirement these are commensurate with the Best Available Technique-Associated Emission Levels (BAT-AEL) for the relevant technology type, as detailed in the Large Combustion Plant (LCP) Best Available Technique (BAT) Reference document (LCP BRef) Ref 3). .

1.2.13 Emission rates of amines and amine degradation products have been based on information provided by the applicant's design team for both the Abated FEED 1 and Abated FEED 2 scenarios.

Cumulative impacts

1.2.14 The contribution to pollutant concentrations from existing sources of pollution in the area are accounted for in the adoption of site-specific background

[1] The assumption of a 21% operational scenario is based on Uniper's data on the recent historic use of the existing power plant and is considered to be robust enough for use in the assessment

pollutant concentrations from archive sources and air quality monitoring in close proximity to the Main Development Area.

1.2.15 It is recognised, however, that there is a potential impact on local air quality from emission sources which have either received or may receive, planning permission or other consent, but have yet to come into operation.

1.2.16 A detailed assessment of cumulative impacts on air quality has been considered within this assessment. The detailed model inputs for the additional emission sources are presented in Annex D.

1.2.17 The results presented within this assessment are inherently cumulative, as the air quality modelling for the operational phase includes all relevant committed developments on top of the existing background, both with and without the Proposed Installation.

Sources of Information

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

- the description of the Proposed Installation, as set out in the supporting statement;
- data on existing emissions to atmosphere taken from the existing Environmental Permit and recent data on the utilisation of the existing power station;
- data on future emissions to atmosphere provided by the project engineers;
- details of site layouts;
- Ordnance Survey mapping;
- baseline air quality data from published sources and Local Authorities, as detailed in Section 4;
- meteorological data supplied by ADM Limited; and
- data on committed developments.

2. Legislative, Policy and Guidance Framework

2.1.1 Legislation and guidance relating to Air Quality and pertinent to the Proposed Installation are detailed in the section below.

2.2 Legislation

European Union Ambient Air Quality Directive

2.2.1 The Clean Air for Europe programme revisited the management of air quality within the European Union (EU) and replaced much of the existing air quality legislation with a single legal act called the Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ref 4). This Directive repealed and replaced the EU Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management and its associated Daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, relating to limit values for ambient air pollutants and the Council Decision 97/101/EC which established a reciprocal exchange of information and data within Member States.

2.2.2 Directive 2008/50/EC is transcribed into United Kingdom (UK) legislation by the Air Quality Standards Regulations 2010 (Ref 5), which came into force on 11th June 2010 and as amended in 2016 (Ref 6) and the Air Quality Standards (Wales) Regulations 2010 (Ref 7). This sets binding limit values or objectives on pollutants with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment.

2.2.3 Air pollution limits set by the EU remain in UK law post Brexit, as EU legislation that applied directly or indirectly to the UK before 11.00 p.m. on 31st December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the EU (Withdrawal) Act 2018 (c. 16) (Ref 8). Section 4 of the Withdrawal Act 2018 ensures that any remaining EU rights and obligations, including directly effective rights within EU treaties, continue to be recognised and available in domestic law after exit. However, the EU will no longer have a role in enforcement.

National Air Quality Legislation

2.2.4 The Environment Act 1995 (Ref 9) requires the UK Government to produce a national Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland containing standards, objectives and measures for improving ambient air quality and to keep the policies identified under review.

2.2.5 The national air quality objectives of relevance to the air quality assessment, as well as to the local air quality management (LAQM) regime, were set by the Air Quality (Wales) Regulations 2000 (Ref 10) and the Air Quality (Wales) (Amendment) Regulations 2002 (Ref 11).

2.2.6 A further revision of the AQS in 2007 (Ref 12) set objective values to help local authorities manage local air quality improvements in accordance with the EU

Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality Standards (Wales) Regulations 2010 (Ref 7).

2.2.7 The Environment Act 2021 (Ref 13) amends the Environment Act 1995. On 9th November 2021, the Environment Act 2021 was approved after being first introduced to Parliament in January 2020 to address environmental protection and the delivery of the Government's 25-year environment plan following Brexit. The Environment Act 2021 works in conjunction with the Environment (Wales) Act 2016 (Ref 14), in terms of target setting, however the role of enforcement of policy within Wales sits with the Welsh Government. The Environment Act 2021 includes provisions to establish a post-Brexit set of statutory environmental principles and ensure environmental governance through an environmental watchdog, the Office for Environmental Protection (OEP). The Environment Act 2021 establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation by 31 October 2022. This duty sits within the environmental targets framework outlined in the Environment Act (Part 1). The Environment (Air Quality and Soundscapes) (Wales) Act 2024 (Ref 15) places a duty on Ministers to set a target for $PM_{2.5}$ (fine particulate matter that are 2.5 microns or less in diameter) and another air pollutant from a short list of six substances, by April 2027. At the time of writing, the $PM_{2.5}$ target has not been set in regulations.

2.2.8 The AQS objective values have been set down in regulation for the purposes of LAQM. Under the LAQM regime, local authorities have a duty to carry out regular assessments of air quality against the AQS objective values and if it is unlikely that the AQS objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. It is not unusual for the boundary of an AQMA to include within it relevant locations where air quality is not at risk of exceeding an AQS objective.

2.2.9 The principal air quality legislation within Wales is the 2010 Air Quality Standards (Wales) Regulations 2010, which transposes relevant EU Air Quality Directives into national legislation. The AQS objective values, Air Quality Assessment Levels (ES) as contained within the Air Quality Standards (Wales) Regulations 2010 or The Air Quality (Wales) Regulations 2000 (15-min SO_2 only) for the pollutants of relevance to the air quality assessment for the Proposed Installation are presented in Table 2-1.

Table 2-1: Key National AQS Objectives

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m³	N/A
	Hourly Mean	200 µg/m³	18 times per year
Particulate Matter (PM_{10})	Annual Mean	40 µg/m³	N/A
	Daily Mean	50 µg/m³	35 times per year

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m³	N/A
Sulphur dioxide (SO_2)	15-minute mean	266 µg/m³	35 times a year (i.e. 99.9th percentile)
	1-hour	350 µg/m³	24 times a year (99.73rd percentile)
	24-hour	125 µg/m³	3 times a year, (99.18th percentile)
Carbon monoxide (CO)	Running 8-hour average*	10,000 µg/m³	N/A

** The maximum daily eight-hour mean concentration of carbon monoxide must be selected by examining eight hour running averages, calculated from hourly data and updated each hour. Each eight-hour average so calculated must be assigned to the day on which it ends, that is, the first calculation period for any one day will be from 17:00 on the previous day to 01:00 on that day, and the last calculation period for any one day will be the period from 16:00 to 24:00 on that day.*

Industrial Emissions Directive 2010 and Environmental Permitting (England and Wales) Regulations 2016

2.2.10 The EU's Industrial Emissions Directive 2010/75/EU (IED) (Ref 16) provides operational limits and controls to which regulated plant must comply, including Emission Limit Values (ELV) for pollutant releases into the air. The operator of a plant covered by the IED is required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole. European BAT reference documents (BREF) are published for each industrial sector regulated under the IED, and they include BAT-Associated Emission Levels (BAT-AELs) which are expected to be met through the application of BAT. These levels may be the same as the ELV published in the IED, or they may be more stringent.

2.2.11 The Proposed Installation will be designed and operated to comply with the relevant provisions of the IED and also the July 2017 BAT conclusions for large combustion plants (LCP BAT Conclusions) (Ref 3). The requirements of the IED were transposed into law via the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the EPR) (Ref 17).

2.2.12 The LCP BAT Conclusions specify BAT AELs for NO_X and CO (and also NH_3 in cases where NO_X abatement is used) that are considered to be achievable through the implementation of BAT within a generating station. The EPR requires that a combustion plant with a thermal input of 50 megawatt (MW) or greater must operate in accordance with an environmental permit issued by Natural Resources Wales (NRW). As part of the permit application process, an operator is required to demonstrate that BAT will be implemented and during permit determination, NRW will set ELV for pollutant releases, based on the IED ELV and the BAT AELs as appropriate.

2.2.13 Current BAT identifies carbon capture as an emerging technique in the LCP BREF, but does not address all the potential environmental effects of the carbon capture activity. This situation is addressed by Article 14(6) of the IED where regulators must set permit conditions (including ELV where applicable), based on their own determination of BAT using the criteria listed in Annex III of the IED. No BAT-AELs have been defined for the carbon capture activity to date. However, Guidance on Post-Combustion Carbon Dioxide Capture: Guidance on Emerging Techniques (GET) (Ref 18) has been published and this will form the basis for NRW to determine appropriate BAT AELs within the environmental permit, required to operate the Proposed Installation. The environmental permit application is being made in parallel with the Development Consent Order (DCO) application submission.

2.2.14 Where legislative ambient air quality limits or objectives are not specified for the pollutant species potentially released from the Proposed Installation, Environmental Assessment Levels (EAL), published in the Air Emissions Risk Assessment for Your Environmental Permit Guidance (Ref 1) can be used to assess potential health effects on the general population. This includes an EAL for hourly concentrations of CO and annual average and hourly EALs for ammonia (NH_3), which can result from the operational Proposed Installation.

2.2.15 As well as the emissions from natural gas combustion in the Proposed Installation's gas turbines, emissions of amines, which are a component of the solvent used for carbon capture could occur directly from the carbon capture plant. Some amines can potentially degrade and form nitrosamines and nitramines (collectively referred to as N-amines) both during the carbon capture process itself or following release to the atmosphere. The impacts of directly released amines and N-amines and the N-amines produced through atmospheric degradation of released amines have also been considered in this assessment Such pollutant species have historically not been included in NRW's risk assessment guidance Ref 1; however, the Environment Agency (EA) has recently derived EALs for a number of amine species, that have been adopted by NRW (Ref 1). This was supported by a best practice methodology for deriving amine and N-amine specific EALs for air quality assessment using available literature and toxicology data. The FEED contractors have assisted in identifying appropriate EALs by providing information on the direct amine species which would be emitted from the process via the absorber stacks or formed in the atmosphere following release. The EALs applied have been derived from experimental data relating to the potential health impacts of the species emitted and/or read across from such data relating to species with published EALs which would be expected to have similar impacts based on structural or other similarity (Ref 1). Supporting information relating to the amine and degradation products associated with the FEED 1 and FEED 2 Designs, and their associated EALs, is included in Annex F and Annex G, respectively. For cumulative impacts, all direct amines emissions from the Proposed Installation and other cumulative sources have been added together and assessed against the MEA EAL. This represents a conservative assumption as it is not established that the impacts of different amines would be cumulative.

2.2.16 NRW has recently adopted an EAL for N-nitrosodimethylamine (NDMA) of 0.2 nanograms per cubic metre (ng/m^3) and it is understood that NRW recommend assessing the total N-amine concentration from plant emissions against the NDMA EAL. It should be recognised NDMA is considered to be one of the most toxic nitrosamines and some of the degradation products will be less harmful, and therefore this is a very conservative approach to the assessment of N-amine impacts.

2.2.17 Amine species concentrations have been assessed against the amine specific EALs when determining impacts from the Proposed Installation alone, but have been assessed cumulatively against the MEA EAL when considered for the in-combination assessments. This reflects that the MEA EAL has been applied for assessment of Amine 1 for both FEED contractors and Amine 1 is the dominant amine emission for both FEED contractors. The cumulative impacts of N-amine species have been assessed against the EAL for NDMA both for the Proposed Installation alone and for in-combination assessment as a conservative approach

2.2.18 Small amounts of other degradation products will be emitted from the post combustion capture (PCC) plant, and therefore these have also been included in the assessment. Note that each FEED option has different amines and degradation products present in the exhaust gas, as presented in the Emissions Inventory section. The EALs adopted in this assessment for the protection of human health are presented in **Table 2-2.** Ethanol is emitted by the Proposed Installation, however an EAL has not been adopted by NRW for this pollutant and it has therefore not been considered in this assessment.

Table 2-2: Environmental Assessment Levels (EALs) for Human Health

Pollutant	Concentration (µg/m^3)	Measured as	Source of EAL
NH_3	180	Annual mean	NRW Risk Assessment Guidance (Ref 1)
	2,500	Hourly mean	
Amine 1 FEED 1/ Total Amines (Based on MEA EAL)	400	Hourly mean	
	100	24-hour Long-term mean	
Amine 2 FEED 1 (Based on Piperazine EAL)	15	24-hour Long-term mean	
Amine 1 FEED 2/ Total Amines (Based on MEA EAL)	400	Hourly mean	
	100	24-hour Long-term mean	
Amine 2 FEED 2 (Based on Piperazine EAL)	15	24-hour Long-term mean	
Nitrosamines	0.2 ng/m^3	Annual mean	
CO	30,000	Hourly mean	
	10,000	Running eight-hour mean	
Formaldehyde	5	Annual Mean	
	100	30-minute mean	
Acetaldehyde	370	Annual mean	
	9,200	Hourly mean	
Acetone	18,100	Annual mean	

Pollutant	Concentration (µg/m³)	Measured as	Source of EAL
	362,000	Hourly mean	
Ketones (Based on Methyl ethyl ketone)	6,000	Annual mean	
	89,900	Hourly mean	
Acetonitrile	680	Annual mean	
	10,200	Hourly mean	
Amide 1 (Based on MEA EAL)	100	Hourly mean	
	400	24-hour Long-term mean	
Formamide 1 (Based on MEA EAL)	100	Hourly mean	
	400	24-hour Long-term mean	

2.2.19 Throughout this assessment, national AQS objectives, critical levels (CL) and EALs are collectively referred to as Environmental Standards (ES).

2.3 Sensitive Ecosystems

2.3.1 The UK has retained the terms of the European Birds Directive 2009 (Ref 19) and Habitats Directives (Ref 20) and the Ramsar Convention (Ref 21) following departure from the EU. The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 22) 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 SAC 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. Consideration has also been given to Ramsar sites, designated as wetlands of international importance.

2.3.2 The impact of air emissions from the Proposed Installation on sensitive ecological receptors are quantified within the 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'.

2.3.3 The Critical Levels (CLe) for the protection of vegetation and ecosystems are defined as '*concentrations of pollutants in the atmosphere above which direct adverse effects on...plants [and] ecosystems...may occur according to present knowledge," and critical loads are defined as "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*' (Centre for Ecology and Hydrology (CEH) and Air Pollution Information System (APIS) website).

2.3.4 The CLe applied in the assessment are set out in **Table 2-3** and apply regardless of the habitat type present at the habitat receptor. In the cases of sulphur dioxide and NH_3, the greater sensitivity of lichens and bryophytes to this pollutant is reflected in the application of two critical levels, with a stricter critical level to be applied to locations where such species are present.

2.3.5 Critical load (CLo) 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 detailed on the APIS website. The APIS critical loads are provided as a range of values for both acid and nitrogen. Advice was taken from the Project Ecologist when selecting the appropriate site relevant CLo, with the emphasis on ensuring that a precautionary CLo was selected whilst ensuring this was appropriate for the species present at the area of impact. Data on APIS is only pertinent to statutory ecological sites, however advice from the project ecologists has provided the lowest appropriate critical load for the non-statutory sites included in the assessment.

Table 2-3: Critical Levels (CLe) – Protection of Vegetation and Ecosystems

Pollutant	Source	Concentration ($\mu g/m^3$)	Measured as
Oxides of nitrogen (NO_X)	EU air quality limit value	30	Annual mean
	UK target value	75	Daily mean
Sulphur dioxide (SO_2)	NRW Environmental Permit Guidance	10	Annual mean, for sensitive lichen communities & bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity
	NRW Environmental Permit Guidance	20	Annual mean, For all higher plants (all other ecosystems)
Ammonia (NH_3)	UK target value for lichen and bryophytes	1	Annual mean
	UK target value	3	Annual mean

2.4 Guidance

Statutory guidance

2.4.1 The environmental regulator's guidance on post-combustion carbon dioxide capture (Ref 18) advises that site operators applying for an environmental permit make reference to the following guidance and information. This information has been taken into account in the air quality assessment, but is not statutory guidance for the purposes of Environmental Impact Assessments.

- Air Quality Modelling and Assessment Unit (AQMAU) recommendations for the regulation of impacts to air quality from amine-based post-combustion carbon capture plant. AQMAU-C2025-RP01 (Ref 23);

- Toxicological advice on air pollutants Hazard Ranking of Substances for Development of EALs for Substance Emissions to Air from Carbon Capture Technologies (Ref 24);
- Air Emissions Risk Assessment for your Environmental Permit Guidance ('Risk Assessment Guidance') (Ref 1);
- Environmental permitting: air dispersion modelling reports (Ref 25); and
- UKCCS Research Community - BAT information for Carbon Capture and Storage (CCS) (Ref 26) which includes:
  - BAT Review for New Build and Retrofit Post-Combustion Carbon Dioxide Capture Using Amine-Based Technologies for Power and CHP Plants Fuelled by Gas and Biomass as an Emerging Technology under the IED for the UK (Ref 27); and
  - AQMAU Proposed assessment method to include amines and degradation products in nutrient nitrogen deposition estimations at ecological sites AQMAU-C2600-RP01 (draft) (Ref 28).

2.4.2 The NRW Risk Assessment Guidance is applied in relation to Environmental Permit applications in Wales. Though the Risk Assessment Guidance relates specifically to permitting, it provides useful supplementary information for interpreting the air quality impacts on human health and ecology.

3. Methodology

3.1 Overview

3.1.1 The dispersion of emissions from both existing and future emission sources has been predicted using the latest version of the atmospheric dispersion model ADMS (currently version 6.0.2). The results are presented in both tabular format within this appendix and as contour plots of predicted ground level change overlaid on mapping of the surrounding area.

3.1.2 The modelled scenarios are detailed in Section 1.2.4 of this report.

3.2 Baseline Assessment

3.2.1 The Baseline Assessment has considered the effects from emissions of oxides of nitrogen (NO_X) and carbon monoxide (CO) associated with the operation of the existing Connah's Quay Power Station's GTs only.

3.3 Future Assessment

3.3.1 For the future assessments, the same pollutants assessed for the Baseline Assessments have been modelled again from the proposed CCP emission sources, except that there would also be emissions of ammonia (NH_3). The release parameters for the new CCP, such as stack height, air flow, efflux velocity, release temperature and pollutant concentration all affect the dispersion of these emissions.

3.3.2 Emissions of amines and their breakdown products have also been modelled due to their potential to be present in the emissions from the CCP Absorber stacks. Breakdown products include NH_3 and formaldehyde (as a pollutant representative of breakdown products).

3.3.3 It is also known that amines can degrade into nitrosamines and nitramines (collectively referred to as N-amines) both within the carbon capture process itself and also in the environment following release.

3.3.4 The direct release of amines and any other degradation products generated in the process have been considered in the future assessment and the results are presented in this report.

3.3.5 Complex atmospheric processes that occur following the release of both amines and directly released N-amines as discussed in **Annex A**.

Dispersion Model Selection

3.3.6 As stated previously, the assessment of emissions from the Proposed Installation has been undertaken using the advanced dispersion model ADMS (version 6.0.2), supplied by Cambridge Environmental Research Consultants Limited (CERC) (Ref 29). ADMS is a modern dispersion model that has an extensive published validation history for use in the UK. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

3.3.7 CERC has developed an amine chemistry module for use with the ADMS dispersion model, for the assessment of emissions of amines and their atmospheric degradation products. The model calculates the rate of amine degradation, taking into account the reaction of amines with other species present in the exhaust gas (i.e. NO and NO_2) and with OH radicals in the atmosphere.

3.3.8 The ADMS Amines chemistry module is currently the only commercially available modelling software for evaluating the potential impacts of amines and amine degradation products.

3.3.9 The module is based on established science considering published research on mechanisms of formation of toxic compounds. Although the module has not been validated, the ADMS air dispersion modelling algorithms are continually validated against real world situations, field campaigns and wind tunnel experiments.

3.3.10 The Air Quality Modelling & Assessment Unit (AQMAU) have reviewed the amines module (Ref 30), stating that '*The amines chemistry module is based on established science considering published research on mechanisms of formation of toxic compounds. Although the validation of the module is not possible at the moment, the ADMS air dispersion modelling algorithms are continually validated against real world situations, field campaigns and wind tunnel experiments'.*

3.3.11 AQMAU recognise in their report (Ref 30) that '*There are various aspects of the current version of the module that suggest the estimation of toxic products might be conservative, however, the level of uncertainties in other input parameters can counteract this.*' Note that an updated version of the amine chemistry module came out in 2023 with the new version of ADMS.

3.3.12 Within the ADMS amines chemistry module, it is necessary to specify the amine, nitrosamine, nitramines and radical species that are being modelled (although the latter is now only necessary if an output of the radical is required). With the new module, emissions of a solvent with multiple amine components can be modelled in the same run, although reactions between the amine components themselves are not accounted for.

3.3.13 The module requires the amine-specific branching ratio and the kinetic constants, k values (specific to each subsequent reaction rate). The rates of reaction may be derived through scientific research, either through experimental observation, for the more stable intermediate reaction species, or through theoretical computational calculations such as Transition State Theory.

Model Inputs

3.3.14 The general model conditions applicable to all the model scenarios assessed are summarised in **Table 3-1**. Specialised model treatment inputs within the ADMS amines model are specified in **Annex A**.

Table 3-1: General ADMS 6 Model Inputs

Variable	Model Input
Surface roughness at source	0.4
Surface roughness at meteorological site	0.3

Variable	Model Input
Receptors	Selected discrete receptors (as detailed in **Table 3-4**)
Receptor locations	X, Y co-ordinates determined by GIS
	z (ground level) = 1.5 m for human receptors
	z = 0 m for ecological receptors
Source locations	X, Y co-ordinates determined by GIS
Meteorological data	5 years of meteorological data, Hawarden Meteorological Station (2019 - 2023)
Terrain data	Flat or simple terrain

3.3.15 The assessment has assumed that all sources operate at continuous design load (8,760 hours per year) as a conservative approach. No time-based variation in emissions has therefore been accounted for within the model.

Emissions Inventory

3.3.16 The stack emission parameters for all the modelled sources are shown in **Table 3-2**.

3.3.17 The stack flow (actual) parameters take account of the CO_2 removal from the gas stream for unabated operation.

Table 3-2: Stack Emission Parameters for all Modelled Sources

Emission Source	Location (x, y)	Stack Height (m)	Stack Diameter (m)	Release Temp (°C)	Stack Airflow (actual) Am^3/s	Stack H_2O Content (%)	Flue O_2 content (dry) (%)	Reference O_2 (%)	Stack flow at reference conditions (STP, dry, Ref O_2)	Stack gas exit velocity (m/s)
HRSG Train (per stack) – FEED 1	327475, 371420 327439, 371367	120	8.0	87.3	839.4	8.6	13.2	15	755.9	16.7
HRSG Train (per stack) – FEED 2	327487, 371419 327426, 371333	130	8.0	89.0	1,056.7	9.3	12.6	15	1,018.1	21.0
Absorber Train (per stack) – FEED 1	327409, 371426 327372, 371372	145	7.0	60.0	735.0	7.7	13.8	15	669.1	19.1
Absorber Train (per stack) – FEED 2	327444, 371434 327383, 371348	145	7.0	56.7	979.2	9.8	12.8	15	999.3	25.4
Existing CCGT (per stack)	327949, 371137 327932, 371112 327914, 371087 327897, 371063	85	7.4	105.0	676.0	NA	NA	15	547.0	15.8

3.3.18 During normal operation, the CCP absorber stack(s) would be the primary source of emissions from both the combustion and carbon capture processes associated with the Proposed Installation.

3.3.19 In addition, there would be bypass stacks (HRSG stack(s)) associated with Proposed Installation's CCGT units (one per train), which would only be operational when the Proposed Installation is operating in an unabated mode (i.e. combustion emissions only, with no carbon capture taking place).

3.3.20 When the plant is operating with carbon capture, there are additional emissions of amines and potentially their degradation compounds (nitrosamines and nitramines, collectively referred to as N-amines).

3.3.21 The main reported emissions for the Proposed Installation have been modelled based on the design case of a single CCP absorber stack per train. These stacks have been evaluated for a range of stack heights, but the results presented are based on the predicted results with a stack height of 145 m AGL with an internal stack diameter of 7 m. It is considered that 145 m AGL is the appropriate stack height that would not result in significant impacts at human health receptors and would minimise effects reported at ecological receptors. With the current conservative model input parameters, a stack height of 145 m AGL has therefore been used in the assessment. The physical properties of the assessed emission sources are shown in Table 3-2 and are illustrated in **Figure 4**.

3.3.22 The modelled pollutant emission rates (in grams per second (g/s)) have been calculated by multiplying the emission concentration by the volumetric flow rate at normalised reference conditions. The emission limits that apply to the existing emission sources and those assumed for the Proposed Installation are shown in **Table 3-3**.

3.3.23 The Environmental Permit issued by NRW would require emission concentrations of NO_X to be no higher than the BAT-AEL range provided in the Large Combustion Plant BRef for new CCGT plant (10 - 30 mg/Nm^3 as a yearly average and 15 - 40 mg/Nm^3 as a daily average). The Proposed Installation's emissions would also need to comply with the Industrial Emissions Directive (IED)'s hourly maximum Emission Limit Value (ELV) of 100 mg/Nm^3. NO_X has been modelled at the upper end of the daily BAT-AEL range for daily average impacts and at the upper end of the hourly IED ELV range for hourly average impacts but at a yearly emission level lower than the upper end of the BAT-AEL range for annual average impacts, as provided by the FEED contractors. It is considered that this represents the worst-case NO_X emissions; in practice the emission is likely to be lower than these concentrations, as it is desirable to reduce the NO_X emissions entering the inlet of the CCP.

3.3.24 For the abated FEED scenarios (FEED 1 and FEED 2) the emission limit values for NO_X and CO have been adjusted to account for the removal of CO_2 by the carbon capture system.

3.3.25 A NO_X abatement system such as Selective Catalytic Reduction (SCR) will be required to achieve the required NO_X emission on inlet to the CCP. SCR reduces NO_X concentrations by spraying ammonia into the flue gas and therefore has the potential to result in 'ammonia slip' with a resulting emission of NH_3. Emissions of NH_3 have therefore also been included in the assessment of the abated FEED scenarios.

3.3.26 In addition, depending on the amine solution used, ammonia can result as a degradation product during the carbon capture process itself. As there is uncertainty in the level of potential ammonia emission, the design for the CCP will include provision for an acid wash to remove ammonia from the absorber stack gas, if required. Emissions of NH_3 have therefore been assessed at a concentration considered to be achievable through the use of acid wash abatement as advised by the Applicant's FEED contractors (0.75 - 1 mg/Nm^3).

3.3.27 The carbon capture process would utilise a proprietary amine solvent to remove the carbon dioxide from the combustion emission. Emissions of 'amine slip' can therefore also result.

3.3.28 Each licensor's proprietary amine solution (i.e. FEED 1 and FEED 2) contains a different mix of amines (See Annex F and Annex G). The results below are based on data provided by the FEED contractors for each solution.

3.3.29 It is also known that amines degrade into nitrosamines and nitramines (collectively referred to as N-amines) both within the carbon capture process itself and also in the environment following release, and therefore this has also been considered in the assessment. Depending on the amine solvent, other degradation products, such as acetaldehyde, formaldehyde and ketones may be formed.

3.3.30 Due to the complexity of the N-amines atmospheric degradation processes that occur following release, the assessment of N-amines is described in **Annex A**.

Table 3-3: Pollutant Emission Limits and Release Rates (per stack)

Emission Source	Pollutant	Annual Average Emissions		Short Term Emissions (where applicable)	
		Emission Concentration (mg/Nm^3)	Release Rate (g/s)	Emission Concentration (mg/Nm^3)	Release Rate (g/s)
HRSG (per stack) – FEED 1	NOx	30	22.7	40 (daily) 100 (hourly)	30.2 75.6
	CO	-	-	200 (hourly)	151.2
HRSG (per stack) – FEED 2	NOx	30	30.5	40 (daily) 100 (hourly)	40.7 101.8
	CO	-	-	200 (hourly)	203.6
Single Absorber (per stack) – FEED 1	NOx	11.3*	7.60	45.2* (daily) 113.0* (hourly)	30.2 75.6
	CO	-	-	226.0* (hourly)	151.2
	NH_3	1	0.67	-	-
	Amine 1	0.99	0.662	-	-
	Amine 2	0.01	0.007	-	-
	Nitrosamine 2	0.00495	0.0033	-	-
	Nitramine 1	0.0000495	0.000033	-	-
	Nitramine 2	0.0000005	0.00000034	-	-

Emission Source	Pollutant	Annual Average Emissions		Short Term Emissions (where applicable)	
		Emission Concentration (mg/Nm³)	Release Rate (g/s)	Emission Concentration (mg/Nm³)	Release Rate (g/s)
	Formaldehyde	4.0	2.01	-	-
	Ketones	8.0	5.35	-	-
	Acetaldehyde	6.0	4.01	-	-
Single Absorber (per stack) – FEED 2	NOx	11.3*	11.3	45.2* (daily) 113.0* (hourly)	45.2 112.9
	CO	-	-	226.0* (hourly)	225.8
	NH_3	0.75	0.75	-	-
	Amine 1	0.087	0.087	-	-
	Amine 2	0.019	0.019	-	-
	Nitrosamine 1	0.0028	0.00284	-	-
	Nitrosamine 2	0.0005	0.00051	-	-
	Formaldehyde	0.13	0.134	-	-
	Acetonitrile	0.18	0.183	-	-
	Acetaldehyde	0.39	0.392	-	-
	Acetone	0.52	0.517	-	-
	Amide 1	0.032	0.032	-	-
	Formamide 1	0.035	0.035	-	-
Existing GT (per stack)	NOx	40	21.9	100	54.7
	CO	-	-	60	32.8

* Emission limit value adjusted to account for CO_2 removal by the carbon capture system

Modelled Domain and Discrete Receptors

Human Health Receptors

3.3.31 The modelling has predicted concentrations of the pollutants relevant to human health at the maximum location anywhere within the modelled area and at discrete air quality sensitive receptors, as listed in **Table 3-4**. The locations of these receptors are also shown in **Figure 2: Operational Phase Assessment – Air Quality Study Area and Human Health Receptors**. The receptors are selected to be representative of residential dwellings and schools in the area around the Proposed Installations.

3.3.32 **Table 3-4** shows the minimum distance of each receptor to the Proposed Installation's stacks.

Table 3-4: Human Health Receptor Locations

Receptor ID	OS Grid Co-ordinate Easting	OS Grid Co-ordinate Northing	Receptor Description	Minimum Distance from the Proposed Installation's Stacks (m)
R1	327170	371241	Residential, Kelsterton Road, Rockcliffe,CH6 5SJ*	220
R2	327152	371210	Residential, Chester Road, Oakenholt, CH6 5SJ	260
R3	326749	371070	Residential, Chester Road, Oakenholt, CH6 5SF	660
R4	327557	370826	Residential, Kelsterton Road, Rockcliffe, CH6 5TH	490
R5	327880	370743	Residential, Kelsterton Road, Rockcliffe, CH5 4BJ	700
R6	327972	370700	Residential, Connah's Quay, CH5 4BL	790
R7	328024	370545	School, Deeside College, York Road, Golftyn, CH5 4YE	950
R8	326371	371298	Residential, Papermill Lane, Oakenholt, CH6 5TD	950
R9	326452	370953	Residential, Oakenholt Lane, Oakenholt, CH6 5SX	970
R10	326048	371070	Residential, Leaderbrook Drive, Oakenholt, CH6 5ST	1,310
R11	325943	371334	Residential, Leaderbrook Drive, Oakenholt, CH6 5ST	1,370
R12	325928	371585	Residential, Leaderbrook Drive, Oakenholt, CH6 5ST	1,390
R13	325967	371792	Residential, Leaderbrook Drive, Oakenholt, CH6 5ST,	1,390
R14	325966	371823	Residential, Chester Road, Oakenholt, CH6 5WF	1,400
R15	328454	370344	Residential, Church Street, Golftyn, CH5 4AS	1,380
R16	328381	370167	Residential, College View, Connah's Quay, CH5 4BY	1,460
R17	328213	370061	Residential, Golftyn Lane, Connah's Quay, CH5 4DT,	1,450
R18	328026	370163	School, Connah's Quay High School, Golftyn Lane, Connah's Quay, CH5 4BH	1,270
R19	327314	369848	Residential, Top-y-fron Hall, Kelsterton Lane, Connah's Quay, Northop Hall, CH6 5TF	1,460
R20	326567	369690	Residential, Oakenholt Lane, Rockcliffe, Connah's Quay, Northop Hall, CH6 5SU	1,840

Receptor ID	OS Grid Co-ordinate Easting	OS Grid Co-ordinate Northing	Receptor Description	Minimum Distance from the Proposed Installation's Stacks (m)
R21	328609	369883	School, Golftyn Primary School, York Rd, Connah's Quay, CH5 4XA	1,830
R22	328824	370107	Residential, Church Street, Golftyn, Connah's Quay, CH5 4AQ	1,820
R23	328830	370114	Place of worship and residential, Church Street, Golftyn, Connah's Quay, CH5 4AQ	1,820
R24	329067	369895	Place of worship, St Mark's Parish Church, Church Hill, Golftyn, CH5 4AD	2,140
R25	328941	369539	School, Bryn Deva C.P. School, Linden Avenue, Golftyn, CH5 4SN	2,300
R26	328634	369331	Residential, Lon Dderwen, Connah's Quay, CH5 4WG	2,300
R27	325516	372175	Residential, St David's, Croes Attilla, CH6 5SP	1,950
R28	324919	372091	School, St Richard Gwyn Roman Catholic High School, Albert Avenue, Flint, CH6 5JZ	2,480
R29	324990	372645	School, Ysgol Gymraeg Croes Atti, Chester Road, Flint, CH6 5DU	2,620
R30	324385	371941	School, Ysgol Maes Hyfryd, Maes Hyfryd, Flint, CH6 5LN	2,970
R31	324516	372532	School, Gwynedd County Primary School, Ysgol Pen Coch, Maes-y-Dre Avenue, Flint, CH6 5JT	3,010
R32	324546	373323	Residential, Lloyd Street, Flint, CH6 5PD	3,350
R33	324186	370145	Place of worship, St Thomas's Church, St Thomas's Court, Flint, Flint Mountain, CH6 5SL	3,370
R34	329678	369534	Residential, High Street, Golftyn, Connah's Quay, CH5 4DJ	2,840
R35	329955	369652	Sports grounds, Dock Road, Connah's Quay, CH5 4EF	2,990
R36	329953	369351	Place of worship, High Street, Golftyn, Connah's Quay, CH5 4DJ	3,170

Receptor ID	OS Grid Co-ordinate Easting	OS Grid Co-ordinate Northing	Receptor Description	Minimum Distance from the Proposed Installation's Stacks (m)
R37	329600	369081	Residential, Mold Road, Connah's Quay, CH5 4QN	3,090
R38	329128	368936	Residential, Cranbrook Close, Connah's Quay, CH5 4JY	2,900
R39	328165	368716	Residential, Mold Road, Connah's Quay, CH5 4QN	2,680
R40	330375	368913	Place of worship, Christ Church Deeside, Victoria Road, Shotton, CH5 1ES	3,770
R41	330528	367801	Hospital, Desside Community Hospital, Plough Lane, Aston, CH5 1XS	4,660
R42	332295	369161	Residential, Farm Road, Garden City, CH5 2HJ	5,270
R43	331087	366723	Residential, Overlea Drive, Deeside CH5 3HS	5,840
R44	331149	373884	Residential, Greenwood Farm, Unnamed Road, Neston CH64 5SH	4,410

* given the locations of receptors were identified in advance of the establishment of the travellers' encampment, other receptor locations in its vicinity (e.g. R1, R2 and R4) are considered to be representative of the significance of effects predicted for the travellers' encampment.

Ecological Receptors

3.3.33 In accordance with the Risk Assessment methodology (Ref 1) adopted by NRW, the impacts associated with emissions from the Proposed Installation on statutory sensitive ecological sites have been quantified. The assessment considers European designated sites (SACs, SPAs and Ramsar sites) and SSSIs within 15km of the operational Proposed Installation, as recommended by the NRW risk assessment guidance for "large emitters".

3.3.34 In additional, Local Wildlife Sites (LWS) within 2 km of Main Development Area have also been included in the assessment.

3.3.35 Ground-level concentrations of the modelled pollutants relevant to sensitive ecological receptors have been predicted at locations listed in **Table 3-5**. The locations of these receptors are also shown in **Figure 3: Operational Phase Assessment – Air Quality Study Area and Ecological Receptors**. The distance reported for each ecology site is to either of the Proposed Installation stack(s), whichever is the closest, and is taken to be representative of the highest impact location. (OE labels are applied to Operational Phase – Ecological Receptors).

Table 3-5: Ecological Receptor Locations

Receptor ID	Ecological Site	Designation	OS Grid Coordinate*		Distance from the Proposed Installation's Stacks (m)
			Easting	Northing	
OE01	Heswall Dales	Site of Special Scientific Interest (SSSI)	326127	381815	10,400
OE02	Dee Estuary	Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA) and SSSI	Varied	Varied	Varied
OE03	The Dungeon	SSSI	325074	383034	11,770
OE04	Thurstaston Common	SSSI	324893	384379	13,130
OE05	Dibbinsdale	SSSI	332304	380953	10,690
OE06	Mersey Estuary	Ramsar, SPA, SSSI	337932	379707	13,340
OE07	New Ferry	SSSI	335477	384176	15,070
OE08	Hallwood Farm Marl Pit	SSSI	334355	375893	8,190
OE09	Inner Marsh Farm	SSSI	330718	372980	3,580
OE10	River Dee and Bala Lake	SAC, SSSI	328755	371000	1,300
OE11	Connah's Quay Ponds and Woodland	SSSI	328955	368680	3,020
OE12	Maes y Grug	SSSI	326031	366762	4,760
OE13	Deeside and Buckley Newt sites	SAC, SSSI	329081	365705	5,830
OE14	Coed Talon Marsh	SSSI	327012	358683	12,630
OE15	Bryn Alyn	SSSI	320410	359418	13,820
OE16	Cambrian Quarry	SSSI	321432	362367	10,780
OE17	Alyn Valley Woods and Alyn Gorge Caves	SAC, SSSI	319797	366391	9,040
OE18	Halkyn Mountain	SAC. SSSI	318259	376351	10,310
OE19	Pen-y-Cefn Pasture	SSSI	318909	366514	9,730

OE20	Cefn Meadow	SSSI	318929	366042	9,950
OE21	Coed Trefraith	SSSI	313639	372797	13,740
OE22	Ddol Uchaf	SSSI	314317	371354	12,990
OE23	Caerwys Tufa	SSSI	313035	371844	14,280
OE24	Tyddyn-y-barcut	SSSI	319073	367525	9,110
OE25	Parc Bodlondeb and Gwenallt-parc	SSSI	317876	370857	9,450
OE26	Parc Linden, Lixwm	SSSI	318383	371925	8,940
OE27	Flint Mountain	SSSI	324875	371560	2,440
OE28	Herward Smithy	SSSI	319855	373980	7,880
OE29	Shotton Lagoons and Reedbeds	SSSI	329515	371040	2,030
OE30	Local Ancient Woodlands	Ancient Woodland (LWS)	329795	368480	3,670
OE31	Dee Cliff	SSSI	324636	382172	11,300

*Point of maximum long-term impact within each site

3.3.36 OE31 is designated for its geological features only and is not sensitive to air quality impacts and therefore is not considered further in this assessment.

Modelled Domain – Receptor Grid

3.3.37 Emissions from the Proposed Installation' stacks have been modelled on a nested receptor grid that is 20 km by 20 km centred on the Proposed Installation's absorber stacks. The nested grid spacing is 40 m for the first 3 km square, 100 m up to 4 km and 500 m up to 20 km, which is considered appropriate for the height of the stacks included in the assessment.

3.3.38 In addition, the receptors detailed in **Table 3-4** have been included as specified points within the model and therefore the predicted PCs at these locations are unaffected by grid spacing.

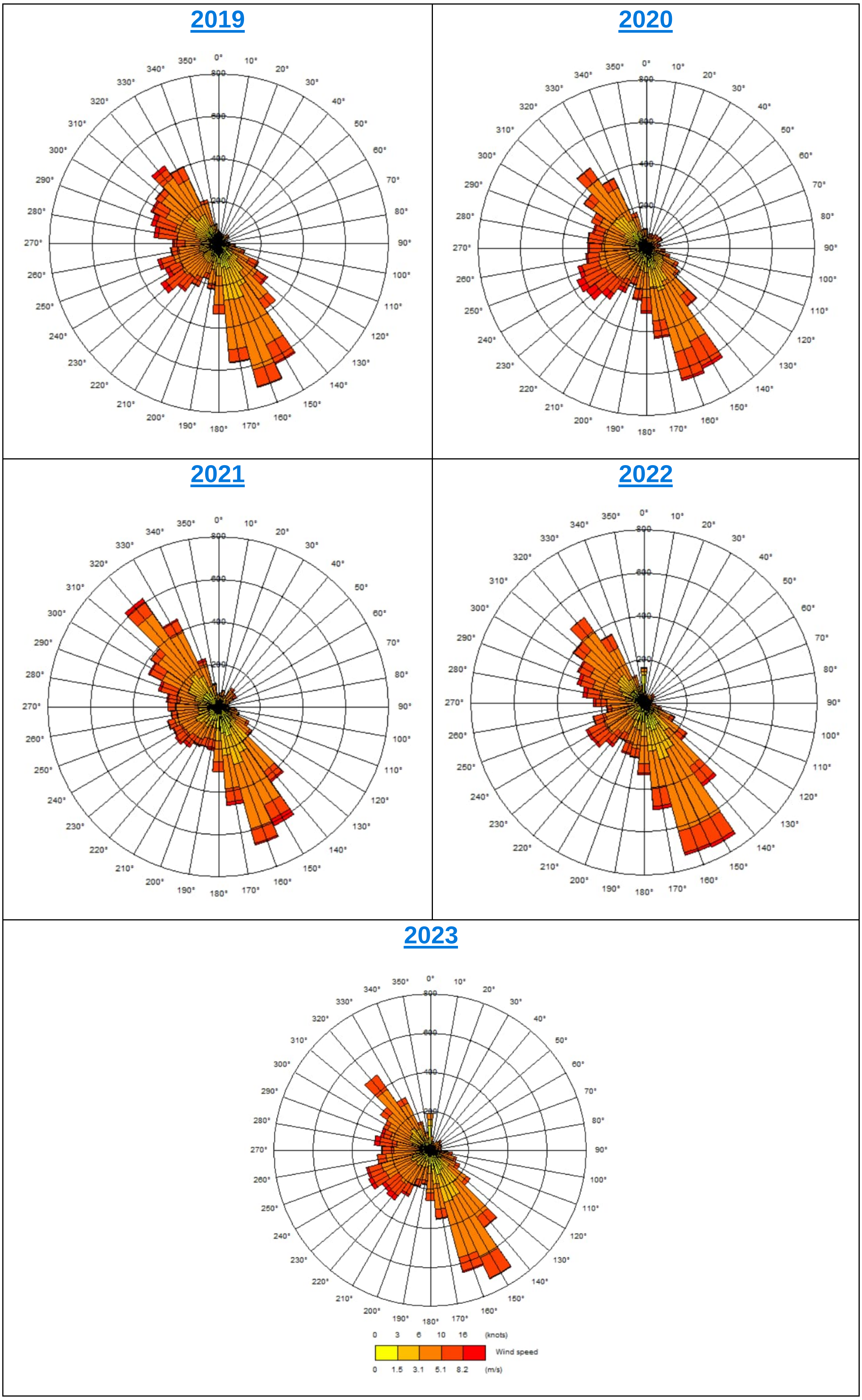
Meteorological Data

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

3.3.40 The meteorological site selected for the assessment is Hawarden Airport, located approximately 9 km south-east of the centre of the Main Development Area, at a flat airfield in a principally agricultural area. A surface roughness of 0.3 m (representative of an agricultural area) has been selected for the meteorological site within the model.

3.3.41 The modelling for this assessment has utilised 5 years of meteorological data for the period 2019 – 2023. Wind roses for each of the years within this period are shown in **Plate 1**.

Plate 1: Hawarden 2019-2023 Wind Roses



Building Downwash Effects

3.3.42 The existing Connah's Quay Power Station buildings, and those that make up the Proposed Installation, have the potential to affect the dispersion of emissions from the stacks assessed. The ADMS buildings effect module has therefore been used to incorporate building downwash effects as part of the model set up. Buildings greater than one-third of the range of stack heights modelled have been included within the modelling assessment.

3.3.43 Buildings associated with the Proposed Installation that have been considered to be of sufficient height and volume to potentially impact on the dispersion of emission stacks are shown in **Table 3-6** and **Table 37**. Each FEED option has a different building layout and plans showing the building layouts used in the ADMS simulations are illustrated in **Figure 4: Air Quality Study Area – FEED 1 Modelled Buildings and Figure 5: Air Quality Study Area – FEED 2 Modelled Buildings**.

Table 3-6: Modelled Building Parameters – FEED Option 1

Building	Building Centre (Easting)	Building Centre (Northing)	Height (m)	Length (m)	Width (m)	Angle (°)
1A	327506	371320	50.0	192.5	250.0	34.5
1C Admin Building	327594	371208	16.0	105.7	23.8	34.5
1F	327198	371544	25.0	166.0	513.0	34.5
Train 1 Absorber	327340	371473	92.0	26.4	22.0	34.5
Train 2 Absorber	327304	371420	92.0	26.4	22.0	34.5
Boiler House	327923	371100	36.5	128.0	34.0	34.5
Train 1 Stripper	327311	371493	65.0	9.3	-	Circular
Train 2 Stripper	327274	371440	65.0	9.3	-	Circular

Table 3-7: Modelled Building Parameters – FEED Option 2

Building	Building Centre (Easting)	Building Centre (Northing)	Height (m)	Length (m)	Width (m)	Angle (°)
1A	327506	371320	50.0	192.5	250.0	34.5
1C Admin Building	327594	371208	16.0	105.7	23.8	34.5
1F	327198	371544	25.0	166.0	513.0	34.5
Train 1 Absorber	327412	371442	86.0	31.8	15.6	124.5
Train 2 Absorber	327367	371377	86.0	31.8	15.6	124.5
Boiler House	327923	371100	36.5	128.0	34.0	34.5
Train 1 Stripper	327366	371493	65.0	11.3	-	Circular
Train 2 Stripper	327316	371421	65.0	11.3	-	Circular

Terrain

3.3.44 The local area immediate to the Main Development Area is predominantly a mix of rural and residential, with the residential area of Connah's Quay to the south-east and Flint to the north-west. Due to the mixed surroundings, a surface roughness of 0.4 m, also used for previous air quality modelling related to the existing Connah's Quay Power Station's permit, has been selected to represent the local terrain.

3.3.45 Site-specific terrain data has not been used in the model, as there are no potentially significant changes in gradient within the study area.

NO_X to NO_2 Conversion

3.3.46 Emissions of NO_X from industrial point sources are typically dominated by nitric oxide (NO), with emissions from combustion sources typically in the ratio of NO to NO_2 of 9:1. However, it is NO_2 that has specified environmental standards due to its potential impact on human health. In ambient air, NO is oxidised to NO_2 by the ozone present, and the rate of oxidation is dependent on the relative concentrations of NO and ozone in the ambient air.

3.3.47 The Risk Assessment methodology (Ref 1) adopted by NRW specifies that an initial screening step is a precautionary approach. In accordance with the risk assessment methodology guidance, in the H1 screening assessment and the stack height determination, it is assumed that 100% of NO_X emitted from the stack is oxidised to NO_2 in the long term and 50% of the emitted NO_X is oxidised to NO_2 in the local vicinity of the Proposed Installation's stacks in the short-term. Online guidance for Environmental permitting: air dispersion modelling reports (Ref 25) adopted by NRW recommends the use of empirically derived conversion rates within detailed modelling. The detailed modelling applies conversion rates of 70% of NO_X to NO_2 in the long term and 35% NO_X to NO_2 in the short-term.

Calculation of Deposition at Sensitive Ecological Receptors

3.3.48 The deposition of nutrient nitrogen and acid at sensitive ecological receptors has been calculated using the modelled PCs predicted at the relevant receptor points. The deposition rates are determined using conversion rates and factors contained within published guidance (Ref 31), which takes into account variations in the deposition mechanisms for different types of habitat.

3.3.49 The conversion rates and factors used in the assessment are shown in **Table 3-8**.

Table 3-8: Deposition Conversion Rates for Ecological Receptors

Pollutant	Deposition Velocity Grasslands (m/s)	Deposition Velocity Woodlands (m/s)	Deposition Conversion Factors	
			Nutrient Nitrogen ($\mu g/m^2/s$ to kgN/ha/yr)	Acid ($\mu g/m^2/s$ to keq/ha/yr)
NO_x as NO_2	0.0015	0.003	95.9	6.84
NH_3	0.02	0.03	259.7	18.5
SO_2	0.012	0.024	-	9.84
Amine 1 – FEED 1	0.02	0.03	49.6	3.5
Amine 2 – FEED 1	0.02	0.03	102.7	7.3

Pollutant	Deposition Velocity Grasslands (m/s)	Deposition Velocity Woodlands (m/s)	Deposition Conversion Factors	
			Nutrient Nitrogen (µg/m²/s to kgN/ha/yr)	Acid (µg/m²/s to keq/ha/yr)
Amine 1 – FEED 2	0.02	0.03	67.9	4.8
Amine 2 – FEED 2	0.02	0.03	102.7	7.3
Nitrosamine 2 – FEED1	0.02	0.03	115.2	8.2
Nitrosamine 1 – FEED 2	0.02	0.03	83.3	5.9
Nitrosamine 2 – FEED 2	0.02	0.03	115.2	8.2
Nitramine – FEED 1	0.02	0.03	101.1	7.2
Nitramine – FEED 2	0.02	0.03	83.3	5.9
Amine 3*	0.02	0.03	72.3	5.2
Amine 4*	0.02	0.03	97.9	7.0
Amine 5*	0.02	0.03	97.9	7.0
Acetonitrile	0.02	0.03	107.6	7.7
Amide1	0.02	0.03	27.6	2.0
Formamide1	0.02	0.03	98.1	7.0

*These amines are associated with emissions from Padeswood Cement, one of the developments considered in the cumulative assessment, as described in **Annex D**.

3.3.50 For the purpose of assessment, the deposition velocity of amine species and amine degradation species has been assumed to be equivalent to that of NH_3, as recommended in the AQMAU guidance (Ref 30).

3.3.51 For amine species, the factors to convert dry deposition flux (µg/m²/s) to nutrient nitrogen deposition (kgN/ha/yr) have been estimated using the nitrogen (N) available for deposition within the pollutant molecule (i.e., nitrogen atomic weight, 14, multiplied by the number of nitrogen atoms in the molecular formula, divided by the species molecular weight). The factors to convert dry deposition flux (µg/m²/s) from to acid deposition (keq/ha/yr) has been estimated by dividing the nutrient nitrogen deposition by the nitrogen atomic weight.

Specialised Model Treatments

3.3.52 Specialised Model Treatments have been used to assess amine and amine degradation products impacts. This includes the amine chemistry module and the dry deposition option in ADMS, as detailed in **Annex A**.

3.4 Evaluation of Significance

3.4.1 The evaluation of the significance of air quality effects from the operational point sources has been based on the criteria in the Risk Assessment methodology (Ref 1) adopted by NRW ('NRW guidance' thereafter). The predicted changes in pollutant concentrations are compared to environmental standards (ES) to determine the magnitude of change.

3.4.2 The Environmental Permitting guidance regime specifies a risk-based approach to identify when additional assessment is required to understand whether or not significant effects are likely to occur. The Risk Assessment methodology (Ref 1) adopted by NRW, includes risk assessment screening criteria to be used for comparison of PC with ES. An emission would not require further consideration where:

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

3.4.3 Where an emission cannot be screened out from requiring more detailed consideration, the second stage of screening considers the PC in the context of the existing background pollutant concentrations; the predicted environmental concentration (PEC) can be screened out from the need to do any further assessment where:

- for human health, short term PC <20% of the short-term environmental standards minus twice the long-term background concentration; and
- long term PEC (PC + background concentration) <70% of the environmental standards.

3.4.4 For local nature sites, such as LWS, the Risk Assessment methodology (Ref 1) adopted by NRW identifies that where the short or long-term PC is less than 100% of the respective standard, then it can be concluded that there are unlikely to be significant effects due to changes in air quality without needing to assess the PEC.

3.4.5 Where impacts cannot be screened out, if the PEC does not exceed the environmental standards and the proposed emissions comply with the BAT-AEL (or equivalent requirements) the emissions are typically considered not significant.

3.5 Assessment Limitations and Assumptions

3.5.1 The greatest uncertainty associated with any dispersion modelling assessment arises through the inherent uncertainty of the dispersion modelling process itself. As discussed below, the impact of this uncertainty can be mitigated by establishing a series of robust assumptions and the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from industrial sources.

3.5.2 In order to minimise the likelihood of under-estimating the PC to ground level concentrations from the Proposed Installation's stacks, the following conservative assumptions have been made within the assessment:

- the operational Proposed Installation has been assumed to operate on a continuous basis i.e. for 8,760 hour per year, although in practice there would be periods when the plant is not generating as it would operate in a dispatchable manner, with a load factor significantly lower and the plant would require routine maintenance periods;

- the modelling predictions are based on the use of five full years of meteorological data from Hawarden Airport meteorological station for the years 2019 to 2023 inclusive, with the highest result being reported for all years assessed;
- the assessment assumes continuity of mass between the emission point and receptor, with no depletion of plume concentrations due to wet or dry deposition;
- nitrogen deposition calculations apply the NO_2 deposition velocity to the whole NO_X concentration (as NO_2). In practice the deposition velocity for the NO component is negligible in comparison with NO_2; and
- emission concentrations for the process are calculated based on the use of BAT-AEL concentrations, Environmental Permit Emission Limit Values or licensor maximum envisaged emission concentrations; in practice annual average rates would be below these values to enable continued compliance with Environmental Permit requirements (Ref 3).

4. Baseline Air Quality

4.1 Overview

4.1.1 This section presents the information used to evaluate the background and baseline ambient air quality in the area surrounding the Proposed Installation. The following steps have been taken in the determination of background values:

- identification of Air Quality Management Areas (AQMA);
- review of Flintshire County Council (FCC) (Ref 32) and project specific ambient monitoring data;
- review of data from Defra's background mapping database (Ref 33) and Automatic Urban and Rural Network (AURN); and
- review of ecological receptor background data and site relevant critical loads from the Air Pollution Information System (APIS) website (Ref 34).

4.2 Baseline Nitrogen Dioxide Survey

Baseline Air Quality Survey Study Area

4.2.1 AECOM conducted an air quality survey to establish baseline air quality in the Connah's Quay area in connection with the proposed construction, operation and maintenance of Proposed Installation. This section details the survey that was undertaken, as well as the results of the survey.

4.2.2 Nitrogen dioxide (NO_2) has been measured as the Proposed Installation would have the potential to change concentrations of this pollutant and it varies spatially within the area due to the proximity of other emission sources, hence the need for several measurement locations. This spatial distribution is due to emissions from vehicles using local roads and other combustion sources (industrial and domestic). Although other pollutants, such as Sulfur Dioxide (SO_2), Carbon Monoxide (CO), benzene and 1,3-butadiene, are present in motor vehicle exhaust emissions, detailed consideration of baseline concentrations of these substances and their associated impacts on local air quality is not considered relevant here. This is because the release concentrations of these pollutants from construction, operation and decommissioning of the Proposed Installation are anticipated to be low enough so as to not be likely to give rise to significant effects. In addition, no areas within the local administrative boundaries are considered to be at risk of exceeding the relevant objectives for these pollutants, and the risks to achievement of the relevant air quality objectives in the area are considered negligible.

4.2.3 The survey study area included areas which may be affected by increased road traffic movements or emissions from sources on site associated with the Proposed Installation within a 15 km radius, with a focus up to 2 km from the Site.

4.2.4 The locations chosen were intended to be representative of the range of NO_2 concentrations which may be experienced in the vicinity of the Proposed Installation, including:

- roadside locations affected by traffic emissions;
- residential areas near to major traffic routes;
- background locations situated away from major sources of air pollution; and
- the monitoring locations are presented in **Figure 1: Air Quality Study Area and Baseline Monitoring Locations**.

Annualisation Methodology

4.2.5 The primary pollutant of concern related to road traffic emissions is NO_2. In order to establish baseline concentrations of NO_2, a 12-week passive diffusion tube survey was undertaken to measure the concentrations of NO_2 within the vicinity of the Site.

4.2.6 Diffusion tubes were deployed at 10 locations, attached to street columns (mostly lampposts), high enough to be out of the sight line of the general public. The sites were chosen as they cover the study area described in paragraph 4.2.4 and provide a good overview of the baseline air quality.

4.2.7 The locations of the monitoring sites (DT1-DT10) are detailed in **Table 4-1**, and presented on Figure 1: Air Quality Study Area and Baseline Monitoring Locations.

4.2.8 The 12-week survey period was split into three periods, in order to obtain a mean concentration of NO_2 across the entire survey period. **Table 4-2** shows the exposure dates for the survey period.

Table 4-1: Air Quality Monitoring Locations

ID	National Grid Easting	National Grid Northing	Height (m)
DT1	327119	371220	1.8
DT2	327779	370830	2
DT3	327986	370643	2.1
DT4	327403	371099	2.2
DT5	328292	370258	2.1
DT6	328728	370172	2.3
DT7	324963	371660	2.2
DT8	325688	371573	1.8
DT9*	328176	369287	2
DT9b*	328180	369121	2.1
DT10	328217	368732	2.25

*DT9 was moved to DT9b for Period 2 and 3 due to its proximity to the presence of construction activities making it an unsuitable location to gain baseline data.

Table 4-2: Diffusion Tube Visits

Period Number	Date Installed	Date Removed
1	09/02/2024	11/03/2024
2	11/03/2024	09/04/2024
3	09/04/2024	07/05/2024

4.2.9 The diffusion tubes were supplied and analysed by Gradko International Ltd, using a 20% triethanolamine (TEA) in water method. Gradko participates in the AIR Proficiency Testing (PT) scheme for diffusion tubes, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL) which provides a Quality Assurance/Quality Control framework.

4.2.10 The data obtained during the survey has been bias adjusted and annualised to calculate an annual mean concentration for 2023 using the methodologies presented in LAQM.TG(22) (Ref 35).

4.2.11 Annualisation is a process which enables the average concentration measured during the survey period to be corrected for seasonal bias, allowing a direct comparison with the annual mean objective for NO_2 to be made.

4.2.12 The bias adjustment factor was obtained from the latest Defra National Bias Adjustment Factor Spreadsheet (Ref 36). A bias adjustment factor of 0.81 was applied to the 2023 annualised concentrations.

Baseline Survey Results and Discussion

4.2.13 Data capture rates for the survey were high, achieving an overall 100% in periods 1 - 3.

4.2.14 The annualised and bias adjusted results are presented in **Table 4-3** below.

4.2.15 There were no exceedances of the annual mean NO_2 objective of 40 µg/m^3. The highest recorded adjusted annual mean was 26.6 µg/m^3 at DT1.

4.2.16 Measured concentrations were well below the NO_2 annual mean objective of 40 µg/m^3, with some elevated concentrations in close proximity to major traffic routes. Overall, air quality within the study area can be considered to be of a good standard and would not represent a constraint on future development.

4.2.17 The data presented in this report has been used both to give an indication of the local air quality prior in the absence of the Proposed Installation, and to verify the performance of road traffic air quality modelling against measured concentrations.

Table 4-3: Bias Adjusted and Annualised Diffusion Tube Survey Monitoring Results (NO_2)

ID	Period 1 Raw Concentration (µg/m^3)	Period 2 Raw Concentration (µg/m^3)	Period 3 Raw Concentration (µg/m^3)	Raw Period Mean Concentration (µg/m^3)	Annualised Mean Concentration (µg/m^3)	Annualised and Bias Adjusted Concentration (µg/m^3)
DT1	31.8	33.9	28.7	31.5	32.9	26.6
DT2	26.7	22.3	19.1	22.7	23.7	19.2
DT3	19.4	13.0	13.0	15.1	15.8	12.8
DT4	17.1	13.6	9.3	13.3	13.9	11.3
DT5	18.0	11.6	7.9	12.5	13.1	10.6
DT6	23.0	17.8	14.2	18.3	19.2	15.5
DT7	9.5	6.1	5.1	6.9	7.2	5.8
DT8	9.8	6.5	6.7	7.6	8.0	6.5
DT9	10.5	6.4	5.0	7.3	7.6	6.2
DT10	21.5	14.6	16.6	17.6	18.3	14.9

4.3 Background Concentrations Used in the Assessment

4.3.1 Full details on the background air quality used at each receptor is included in each table of the Assessment Results section, however a summary of the specific background (ambient) data that has been used for the operational assessment is provided in **Table 4-4**.

Table 4-4: Background Concentrations

Pollutant	Background Concentration Used at all Receptor Locations (µg/m^3)	Source of Data
NO_2	6.5	Highest value from background sites measured during the site specific survey
CO	0.249 - 0.301	Defra background mapping from 2001.
NH_3	1.2 - 2.0	APIS website 2020 – 2022.
NO_X	4.5 – 11.5	APIS website 2020 – 2022.
N-Deposition (kg N/Ha/Yr)	16.2 - 31.1	APIS website 2020 – 2022.
Acid Deposition (K Neq/Ha/Yr)	0.15 - 0.28	APIS website 2020 – 2022.
Acid Deposition (K Seq/Ha/Yr)	0.69 - 2.13	APIS website 2020 – 2022.
Amines and byproducts	No background data available	

4.3.2 Short-term (hourly) background concentrations have been calculated by multiplying the selected annual mean background concentration by a factor of two, in accordance with the Risk Assessment methodology (Ref 1) adopted by NRW. For daily NO_X impacts, the annual mean has been multiplied by a factor of 2, as advised by NRW in the Environmental Statement consultation. This is a conservative assumption for tall stacks

4.3.3 Data on APIS is only pertinent to statutory ecological sites, however advice from the project ecologists has provided the lowest appropriate critical load for the non-statutory sites included in the assessment.

4.3.4 In order to represent a conservative approach, it has been assumed that background concentrations, particularly of NO_2 and NO_X, would not decrease in future years. Therefore, the current background concentrations have been assumed to apply to the first projected year in which both trains will be running, 2036.

4.4 Automatic Urban and Rural Network (AURN)

4.4.1 The AURN is the UK's largest automatic monitoring network and is run by the Department for Environment, Food & Rural Affairs (Defra). It includes automatic air quality monitoring stations measuring oxides of nitrogen (NOx) and ozone (O_3), amongst others, at rural, urban or industrial sites around the UK. Hourly information from the Wirral Tranmere background site, located approximately 16 km north-east of the Main Development Area, has been used in this assessment as the closest representative background site to the facility site.

4.4.2 Hourly values for NO, NO_2 and O_3 for the 5 meteorological years used in the model are required when using the Atmospheric Dispersion Modelling System (ADMS) chemistry module. However, any gap of more than 24 hours in the AURN dataset needs to be filled prior to the model runs. Although most of the data was available, some gaps had to be filled. For this, the hourly average for each hour of the day was calculated for each year (i.e. the average concentration at 1:00, the average concentrations at 2:00, etc) to account for daily concentration variability, and each missing hour was replaced with the relevant average.

5. Assessment Results

5.1 Evaluation of Stack Height

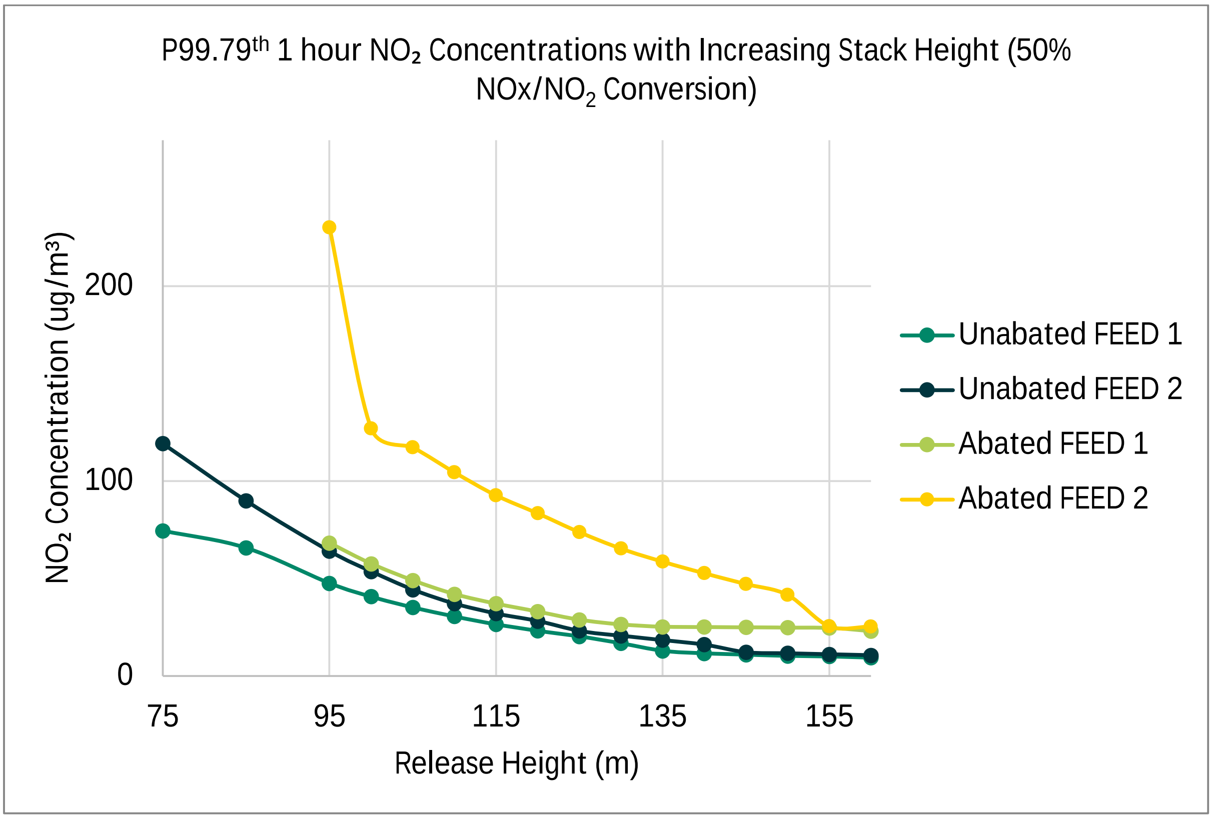
5.1.1 The selection of an appropriate stack release height requires a number of factors to be taken into account, the most important of which is the need to balance a release height sufficient to achieve adequate dispersion of pollutants against other constraints such as the visual impact of tall stacks.

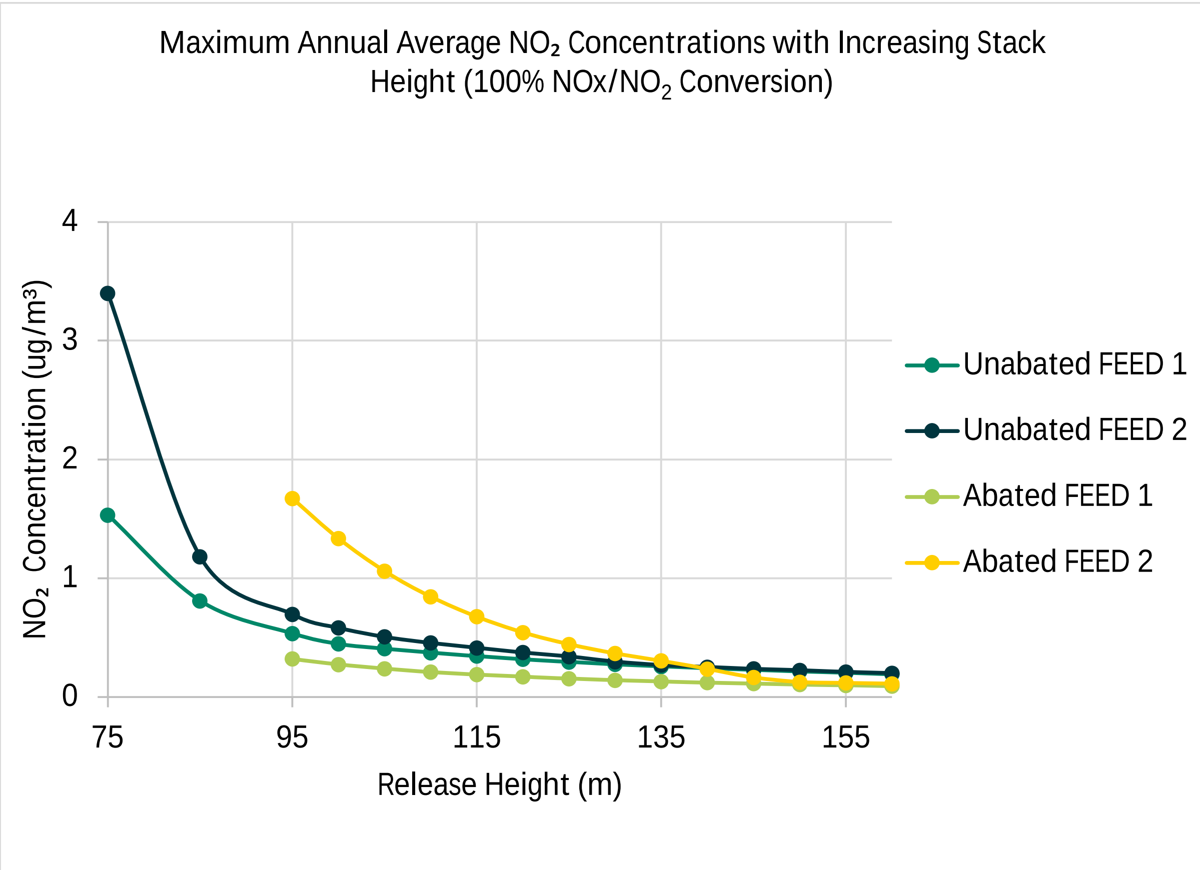
5.1.2 Emissions from each Unabated stack have been modelled at heights between 75 m and 160 m, at 5 m increments, and between 95 m and 160 m for the FEED 1 and FEED 2 stacks. Graphs for the results, showing the maximum predicted ground level concentrations within the gridded model domain, for annual mean and maximum one hour NO_2 concentrations, are presented in Plate 2. The purpose of the graphs is to evaluate the optimum release height in terms of the dispersion of pollutants which would occur, against the visual constraints of further increases in release height, with the 'elbow' of the resulting curve showing where the reductions in ground level concentrations become disproportionate to the increasing height.

5.1.3 Analysis of the curves shows that the benefit of incremental increases in release heights of the absorber stacks (as used in the FEED 1 and FEED 2 scenario) after 130 m become less pronounced, but concentrations are still decreasing slowly. Because of the proximity of sensitive ecological habitats, that decrease in concentration is useful to limit impacts on ecosystems, even if the curve flattens. Benefits on air quality from increasing release height further is reduced after 145 m. A release height of 145 m for the absorber stacks is predicted to provide a sufficient degree of dispersion such that ground level PCs are at an acceptable level.

5.1.4 Analysis of the curves shows that the benefit of incremental increases in release heights of the HRSG stacks in unabated mode after 115 m become less pronounced, but concentrations are still decreasing slowly. Because of the proximity of sensitive ecological habitats, that decrease in concentration is useful to limit impacts on ecosystems, even if the curve flattens. Benefits on air quality from increasing release height further is reduced, with this levelling out after 150 m. A height of 120 m to 130 m for the HRSG stacks is predicted to provide a sufficient degree of dispersion such that ground level PCs are at an acceptable level.

Plate 2: Predicted Maximum Process Contribution to Ground Level NO_2 Concentrations at Stack Release Heights of 75 m to 160 m





5.2 Human Health Receptor Results

5.2.1 The Process Contribution (PC) due to the Proposed Installation have been modelled at the emission parameters detailed in **Table 3-2** and **Table 3-3**. Results for some of the trace byproducts listed in **Table 3-3** are presented in **Annex E** for completion, as impacts on human health from these pollutants, at the emission rates considered in this assessment, are negligible.

5.2.2 The column in the tables referring to the PC from cumulative sources is that occurring from additional projects, and does not contain the Proposed Development PC. The Predicted Environmental Concentration (PEC) is determined by adding the sum of the Proposed Development and cumulative PCs to the background concentration. In some results' tables, an additional "PC as % of headroom" column has been added if NRW's second stage screening criteria for short-term averaging periods is used to conclude on significance. It represents the PC as a percentage of the relevant ES minus twice the long-term background concentration.

5.2.3 Where the long-term concentrations from the Proposed Installation PC exceed 1% of the ESs, results from the change in concentration between the Proposed Installation and the existing Connah's Quay Power Station are also presented, if the pollutant of concern was already emitted by the existing Connah's Quay Power Station.

5.2.4 The modelled concentrations have been compared to the ESs for each pollutant released. The background concentrations have then been added to the modelled concentrations to determine PECs, which are again then compared to the ES.

Human Health Receptor Results – Abated FEED 1 Scenario

5.2.5 The results at the identified human health receptors for the Abated FEED 1 scenario are shown in **Table 5-1 to Table 5-12**.

Table 5-1 Predicted Process Contribution Annual Mean NO_2 Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Conc. (µg/m^3)	PC from Cumulative Sources (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
R1	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R2	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R3	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R4	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R5	<0.1	0.1%	6.5	0.1	6.6	16.5%
R6	<0.1	0.1%	6.5	0.1	6.6	16.6%
R7	0.1	0.2%	6.5	0.1	6.6	16.6%
R8	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R9	<0.1	<0.1%	6.5	0.1	6.6	16.4%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Conc. (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R10	<0.1	<0.1%	6.5	0.0	6.6	16.4%
R11	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R12	<0.1	0.1%	6.5	0.1	6.6	16.4%
R13	<0.1	0.1%	6.5	0.1	6.6	16.5%
R14	<0.1	0.1%	6.5	0.1	6.6	16.5%
R15	0.1	0.2%	6.5	0.1	6.7	16.7%
R16	0.1	0.3%	6.5	0.1	6.7	16.7%
R17	0.1	0.2%	6.5	0.1	6.7	16.7%
R18	0.1	0.2%	6.5	0.1	6.7	16.6%
R19	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R20	<0.1	<0.1%	6.5	0.0	6.6	16.4%
R21	0.1	0.3%	6.5	0.1	6.7	16.8%
R22	0.1	0.2%	6.5	0.1	6.7	16.7%
R23	0.1	0.2%	6.5	0.1	6.7	16.7%
R24	0.1	0.2%	6.5	0.1	6.7	16.7%
R25	0.1	0.3%	6.5	0.1	6.7	16.7%
R26	0.1	0.2%	6.5	0.1	6.7	16.7%
R27	<0.1	0.1%	6.5	0.1	6.6	16.5%
R28	<0.1	0.1%	6.5	0.0	6.6	16.4%
R29	<0.1	0.1%	6.5	0.1	6.6	16.5%
R30	<0.1	0.1%	6.5	0.0	6.6	16.4%
R31	<0.1	0.1%	6.5	0.0	6.6	16.4%
R32	<0.1	0.1%	6.5	0.1	6.6	16.5%
R33	<0.1	<0.1%	6.5	0.0	6.5	16.4%
R34	0.1	0.2%	6.5	0.1	6.7	16.7%
R35	0.1	0.1%	6.5	0.1	6.7	16.7%
R36	0.1	0.2%	6.5	0.1	6.7	16.7%
R37	0.1	0.2%	6.5	0.1	6.7	16.7%
R38	0.1	0.2%	6.5	0.1	6.7	16.7%
R39	<0.1	0.1%	6.5	0.1	6.6	16.5%
R40	0.1	0.2%	6.5	0.1	6.7	16.7%
R41	0.1	0.2%	6.5	0.1	6.7	16.7%
R42	<0.1	0.1%	6.5	1.2	7.8	19.4%
R43	0.1	0.2%	6.5	0.1	6.6	16.6%
R44	<0.1	0.1%	6.5	0.3	6.8	17.0%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Conc. (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R3_Cement	<0.1	<0.1%	6.5	0.0	6.5	16.4%
R6_Cement	<0.1	<0.1%	6.5	0.0	6.5	16.4%
1_ICT	<0.1	0.1%	6.5	0.7	7.2	18.0%
9_ICT	<0.1	0.1%	6.5	1.8	8.4	20.9%
Maximum	0.1	0.3%	6.5	0.6	7.3	18.1%

ES 40 µg/m³

Table 5-2: Predicted Process Contribution 1-hour Mean 99.79th Percentile NO_2 Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)	PC as % of headroom
R1	0.2	0.1%	13.0	1.7	14.9	7.4%	0.1%
R2	0.4	0.2%	13.0	1.5	14.9	7.5%	0.2%
R3	5.0	2.5%	13.0	0.6	18.7	9.3%	2.7%
R4	3.1	1.5%	13.0	0.2	16.3	8.1%	1.6%
R5	7.8	3.9%	13.0	<0.1	20.8	10.4%	4.2%
R6	9.8	4.9%	13.0	<0.1	22.8	11.4%	5.3%
R7	11.9	5.9%	13.0	<0.1	24.9	12.4%	6.4%
R8	10.9	5.5%	13.0	0.9	24.8	12.4%	5.8%
R9	10.3	5.2%	13.0	0.5	23.8	11.9%	5.5%
R10	14.7	7.3%	13.0	0.3	27.9	14.0%	7.9%
R11	11.9	6.0%	13.0	0.5	25.5	12.7%	6.4%
R12	11.6	5.8%	13.0	0.5	25.0	12.5%	6.2%
R13	12.7	6.4%	13.0	0.4	26.2	13.1%	6.8%
R14	12.8	6.4%	13.0	0.5	26.3	13.2%	6.8%
R15	14.5	7.2%	13.0	<0.1	27.5	13.7%	7.7%
R16	14.5	7.3%	13.0	<0.1	27.5	13.8%	7.8%
R17	14.2	7.1%	13.0	<0.1	27.2	13.6%	7.6%
R18	13.9	7.0%	13.0	<0.1	26.9	13.5%	7.4%
R19	10.0	5.0%	13.0	<0.1	23.0	11.5%	5.3%
R20	9.4	4.7%	13.0	<0.1	22.4	11.2%	5.0%
R21	13.7	6.9%	13.0	<0.1	26.7	13.4%	7.3%
R22	13.3	6.6%	13.0	<0.1	26.3	13.1%	7.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)	PC as % of headroom
R23	13.2	6.6%	13.0	<0.1	26.2	13.1%	7.1%
R24	12.2	6.1%	13.0	<0.1	25.2	12.6%	6.5%
R25	12.0	6.0%	13.0	<0.1	25.0	12.5%	6.4%
R26	11.6	5.8%	13.0	<0.1	24.6	12.3%	6.2%
R27	12.4	6.2%	13.0	0.3	25.7	12.8%	6.6%
R28	10.7	5.4%	13.0	0.4	24.1	12.1%	5.7%
R29	10.3	5.2%	13.0	0.3	23.6	11.8%	5.5%
R30	9.2	4.6%	13.0	0.5	22.7	11.3%	4.9%
R31	9.3	4.7%	13.0	0.3	22.6	11.3%	5.0%
R32	9.2	4.6%	13.0	0.2	22.3	11.2%	4.9%
R33	8.1	4.1%	13.0	0.3	21.4	10.7%	4.4%
R34	10.0	5.0%	13.0	<0.1	23.0	11.5%	5.3%
R35	9.4	4.7%	13.0	<0.1	22.4	11.2%	5.0%
R36	9.4	4.7%	13.0	<0.1	22.4	11.2%	5.1%
R37	10.1	5.0%	13.0	<0.1	23.1	11.5%	5.4%
R38	10.2	5.1%	13.0	<0.1	23.2	11.6%	5.5%
R39	9.9	4.9%	13.0	<0.1	22.9	11.4%	5.3%
R40	8.3	4.2%	13.0	<0.1	21.3	10.7%	4.5%
R41	10.5	5.2%	13.0	<0.1	23.5	11.7%	5.6%
R42	8.1	4.0%	13.0	1.9	23.0	11.5%	4.3%
R43	9.9	4.9%	13.0	<0.1	22.9	11.5%	5.3%
R44	7.1	3.5%	13.0	<0.1	20.1	10.0%	3.8%
R3_Cement	6.2	3.1%	13.0	0.2	19.4	9.7%	3.3%
R6_Cement	6.4	3.2%	13.0	0.1	19.5	9.8%	3.4%
1_ICT	8.4	4.2%	13.0	0.1	23.5	11.7%	4.5%
9_ICT	7.7	3.9%	13.0	7.8	32.5	16.3%	4.1%
Max	16.5	8.2%	13.0	<0.1	35.5	17.7%	8.8%

ES 200 µg/m³

Table 5-3: Predicted Process Contribution 8-hour Rolling Maximum CO Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (mg/m^3)	PC/ ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ ES (%)
R1	<0.01	<0.1%	0.60	0.60	6.0%
R2	<0.01	<0.1%	0.60	0.61	6.1%
R3	0.03	0.3%	0.51	0.54	5.4%
R4	0.03	0.3%	0.51	0.53	5.3%
R5	0.03	0.3%	0.50	0.54	5.4%
R6	0.04	0.4%	0.50	0.54	5.4%
R7	0.06	0.6%	0.50	0.56	5.6%
R8	0.05	0.5%	0.50	0.55	5.5%
R9	0.05	0.5%	0.51	0.56	5.6%
R10	0.07	0.7%	0.52	0.58	5.8%
R11	0.05	0.5%	0.51	0.56	5.6%
R12	0.05	0.5%	0.51	0.56	5.6%
R13	0.06	0.6%	0.51	0.57	5.7%
R14	0.06	0.6%	0.52	0.58	5.8%
R15	0.07	0.7%	0.52	0.59	5.9%
R16	0.07	0.7%	0.53	0.60	6.0%
R17	0.07	0.7%	0.50	0.57	5.7%
R18	0.07	0.7%	0.50	0.57	5.7%
R19	0.03	0.3%	0.55	0.59	5.9%
R20	0.05	0.5%	0.55	0.60	6.0%
R21	0.06	0.6%	0.50	0.56	5.6%
R22	0.06	0.6%	0.55	0.62	6.2%
R23	0.06	0.6%	0.52	0.59	5.9%
R24	0.06	0.6%	0.52	0.58	5.8%
R25	0.06	0.6%	0.53	0.59	5.9%
R26	0.06	0.6%	0.55	0.61	6.1%
R27	0.06	0.6%	0.55	0.61	6.1%
R28	0.05	0.5%	0.55	0.60	6.0%
R29	0.05	0.5%	0.59	0.64	6.4%
R30	0.04	0.4%	0.50	0.54	5.4%
R31	0.04	0.4%	0.50	0.54	5.4%
R32	0.04	0.4%	0.50	0.53	5.3%
R33	0.03	0.3%	0.50	0.53	5.3%

Receptor	Proposed Installation PC (mg/m^3)	PC/ ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ ES (%)
R34	0.04	0.4%	0.52	0.57	5.7%
R35	0.04	0.4%	0.52	0.57	5.7%
R36	0.04	0.4%	0.51	0.55	5.5%
R37	0.04	0.4%	0.52	0.56	5.6%
R38	0.05	0.5%	0.53	0.58	5.8%
R39	0.04	0.4%	0.57	0.61	6.1%
R40	0.03	0.3%	0.60	0.63	6.3%
R41	0.03	0.3%	0.59	0.62	6.2%
R42	0.03	0.3%	0.50	0.53	5.3%
R43	0.03	0.3%	0.60	0.63	6.3%
R44	0.03	0.3%	0.55	0.58	5.8%
R3_Cement	0.03	0.3%	0.52	0.55	5.5%
R6_Cement	0.02	0.2%	0.52	0.54	5.4%
1_ICT	0.03	0.3%	0.60	0.63	6.3%
9_ICT	0.03	0.3%	0.60	0.63	6.3%
Max	0.07	0.7%	0.60	0.68	6.8%

ES 10 mg/m^3

Table 5-4: Predicted Process Contribution 1-hour Maximum CO Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (mg/m^3)	PC/ ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ ES (%)
R1	0.01	<0.1%	0.60	0.62	2.1%
R2	0.02	0.1%	0.60	0.62	2.1%
R3	0.10	0.3%	0.51	0.61	2.0%
R4	0.08	0.3%	0.51	0.59	2.0%
R5	0.08	0.3%	0.50	0.59	2.0%
R6	0.10	0.3%	0.50	0.60	2.0%
R7	0.10	0.3%	0.50	0.60	2.0%
R8	0.10	0.3%	0.50	0.60	2.0%
R9	0.11	0.4%	0.51	0.61	2.0%
R10	0.11	0.4%	0.52	0.62	2.1%
R11	0.10	0.3%	0.51	0.61	2.0%
R12	0.10	0.3%	0.51	0.61	2.0%
R13	0.09	0.3%	0.51	0.61	2.0%

Receptor	Proposed Installation PC (mg/m^3)	PC/ ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ ES (%)
R14	0.09	0.3%	0.52	0.61	2.0%
R15	0.10	0.3%	0.52	0.62	2.1%
R16	0.10	0.3%	0.53	0.63	2.1%
R17	0.09	0.3%	0.50	0.59	2.0%
R18	0.10	0.3%	0.50	0.60	2.0%
R19	0.13	0.4%	0.55	0.68	2.3%
R20	0.13	0.4%	0.55	0.68	2.3%
R21	0.11	0.4%	0.50	0.61	2.0%
R22	0.11	0.4%	0.55	0.66	2.2%
R23	0.11	0.4%	0.52	0.63	2.1%
R24	0.12	0.4%	0.52	0.64	2.1%
R25	0.12	0.4%	0.53	0.65	2.2%
R26	0.10	0.3%	0.55	0.65	2.2%
R27	0.12	0.4%	0.55	0.67	2.2%
R28	0.11	0.4%	0.55	0.66	2.2%
R29	0.12	0.4%	0.59	0.71	2.4%
R30	0.11	0.4%	0.50	0.61	2.0%
R31	0.10	0.3%	0.50	0.60	2.0%
R32	0.10	0.3%	0.50	0.60	2.0%
R33	0.10	0.3%	0.50	0.60	2.0%
R34	0.10	0.3%	0.52	0.62	2.1%
R35	0.10	0.3%	0.52	0.62	2.1%
R36	0.10	0.3%	0.51	0.61	2.0%
R37	0.11	0.4%	0.52	0.63	2.1%
R38	0.10	0.3%	0.53	0.63	2.1%
R39	0.11	0.4%	0.57	0.69	2.3%
R40	0.10	0.3%	0.60	0.69	2.3%
R41	0.11	0.4%	0.59	0.70	2.3%
R42	0.09	0.3%	0.50	0.59	2.0%
R43	0.09	0.3%	0.60	0.69	2.3%
R44	0.11	0.4%	0.55	0.65	2.2%
R3_Cement	0.07	0.2%	0.52	0.59	2.0%
R6_Cement	0.07	0.2%	0.52	0.59	2.0%
1_ICT	0.09	0.3%	0.60	0.69	2.3%
9_ICT	0.09	0.3%	0.60	0.69	2.3%

Receptor	Proposed Installation PC (mg/m³)	PC/ ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ ES (%)
Max	0.14	0.5%	0.60	0.74	2.5%

ES 30 mg/m³

Table 5-5: Predicted Process Contribution 24-hour Long Term Mean Total Amines Concentrations (assessed against ES for total amines based on MEA) – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	<0.01	<0.1%	No data available	<0.1	<0.01	<0.1%
R2	<0.01	<0.1%		<0.1	<0.01	<0.1%
R3	<0.01	<0.1%		<0.1	<0.01	<0.1%
R4	<0.01	<0.1%		<0.1	<0.01	<0.1%
R5	<0.01	<0.1%		<0.1	<0.01	<0.1%
R6	0.01	<0.1%		<0.1	0.01	<0.1%
R7	0.01	<0.1%		<0.1	0.01	<0.1%
R8	<0.01	<0.1%		<0.1	<0.01	<0.1%
R9	<0.01	<0.1%		<0.1	<0.01	<0.1%
R10	<0.01	<0.1%		<0.1	<0.01	<0.1%
R11	<0.01	<0.1%		<0.1	<0.01	<0.1%
R12	<0.01	<0.1%		<0.1	<0.01	<0.1%
R13	<0.01	<0.1%		<0.1	<0.01	<0.1%
R14	<0.01	<0.1%		<0.1	<0.01	<0.1%
R15	0.01	<0.1%		<0.1	0.01	<0.1%
R16	0.01	<0.1%		<0.1	0.01	<0.1%
R17	0.01	<0.1%		<0.1	0.01	<0.1%
R18	0.01	<0.1%		<0.1	0.01	<0.1%
R19	<0.01	<0.1%		<0.1	<0.01	<0.1%
R20	<0.01	<0.1%		<0.1	<0.01	<0.1%
R21	0.01	<0.1%		<0.1	0.01	<0.1%
R22	0.01	<0.1%		<0.1	0.01	<0.1%
R23	0.01	<0.1%		<0.1	0.01	<0.1%
R24	0.01	<0.1%		<0.1	0.01	<0.1%
R25	0.01	<0.1%		<0.1	0.01	<0.1%
R26	0.01	<0.1%		<0.1	0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R27	<0.01	<0.1%		<0.1	<0.01	<0.1%
R28	<0.01	<0.1%		<0.1	<0.01	<0.1%
R29	<0.01	<0.1%		<0.1	<0.01	<0.1%
R30	<0.01	<0.1%		<0.1	<0.01	<0.1%
R31	<0.01	<0.1%		<0.1	<0.01	<0.1%
R32	<0.01	<0.1%		<0.1	<0.01	<0.1%
R33	<0.01	<0.1%		<0.1	<0.01	<0.1%
R34	0.01	<0.1%		<0.1	0.01	<0.1%
R35	0.01	<0.1%		<0.1	0.01	<0.1%
R36	0.01	<0.1%		<0.1	0.01	<0.1%
R37	0.01	<0.1%		<0.1	0.01	<0.1%
R38	0.01	<0.1%		<0.1	0.01	<0.1%
R39	<0.01	<0.1%		<0.1	<0.01	<0.1%
R40	0.01	<0.1%		<0.1	0.01	<0.1%
R41	0.01	<0.1%		<0.1	0.01	<0.1%
R42	<0.01	<0.1%		<0.1	<0.01	<0.1%
R43	0.01	<0.1%		<0.1	0.01	<0.1%
R44	0.01	<0.1%		<0.1	0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.1	<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.1	<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.1	<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.1	<0.01	<0.1%
Maximum	0.03	<0.1%		<0.1	0.03	<0.1%

ES 100 µg/m³

Table 5-6: Predicted Process Contribution 1-hour Maximum Total Amines Concentrations (assessed against ES based on NDMA) – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	0.06	<0.1%	No data available	<0.01	0.06	<0.1%
R2	0.07	<0.1%		<0.01	0.07	<0.1%
R3	0.45	0.1%		<0.01	0.45	0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R4	0.35	0.1%		<0.01	0.35	0.1%
R5	0.38	0.1%		<0.01	0.38	0.1%
R6	0.43	0.1%		<0.01	0.43	0.1%
R7	0.44	0.1%		<0.01	0.44	0.1%
R8	0.45	0.1%		<0.01	0.45	0.1%
R9	0.48	0.1%		<0.01	0.48	0.1%
R10	0.47	0.1%		<0.01	0.47	0.1%
R11	0.44	0.1%		<0.01	0.44	0.1%
R12	0.43	0.1%		<0.01	0.43	0.1%
R13	0.41	0.1%		<0.01	0.41	0.1%
R14	0.41	0.1%		<0.01	0.41	0.1%
R15	0.43	0.1%		<0.01	0.43	0.1%
R16	0.42	0.1%		<0.01	0.42	0.1%
R17	0.41	0.1%		<0.01	0.41	0.1%
R18	0.44	0.1%		<0.01	0.44	0.1%
R19	0.57	0.1%		<0.01	0.57	0.1%
R20	0.57	0.1%		<0.01	0.57	0.1%
R21	0.49	0.1%		<0.01	0.49	0.1%
R22	0.47	0.1%		<0.01	0.47	0.1%
R23	0.47	0.1%		<0.01	0.47	0.1%
R24	0.52	0.1%		<0.01	0.52	0.1%
R25	0.52	0.1%		<0.01	0.52	0.1%
R26	0.42	0.1%		<0.01	0.42	0.1%
R27	0.51	0.1%		<0.01	0.51	0.1%
R28	0.48	0.1%		<0.01	0.48	0.1%
R29	0.53	0.1%		<0.01	0.53	0.1%
R30	0.47	0.1%		<0.01	0.47	0.1%
R31	0.46	0.1%		<0.01	0.46	0.1%
R32	0.43	0.1%		<0.01	0.43	0.1%
R33	0.42	0.1%		<0.01	0.42	0.1%
R34	0.45	0.1%		<0.01	0.45	0.1%
R35	0.43	0.1%		<0.01	0.43	0.1%
R36	0.43	0.1%		<0.01	0.43	0.1%
R37	0.48	0.1%		<0.01	0.48	0.1%
R38	0.43	0.1%		<0.01	0.43	0.1%

Receptor	Proposed Installation PC (μg/m³)	PC/ ES (%)	Background Concentration (μg/m³)	PC from Cumulative Sources (μg/m³)	PEC (μg/m³)	PEC/ ES (%)
R39	0.51	0.1%		<0.01	0.51	0.1%
R40	0.42	0.1%		<0.01	0.42	0.1%
R41	0.47	0.1%		<0.01	0.47	0.1%
R42	0.38	0.1%		<0.01	0.38	0.1%
R43	0.38	0.1%		<0.01	0.38	0.1%
R44	0.47	0.1%		<0.01	0.47	0.1%
R3_Cement	0.29	0.1%		<0.01	0.29	0.1%
R6_Cement	0.30	0.1%		<0.01	0.30	0.1%
1_ICT	0.41	0.1%		<0.01	0.41	0.1%
9_ICT	0.41	0.1%		<0.01	0.41	0.1%
Maximum	0.63	0.2%		<0.01	0.63	0.2%

ES 400 μg/m³

Table 5-7: Predicted Process Contribution 24-hour Long Term Mean Amine 2 Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (μg/m³)	PC/ES (%)	Background Concentration (μg/m³)	PEC (μg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R17	<0.01	<0.1%		<0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.1%
R24	<0.01	<0.1%		<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	<0.01	<0.1%		<0.01	<0.1%

ES 15 µg/m³

Table 5-8: Predicted Process Contribution Annual Mean Total N-Amines Concentrations (assessed against ES based on NDMA) – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (ng/m³)	PC/ ES (%)	Background Concentration (ng/m³)	PC from Cumulative Sources (ng/m³)	PEC (ng/m³)	PEC/ ES (%)
R1	<0.01	0.1%	No Data Available – Assumed to be zero.	0.01	0.01	3.5%
R2	<0.01	0.2%		0.01	0.01	3.6%
R3	0.01	2.6%		0.01	0.01	5.9%
R4	<0.01	1.9%		0.01	0.01	4.9%
R5	0.03	12.6%		0.01	0.03	15.2%
R6	0.04	17.8%		0.01	0.04	20.4%
R7	0.05	25.8%		0.01	0.06	28.4%
R8	0.01	6.2%		0.01	0.02	9.7%
R9	0.01	5.6%		0.01	0.02	9.6%
R10	0.02	8.3%		0.01	0.03	12.6%
R11	0.02	8.7%		0.01	0.02	12.3%
R12	0.02	10.0%		0.01	0.03	14.0%
R13	0.03	12.6%		0.01	0.03	16.5%
R14	0.03	12.9%		0.01	0.03	16.8%
R15	0.08	38.7%		<0.01	0.08	41.0%
R16	0.09	43.8%		<0.01	0.09	46.2%
R17	0.08	37.8%		0.01	0.08	40.4%
R18	0.06	28.1%		0.01	0.06	30.9%
R19	0.01	6.4%		0.01	0.02	9.9%
R20	0.01	7.5%		0.01	0.02	12.4%
R21	0.10	47.6%		<0.01	0.10	50.0%
R22	0.08	39.6%		<0.01	0.08	41.8%
R23	0.08	39.2%		<0.01	0.08	41.4%
R24	0.08	39.8%		<0.01	0.08	41.8%
R25	0.10	47.9%		<0.01	0.10	50.1%
R26	0.08	40.5%		0.01	0.09	43.1%
R27	0.03	15.8%		0.01	0.04	19.8%
R28	0.03	15.0%		0.01	0.04	19.2%
R29	0.04	17.8%		0.01	0.04	21.4%
R30	0.03	12.9%		0.01	0.03	17.3%
R31	0.03	15.9%		0.01	0.04	20.0%
R32	0.04	21.1%		0.01	0.05	24.5%

Receptor	Proposed Installation PC (ng/m³)	PC/ ES (%)	Background Concentration (ng/m³)	PC from Cumulative Sources (ng/m³)	PEC (ng/m³)	PEC/ ES (%)
R33	0.02	9.7%		0.01	0.03	14.6%
R34	0.07	33.8%		<0.01	0.07	35.6%
R35	0.05	26.7%		<0.01	0.06	28.3%
R36	0.06	32.1%		<0.01	0.07	33.7%
R37	0.09	43.0%		<0.01	0.09	44.9%
R38	0.09	44.3%		<0.01	0.09	46.5%
R39	0.03	16.6%		0.01	0.04	19.9%
R40	0.06	31.9%		<0.01	0.07	33.5%
R41	0.08	38.7%		<0.01	0.08	40.6%
R42	0.04	17.7%		<0.01	0.04	19.0%
R43	0.07	33.6%		<0.01	0.07	35.7%
R44	0.04	17.7%		<0.01	0.04	18.9%
R3_Cement	0.02	7.8%		0.01	0.02	12.1%
R6_Cement	0.02	9.9%		0.03	0.05	24.4%
1_ICT	0.03	17.4%		<0.01	0.04	19.0%
9_ICT	0.04	17.7%		<0.01	0.04	18.9%
Maximum	0.11	56.3%		0.01	0.12	58.8%

ES 0.2 ng/m³

Table 5-9: Predicted Process Contribution Annual Mean NH_3 Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	<0.1	<0.1%	2.0	2.0	1.1%
R2	<0.1	<0.1%		2.0	1.1%
R3	<0.1	<0.1%		2.0	1.1%
R4	<0.1	<0.1%		2.0	1.1%
R5	<0.1	<0.1%		2.0	1.1%
R6	<0.1	<0.1%		2.0	1.1%
R7	<0.1	<0.1%		2.0	1.1%
R8	<0.1	<0.1%		2.0	1.1%
R9	<0.1	<0.1%		2.0	1.1%
R10	<0.1	<0.1%		2.0	1.1%
R11	<0.1	<0.1%		2.0	1.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R12	<0.1	<0.1%		2.0	1.1%
R13	<0.1	<0.1%		2.0	1.1%
R14	<0.1	<0.1%		2.0	1.1%
R15	<0.1	<0.1%		2.0	1.1%
R16	<0.1	<0.1%		2.0	1.1%
R17	<0.1	<0.1%		2.0	1.1%
R18	<0.1	<0.1%		2.0	1.1%
R19	<0.1	<0.1%		2.0	1.1%
R20	<0.1	<0.1%		2.0	1.1%
R21	<0.1	<0.1%		2.0	1.1%
R22	<0.1	<0.1%		2.0	1.1%
R23	<0.1	<0.1%		2.0	1.1%
R24	<0.1	<0.1%		2.0	1.1%
R25	<0.1	<0.1%		2.0	1.1%
R26	<0.1	<0.1%		2.0	1.1%
R27	<0.1	<0.1%		2.0	1.1%
R28	<0.1	<0.1%		2.0	1.1%
R29	<0.1	<0.1%		2.0	1.1%
R30	<0.1	<0.1%		2.0	1.1%
R31	<0.1	<0.1%		2.0	1.1%
R32	<0.1	<0.1%		2.0	1.1%
R33	<0.1	<0.1%		2.0	1.1%
R34	<0.1	<0.1%		2.0	1.1%
R35	<0.1	<0.1%		2.0	1.1%
R36	<0.1	<0.1%		2.0	1.1%
R37	<0.1	<0.1%		2.0	1.1%
R38	<0.1	<0.1%		2.0	1.1%
R39	<0.1	<0.1%		2.0	1.1%
R40	<0.1	<0.1%		2.0	1.1%
R41	<0.1	<0.1%		2.0	1.1%
R42	<0.1	<0.1%		2.0	1.1%
R43	<0.1	<0.1%		2.0	1.1%
R44	<0.1	<0.1%		2.0	1.1%
R3_Cement	<0.1	<0.1%		2.0	1.1%
R6_Cement	<0.1	<0.1%		2.0	1.1%
1_ICT	<0.1	<0.1%		2.0	1.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
9_ICT	<0.1	<0.1%		2.0	1.1%
Maximum	<0.1	<0.1%		2.0	1.1%

ES 180 µg/m³

Table 5-10: Predicted Process Contribution Maximum 1 Hour NH_3 Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	0.1	<0.1%	4.0	4.1	0.2%
R2	0.1	<0.1%		4.1	0.2%
R3	0.4	<0.1%		4.4	0.2%
R4	0.4	<0.1%		4.4	0.2%
R5	0.4	<0.1%		4.4	0.2%
R6	0.4	<0.1%		4.4	0.2%
R7	0.4	<0.1%		4.4	0.2%
R8	0.4	<0.1%		4.4	0.2%
R9	0.5	<0.1%		4.5	0.2%
R10	0.5	<0.1%		4.5	0.2%
R11	0.4	<0.1%		4.4	0.2%
R12	0.4	<0.1%		4.4	0.2%
R13	0.4	<0.1%		4.4	0.2%
R14	0.4	<0.1%		4.4	0.2%
R15	0.4	<0.1%		4.4	0.2%
R16	0.4	<0.1%		4.4	0.2%
R17	0.4	<0.1%		4.4	0.2%
R18	0.4	<0.1%		4.4	0.2%
R19	0.6	<0.1%		4.6	0.2%
R20	0.6	<0.1%		4.6	0.2%
R21	0.5	<0.1%		4.5	0.2%
R22	0.5	<0.1%		4.5	0.2%
R23	0.5	<0.1%		4.5	0.2%
R24	0.5	<0.1%		4.5	0.2%
R25	0.5	<0.1%		4.5	0.2%
R26	0.4	<0.1%		4.4	0.2%
R27	0.5	<0.1%		4.5	0.2%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R28	0.5	<0.1%		4.5	0.2%
R29	0.5	<0.1%		4.5	0.2%
R30	0.5	<0.1%		4.5	0.2%
R31	0.5	<0.1%		4.5	0.2%
R32	0.4	<0.1%		4.4	0.2%
R33	0.4	<0.1%		4.4	0.2%
R34	0.5	<0.1%		4.5	0.2%
R35	0.4	<0.1%		4.4	0.2%
R36	0.4	<0.1%		4.4	0.2%
R37	0.5	<0.1%		4.5	0.2%
R38	0.4	<0.1%		4.4	0.2%
R39	0.5	<0.1%		4.5	0.2%
R40	0.4	<0.1%		4.4	0.2%
R41	0.5	<0.1%		4.5	0.2%
R42	0.4	<0.1%		4.4	0.2%
R43	0.4	<0.1%		4.4	0.2%
R44	0.5	<0.1%		4.5	0.2%
R3_Cement	0.3	<0.1%		4.3	0.2%
R6_Cement	0.3	<0.1%		4.3	0.2%
1_ICT	0.4	<0.1%		4.4	0.2%
9_ICT	0.4	<0.1%		4.4	0.2%
Maximum	0.6	<0.1%		4.6	0.2%

ES 2,500 µg/m³

Table 5-11: Predicted Process Contribution 30-min Maximum Formaldehyde Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	0.2	0.2%	No data available	0.2	0.2%
R2	0.2	0.2%		0.2	0.2%
R3	1.4	1.4%		1.4	1.4%
R4	1.1	1.1%		1.1	1.1%
R5	1.2	1.2%		1.2	1.2%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R6	1.4	1.4%		1.4	1.4%
R7	1.4	1.4%		1.4	1.4%
R8	1.4	1.4%		1.4	1.4%
R9	1.5	1.5%		1.5	1.5%
R10	1.5	1.5%		1.5	1.5%
R11	1.4	1.4%		1.4	1.4%
R12	1.4	1.4%		1.4	1.4%
R13	1.3	1.3%		1.3	1.3%
R14	1.3	1.3%		1.3	1.3%
R15	1.4	1.4%		1.4	1.4%
R16	1.3	1.3%		1.3	1.3%
R17	1.3	1.3%		1.3	1.3%
R18	1.4	1.4%		1.4	1.4%
R19	1.8	1.8%		1.8	1.8%
R20	1.8	1.8%		1.8	1.8%
R21	1.6	1.6%		1.6	1.6%
R22	1.5	1.5%		1.5	1.5%
R23	1.5	1.5%		1.5	1.5%
R24	1.7	1.7%		1.7	1.7%
R25	1.7	1.7%		1.7	1.7%
R26	1.3	1.3%		1.3	1.3%
R27	1.6	1.6%		1.6	1.6%
R28	1.5	1.5%		1.5	1.5%
R29	1.7	1.7%		1.7	1.7%
R30	1.5	1.5%		1.5	1.5%
R31	1.7	1.7%		1.7	1.7%
R32	1.4	1.4%		1.4	1.4%
R33	1.4	1.4%		1.4	1.4%
R34	1.5	1.5%		1.5	1.5%
R35	1.4	1.4%		1.4	1.4%
R36	1.4	1.4%		1.4	1.4%
R37	1.6	1.6%		1.6	1.6%
R38	1.4	1.4%		1.4	1.4%
R39	1.7	1.7%		1.7	1.7%
R40	1.4	1.4%		1.4	1.4%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R41	1.8	1.8%		1.8	1.8%
R42	1.4	1.4%		1.4	1.4%
R43	1.5	1.5%		1.5	1.5%
R44	1.8	1.8%		1.8	1.8%
R3_Cement	1.1	1.1%		1.1	1.1%
R6_Cement	1.1	1.1%		1.1	1.1%
1_ICT	1.6	1.6%		1.6	1.6%
9_ICT	1.6	1.6%		1.6	1.6%
Maximum	2.1	2.1%		2.1	2.1%

ES 100 µg/m³

Table 5-12: Predicted Process Contribution Annual Mean Formaldehyde Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	<0.01	<0.1%	No data available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	0.01	0.3%		0.01	0.3%
R6	0.02	0.4%		0.02	0.4%
R7	0.03	0.5%		0.03	0.5%
R8	0.01	0.1%		0.01	0.1%
R9	0.01	0.1%		0.01	0.1%
R10	0.01	0.1%		0.01	0.1%
R11	0.01	0.1%		0.01	0.1%
R12	0.01	0.2%		0.01	0.2%
R13	0.01	0.2%		0.01	0.2%
R14	0.01	0.2%		0.01	0.2%
R15	0.04	0.7%		0.04	0.7%
R16	0.04	0.8%		0.04	0.8%
R17	0.04	0.7%		0.04	0.7%
R18	0.03	0.6%		0.03	0.6%
R19	<0.01	0.1%		<0.01	0.1%
R20	0.01	0.1%		0.01	0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R21	0.04	0.9%		0.04	0.9%
R22	0.04	0.7%		0.04	0.7%
R23	0.04	0.7%		0.04	0.7%
R24	0.03	0.7%		0.03	0.7%
R25	0.04	0.8%		0.04	0.8%
R26	0.04	0.7%		0.04	0.7%
R27	0.01	0.2%		0.01	0.2%
R28	0.01	0.2%		0.01	0.2%
R29	0.01	0.2%		0.01	0.2%
R30	0.01	0.2%		0.01	0.2%
R31	0.01	0.2%		0.01	0.2%
R32	0.01	0.3%		0.01	0.3%
R33	0.01	0.1%		0.01	0.1%
R34	0.03	0.6%		0.03	0.6%
R35	0.02	0.4%		0.02	0.4%
R36	0.03	0.5%		0.03	0.5%
R37	0.03	0.7%		0.03	0.7%
R38	0.04	0.7%		0.04	0.7%
R39	0.01	0.3%		0.01	0.3%
R40	0.02	0.5%		0.02	0.5%
R41	0.03	0.6%		0.03	0.6%
R42	0.01	0.3%		0.01	0.3%
R43	0.02	0.5%		0.02	0.5%
R44	0.02	0.3%		0.02	0.3%
R3_Cement	0.01	0.1%		0.01	0.1%
R6_Cement	0.01	0.1%		0.01	0.1%
1_ICT	0.01	0.3%		0.01	0.3%
9_ICT	0.01	0.3%		0.01	0.3%
Maximum	0.04	0.9%		0.04	0.9%

ES 5 µg/m³

5.2.6 The annual average changes at all human health receptors for NO_2, NH_3 and formaldehyde are less than 1% of the relevant ES and therefore can be screened out from the need for further assessment.

5.2.7 The short-term PCs for NO_2, CO, NH_3 and formaldehyde are less than the 10% of the relevant ES at discrete receptors and therefore can be screened out from the need for further assessment.

5.2.8 Predicted concentrations at all human health receptors, except R1 and R2, for N-Amines are more than 1% of the NDMA EAL. PECs are, however, below 60% of NDMA EAL at all discrete receptors and at the point of maximum impact, therefore they can be screened out from the need for further assessment and can be considered not significant.

5.2.9 The assessment for N-Amines should be regarded as extremely conservative as it incorporates a number of robust assumptions, namely:

- the Proposed Installation is assumed to run two trains at full load during every hour of the year, whereas in practice the load factor is likely to be substantially lower due the plant providing dispatchable power when required;
- the assessment is based on the highest annual impact at each receptor out of the five years modelled;
- the assessment assumed no depletion of plume concentrations due to wet or dry deposition;
- the assessment assumes that all nitramines and nitrosamines emitted from the stack(s) or formed in the atmosphere have the same toxicity as NDMA, known to be one of the most toxic nitrosamine species. In particular current studies suggest that nitramines are substantially less toxic than their corresponding nitrosamines; and
- all buildings have been modelled at their maximum anticipated dimensions ensuring the potential for impacting on plume dispersion is captured in the dispersion model.

5.2.10 Based on the above, N-Amines impacts would be substantially lower than those presented.

Human Health Receptor Results – Abated FEED 2 Scenario

5.2.11 The results at the identified human health receptors for the Abated FEED 2 scenario are shown in **Table 5-13 to Table 5-24**.

Table 5-13 Predicted Process Contribution Annual Mean NO_2 Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	PC from Cumulative Sources (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
R1	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R2	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R3	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R4	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R5	<0.1	0.1%	6.5	0.1	6.6	16.5%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R6	<0.1	0.1%	6.5	0.1	6.6	16.6%
R7	0.1	0.2%	6.5	0.1	6.7	16.6%
R8	<0.1	0.1%	6.5	0.1	6.6	16.4%
R9	<0.1	0.1%	6.5	0.1	6.6	16.4%
R10	<0.1	0.1%	6.5	<0.1	6.6	16.5%
R11	<0.1	0.1%	6.5	<0.1	6.6	16.4%
R12	<0.1	0.1%	6.5	<0.1	6.6	16.4%
R13	<0.1	0.1%	6.5	0.1	6.6	16.5%
R14	<0.1	0.1%	6.5	0.1	6.6	16.5%
R15	0.1	0.3%	6.5	0.1	6.7	16.8%
R16	0.1	0.3%	6.5	0.1	6.7	16.8%
R17	0.1	0.3%	6.5	0.1	6.7	16.7%
R18	0.1	0.2%	6.5	0.1	6.7	16.7%
R19	<0.1	<0.1%	6.5	0.1	6.6	16.4%
R20	<0.1	<0.1%	6.5	<0.1	6.6	16.4%
R21	0.1	0.3%	6.5	0.1	6.7	16.8%
R22	0.1	0.3%	6.5	0.1	6.7	16.8%
R23	0.1	0.3%	6.5	0.1	6.7	16.8%
R24	0.1	0.3%	6.5	0.1	6.7	16.8%
R25	0.1	0.3%	6.5	0.1	6.7	16.8%
R26	0.1	0.3%	6.5	0.1	6.7	16.7%
R27	<0.1	0.1%	6.5	0.1	6.6	16.5%
R28	<0.1	0.1%	6.5	<0.1	6.6	16.4%
R29	<0.1	0.1%	6.5	0.1	6.6	16.5%
R30	<0.1	0.1%	6.5	<0.1	6.6	16.4%
R31	<0.1	0.1%	6.5	<0.1	6.6	16.5%
R32	<0.1	0.1%	6.5	0.1	6.6	16.5%
R33	<0.1	0.1%	6.5	<0.1	6.5	16.4%
R34	0.1	0.2%	6.5	0.1	6.7	16.7%
R35	0.1	0.2%	6.5	0.1	6.7	16.7%
R36	0.1	0.2%	6.5	0.1	6.7	16.7%
R37	0.1	0.3%	6.5	0.1	6.7	16.7%
R38	0.1	0.3%	6.5	0.1	6.7	16.7%
R39	<0.1	0.1%	6.5	0.1	6.6	16.5%
R40	0.1	0.2%	6.5	0.1	6.7	16.7%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R41	0.1	0.2%	6.5	0.1	6.7	16.7%
R42	<0.1	0.1%	6.5	1.2	7.8	19.4%
R43	0.1	0.2%	6.5	0.1	6.7	16.6%
R44	0.1	0.2%	6.5	0.3	6.8	17.1%
R3_Cement	<0.1	0.1%	6.5	<0.1	6.5	16.4%
R6_Cement	<0.1	0.1%	6.5	<0.1	6.6	16.4%
1_ICT	<0.1	0.1%	6.5	0.7	7.2	18.1%
9_ICT	<0.1	0.1%	6.5	1.8	8.4	21.0%
Maximum	0.2	0.4%	6.5	0.1	6.8	16.9%

ES 40 µg/m³

Table 5-14: Predicted Process Contribution 1-hour Mean 99.79th Percentile NO_2 Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R1	0.1	0.1%	13.0	1.9	15.1	7.5%	0.1%
R2	0.2	0.1%	13.0	1.7	14.9	7.4%	0.1%
R3	5.6	2.8%	13.0	0.4	18.9	9.5%	3.0%
R4	3.1	1.5%	13.0	0.3	16.3	8.2%	1.6%
R5	8.7	4.3%	13.0	<0.1	21.7	10.8%	4.6%
R6	10.4	5.2%	13.0	<0.1	23.4	11.7%	5.6%
R7	13.8	6.9%	13.0	<0.1	26.8	13.4%	7.4%
R8	17.2	8.6%	13.0	0.5	30.7	15.4%	9.2%
R9	21.8	10.9%	13.0	0.1	34.9	17.5%	11.6%
R10	26.5	13.2%	13.0	0.4	39.9	20.0%	14.2%
R11	21.1	10.5%	13.0	0.6	34.7	17.4%	11.3%
R12	16.9	8.5%	13.0	0.7	30.6	15.3%	9.1%
R13	15.3	7.7%	13.0	0.4	28.7	14.4%	8.2%
R14	15.8	7.9%	13.0	0.4	29.2	14.6%	8.5%
R15	17.3	8.7%	13.0	<0.1	30.3	15.2%	9.3%
R16	18.0	9.0%	13.0	<0.1	31.0	15.5%	9.6%
R17	18.0	9.0%	13.0	<0.1	31.0	15.5%	9.6%

Receptor	Proposed Installation PC (μg/m³)	PC/ES (%)	Background Concentration (μg/m³)	PC from Cumulative Sources (μg/m³)	PEC (μg/m³)	PEC/ES (%)	PC as % of headroom
R18	21.4	10.7%	13.0	<0.1	34.4	17.2%	11.5%
R19	10.4	5.2%	13.0	<0.1	23.4	11.7%	5.5%
R20	12.5	6.3%	13.0	<0.1	25.5	12.8%	6.7%
R21	17.6	8.8%	13.0	<0.1	30.6	15.3%	9.4%
R22	16.8	8.4%	13.0	<0.1	29.8	14.9%	9.0%
R23	16.7	8.4%	13.0	<0.1	29.7	14.9%	8.9%
R24	15.7	7.9%	13.0	<0.1	28.7	14.4%	8.4%
R25	15.9	7.9%	13.0	<0.1	28.9	14.4%	8.5%
R26	15.3	7.7%	13.0	<0.1	28.3	14.2%	8.2%
R27	15.8	7.9%	13.0	0.4	29.2	14.6%	8.5%
R28	14.5	7.3%	13.0	0.4	27.9	14.0%	7.8%
R29	13.9	7.0%	13.0	0.4	27.4	13.7%	7.4%
R30	12.3	6.1%	13.0	0.7	25.9	13.0%	6.6%
R31	12.7	6.4%	13.0	0.2	26.0	13.0%	6.8%
R32	11.9	5.9%	13.0	0.2	25.1	12.5%	6.3%
R33	11.5	5.8%	13.0	0.2	24.7	12.4%	6.2%
R34	13.4	6.7%	13.0	<0.1	26.4	13.2%	7.1%
R35	12.4	6.2%	13.0	<0.1	25.4	12.7%	6.7%
R36	12.4	6.2%	13.0	<0.1	25.4	12.7%	6.6%
R37	13.2	6.6%	13.0	<0.1	26.2	13.1%	7.1%
R38	13.5	6.7%	13.0	<0.1	26.5	13.2%	7.2%
R39	13.6	6.8%	13.0	0.1	26.7	13.3%	7.3%
R40	11.1	5.5%	13.0	<0.1	24.1	12.0%	5.9%
R41	12.8	6.4%	13.0	<0.1	25.8	12.9%	6.8%
R42	10.8	5.4%	13.0	0.1	23.9	11.9%	5.8%
R43	12.9	6.5%	13.0	<0.1	25.9	13.0%	6.9%
R44	10.0	5.0%	13.0	<0.1	23.0	11.5%	5.3%
R3_Cement	8.8	4.4%	13.0	0.1	21.8	10.9%	4.7%
R6_Cement	9.3	4.7%	13.0	0.1	22.4	11.2%	5.0%
1_ICT	11.4	5.7%	13.0	<0.1	24.4	12.2%	6.1%
9_ICT	9.9	4.9%	13.0	6.0	28.9	14.5%	5.3%
Max	39.8	19.9%	13.0	<0.1	52.8	26.4%	21.3%

ES 200 μg/m³

Table 5-15: Predicted Process Contribution 8-hour Rolling Maximum CO Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (mg/m^3)	PC/ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ES (%)
R1	<0.01	0.0%	0.60	0.61	6.1%
R2	<0.01	0.0%	0.60	0.61	6.1%
R3	0.08	0.8%	0.51	0.59	5.9%
R4	0.03	0.3%	0.51	0.53	5.3%
R5	0.05	0.5%	0.50	0.55	5.5%
R6	0.04	0.4%	0.50	0.54	5.4%
R7	0.06	0.6%	0.50	0.57	5.7%
R8	0.10	1.0%	0.50	0.60	6.0%
R9	0.15	1.5%	0.51	0.66	6.6%
R10	0.13	1.3%	0.52	0.65	6.5%
R11	0.08	0.8%	0.51	0.60	6.0%
R12	0.08	0.8%	0.51	0.59	5.9%
R13	0.08	0.8%	0.51	0.59	5.9%
R14	0.08	0.8%	0.52	0.60	6.0%
R15	0.08	0.8%	0.52	0.60	6.0%
R16	0.08	0.8%	0.53	0.61	6.1%
R17	0.09	0.9%	0.50	0.59	5.9%
R18	0.12	1.2%	0.50	0.62	6.2%
R19	0.04	0.4%	0.55	0.59	5.9%
R20	0.08	0.8%	0.55	0.63	6.3%
R21	0.08	0.8%	0.50	0.58	5.8%
R22	0.08	0.8%	0.55	0.63	6.3%
R23	0.08	0.8%	0.52	0.60	6.0%
R24	0.08	0.8%	0.52	0.60	6.0%
R25	0.07	0.7%	0.53	0.61	6.1%
R26	0.08	0.8%	0.55	0.63	6.3%
R27	0.08	0.8%	0.55	0.63	6.3%
R28	0.07	0.7%	0.55	0.62	6.2%
R29	0.08	0.8%	0.59	0.67	6.7%
R30	0.06	0.6%	0.50	0.56	5.6%
R31	0.06	0.6%	0.50	0.55	5.5%
R32	0.05	0.5%	0.50	0.55	5.5%
R33	0.04	0.4%	0.50	0.54	5.4%

Receptor	Proposed Installation PC (mg/m^3)	PC/ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ES (%)
R34	0.06	0.6%	0.52	0.58	5.8%
R35	0.06	0.6%	0.52	0.58	5.8%
R36	0.05	0.5%	0.51	0.57	5.7%
R37	0.06	0.6%	0.52	0.58	5.8%
R38	0.07	0.7%	0.53	0.60	6.0%
R39	0.06	0.6%	0.57	0.63	6.3%
R40	0.04	0.4%	0.60	0.64	6.4%
R41	0.05	0.5%	0.59	0.64	6.4%
R42	0.04	0.4%	0.50	0.54	5.4%
R43	0.04	0.4%	0.60	0.64	6.4%
R44	0.04	0.4%	0.55	0.59	5.9%
R3_Cement	0.04	0.4%	0.52	0.56	5.6%
R6_Cement	0.03	0.3%	0.52	0.55	5.5%
1_ICT	0.05	0.5%	0.60	0.64	6.4%
9_ICT	0.03	0.3%	0.60	0.64	6.4%
Maximum	0.22	2.2%	0.60	0.82	8.2%

ES 10 mg/m^3

Table 5-16: Predicted Process Contribution 1-hour Maximum CO Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (mg/m^3)	PC/ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ES (%)
R1	0.02	0.1%	0.60	0.62	2.1%
R2	0.02	0.1%	0.60	0.62	2.1%
R3	0.14	0.5%	0.51	0.65	2.2%
R4	0.08	0.3%	0.51	0.59	2.0%
R5	0.10	0.3%	0.50	0.60	2.0%
R6	0.11	0.4%	0.50	0.61	2.0%
R7	0.12	0.4%	0.50	0.62	2.1%
R8	0.22	0.7%	0.50	0.72	2.4%
R9	0.20	0.7%	0.51	0.71	2.4%
R10	0.18	0.6%	0.52	0.70	2.3%
R11	0.19	0.6%	0.51	0.70	2.3%
R12	0.17	0.6%	0.51	0.68	2.3%
R13	0.11	0.4%	0.51	0.63	2.1%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R14	0.11	0.4%	0.52	0.64	2.1%
R15	0.12	0.4%	0.52	0.64	2.1%
R16	0.12	0.4%	0.53	0.65	2.2%
R17	0.13	0.4%	0.50	0.63	2.1%
R18	0.16	0.5%	0.50	0.66	2.2%
R19	0.12	0.4%	0.55	0.67	2.2%
R20	0.12	0.4%	0.55	0.67	2.2%
R21	0.11	0.4%	0.50	0.61	2.0%
R22	0.11	0.4%	0.55	0.66	2.2%
R23	0.11	0.4%	0.52	0.63	2.1%
R24	0.10	0.3%	0.52	0.63	2.1%
R25	0.14	0.5%	0.53	0.67	2.2%
R26	0.13	0.4%	0.55	0.68	2.3%
R27	0.11	0.4%	0.55	0.66	2.2%
R28	0.10	0.3%	0.55	0.66	2.2%
R29	0.13	0.4%	0.59	0.72	2.4%
R30	0.12	0.4%	0.50	0.62	2.1%
R31	0.12	0.4%	0.50	0.62	2.1%
R32	0.12	0.4%	0.50	0.62	2.1%
R33	0.13	0.4%	0.50	0.63	2.1%
R34	0.13	0.4%	0.60	0.72	2.4%
R35	0.12	0.4%	0.60	0.73	2.4%
R36	0.27	0.9%	0.60	0.87	2.9%
R37	0.02	0.1%	0.60	0.62	2.1%
R38	0.02	0.1%	0.60	0.62	2.1%
R39	0.14	0.5%	0.51	0.65	2.2%
R40	0.08	0.3%	0.51	0.59	2.0%
R41	0.10	0.3%	0.50	0.60	2.0%
R42	0.11	0.4%	0.50	0.61	2.0%
R43	0.12	0.4%	0.50	0.62	2.1%
R44	0.22	0.7%	0.50	0.72	2.4%
R3_Cement	0.20	0.7%	0.51	0.71	2.4%
R6_Cement	0.18	0.6%	0.52	0.70	2.3%
1_ICT	0.19	0.6%	0.51	0.70	2.3%
9_ICT	0.17	0.6%	0.51	0.68	2.3%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
Maximum	0.11	0.4%	0.51	0.63	2.1%

ES 30 mg/m³

Table 5-17: Predicted Process Contribution 24-hour LongTerm Mean Amines Concentrations (assessed against ES based on MEA) – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.01	<0.1%
R17	<0.01	<0.1%		<0.01	<0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.01	<0.1%
R24	<0.01	<0.1%		<0.01	<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R28	<0.01	<0.1%		<0.01	<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.01	<0.1%
Maximum	<0.01	<0.1%		<0.01	<0.01	<0.1%

ES 100 µg/m³

Table 5-18: Predicted Process Contribution 1-hour Maximum Amines Concentrations (against ES baed on MEA) – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	0.01	<0.1%	No Data Available	0.02	0.01	<0.1%
R2	0.01	<0.1%		0.02	0.01	<0.1%
R3	0.07	<0.1%		<0.01	0.07	<0.1%
R4	0.04	<0.1%		<0.01	0.04	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R5	0.05	<0.1%		<0.01	0.05	<0.1%
R6	0.05	<0.1%		<0.01	0.05	<0.1%
R7	0.05	<0.1%		<0.01	0.05	<0.1%
R8	0.10	<0.1%		<0.01	0.10	<0.1%
R9	0.10	<0.1%		<0.01	0.10	<0.1%
R10	0.09	<0.1%		<0.01	0.09	<0.1%
R11	0.09	<0.1%		<0.01	0.09	<0.1%
R12	0.08	<0.1%		<0.01	0.08	<0.1%
R13	0.05	<0.1%		<0.01	0.05	<0.1%
R14	0.05	<0.1%		<0.01	0.05	<0.1%
R15	0.06	<0.1%		<0.01	0.06	<0.1%
R16	0.06	<0.1%		<0.01	0.06	<0.1%
R17	0.06	<0.1%		<0.01	0.06	<0.1%
R18	0.08	<0.1%		<0.01	0.08	<0.1%
R19	0.06	<0.1%		<0.01	0.06	<0.1%
R20	0.06	<0.1%		<0.01	0.06	<0.1%
R21	0.05	<0.1%		<0.01	0.05	<0.1%
R22	0.05	<0.1%		<0.01	0.05	<0.1%
R23	0.05	<0.1%		<0.01	0.05	<0.1%
R24	0.05	<0.1%		<0.01	0.05	<0.1%
R25	0.06	<0.1%		<0.01	0.06	<0.1%
R26	0.06	<0.1%		<0.01	0.06	<0.1%
R27	0.05	<0.1%		<0.01	0.05	<0.1%
R28	0.05	<0.1%		<0.01	0.05	<0.1%
R29	0.06	<0.1%		<0.01	0.06	<0.1%
R30	0.06	<0.1%		<0.01	0.06	<0.1%
R31	0.06	<0.1%		<0.01	0.06	<0.1%
R32	0.06	<0.1%		<0.01	0.06	<0.1%
R33	0.06	<0.1%		<0.01	0.06	<0.1%
R34	0.05	<0.1%		<0.01	0.05	<0.1%
R35	0.06	<0.1%		<0.01	0.06	<0.1%
R36	0.05	<0.1%		<0.01	0.05	<0.1%
R37	0.06	<0.1%		<0.01	0.06	<0.1%
R38	0.06	<0.1%		<0.01	0.06	<0.1%
R39	0.07	<0.1%		<0.01	0.07	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R40	0.05	<0.1%		<0.01	0.05	<0.1%
R41	0.07	<0.1%		<0.01	0.07	<0.1%
R42	0.05	<0.1%		<0.01	0.05	<0.1%
R43	0.06	<0.1%		<0.01	0.06	<0.1%
R44	0.06	<0.1%		<0.01	0.06	<0.1%
R3_Cement	0.04	<0.1%		0.03	0.04	<0.1%
R6_Cement	0.05	<0.1%		0.01	0.05	<0.1%
1_ICT	0.06	<0.1%		<0.01	0.06	<0.1%
9_ICT	0.06	<0.1%		<0.01	0.06	<0.1%
Maximum	0.13	<0.1%		<0.01	0.13	<0.1%

ES 400 µg/m³

Table 5-19: Predicted Process Contribution 24-hour LongTerm Mean Amine 2 Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.1%
R17	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.1%
R24	<0.01	<0.1%		<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	<0.01	<0.1%		<0.01	<0.1%

ES 15 µg/m^3

Table 5-20: Predicted Process Contribution Annual Mean N-Amines Concentrations (assessed against ES based on NDMA) – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (ng/m^3)	PC/ES (%)	Background Concentration (ng/m^3)	PC from Cumulative Sources (ng/m^3)	PEC (ng/m^3)	PEC/ES (%)
R1	<0.01	0.1%	No data available	0.01	0.01	3.5%
R2	<0.01	0.1%		0.01	0.01	3.6%
R3	<0.01	1.9%		0.01	0.01	5.6%
R4	<0.01	1.3%		0.01	0.01	4.4%
R5	0.02	8.7%		0.01	0.02	11.3%
R6	0.02	12.1%		0.01	0.03	14.6%
R7	0.04	18.4%		0.01	0.04	21.0%
R8	0.01	6.1%		0.01	0.02	9.8%
R9	0.01	7.0%		0.01	0.02	11.0%
R10	0.02	9.2%		0.01	0.03	13.5%
R11	0.02	8.4%		0.01	0.02	12.1%
R12	0.02	8.3%		0.01	0.02	11.9%
R13	0.02	9.4%		0.01	0.03	13.3%
R14	0.02	9.6%		0.01	0.03	13.5%
R15	0.06	28.3%		<0.01	0.06	30.6%
R16	0.07	32.8%		<0.01	0.07	35.2%
R17	0.06	29.5%		0.01	0.06	32.1%
R18	0.05	22.6%		0.01	0.05	25.4%
R19	0.01	4.3%		0.01	0.02	8.2%
R20	0.01	6.0%		0.01	0.02	10.9%
R21	0.07	36.8%		<0.01	0.08	39.2%
R22	0.06	30.2%		<0.01	0.06	32.3%
R23	0.06	29.9%		<0.01	0.06	32.0%
R24	0.06	31.0%		<0.01	0.07	33.0%
R25	0.08	38.2%		<0.01	0.08	40.4%
R26	0.07	32.9%		0.01	0.07	35.5%
R27	0.02	12.3%		0.01	0.03	16.2%
R28	0.02	12.0%		0.01	0.03	16.2%
R29	0.03	13.6%		0.01	0.03	17.2%
R30	0.02	10.4%		0.01	0.03	14.8%
R31	0.03	13.0%		0.01	0.03	17.1%
R32	0.03	16.0%		0.01	0.04	19.4%
R33	0.02	7.9%		0.01	0.03	12.7%

Receptor	Proposed Installation PC (ng/m^3)	PC/ES (%)	Background Concentration (ng/m^3)	PC from Cumulative Sources (ng/m^3)	PEC (ng/m^3)	PEC/ES (%)
R34	0.05	27.0%		<0.01	0.06	28.7%
R35	0.04	21.2%		<0.01	0.05	22.8%
R36	0.05	25.7%		<0.01	0.05	27.3%
R37	0.07	35.0%		<0.01	0.07	36.8%
R38	0.07	36.1%		<0.01	0.08	38.4%
R39	0.03	13.6%		0.01	0.03	17.0%
R40	0.05	25.9%		<0.01	0.06	27.5%
R41	0.06	32.3%		<0.01	0.07	34.2%
R42	0.03	14.9%		<0.01	0.03	16.3%
R43	0.06	29.1%		<0.01	0.06	31.2%
R44	0.04	17.8%		<0.01	0.04	19.1%
R3_Cement	0.01	7.4%		0.01	0.02	12.1%
R6_Cement	0.02	9.4%		0.03	0.05	24.4%
1_ICT	0.03	14.8%		<0.01	0.03	16.3%
9_ICT	0.03	14.9%		<0.01	0.03	16.1%
Maximum	0.09	45.7%		0.01	0.10	48.4%

ES 0.2 ng/m^3

Table 5-21: Predicted Process Contribution Annual Mean NH_3 Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	PEC/ ES (%)
R1	<0.1	<0.1%	2.0	2.0	1.1%
R2	<0.1	<0.1%		2.0	1.1%
R3	<0.1	<0.1%		2.0	1.1%
R4	<0.1	<0.1%		2.0	1.1%
R5	<0.1	<0.1%		2.0	1.1%
R6	<0.1	<0.1%		2.0	1.1%
R7	<0.1	<0.1%		2.0	1.1%
R8	<0.1	<0.1%		2.0	1.1%
R9	<0.1	<0.1%		2.0	1.1%
R10	<0.1	<0.1%		2.0	1.1%
R11	<0.1	<0.1%		2.0	1.1%
R12	<0.1	<0.1%		2.0	1.1%

Receptor	Proposed Installation PC (µg/m^3)	PC/ ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	PEC/ ES (%)
R13	<0.1	<0.1%		2.0	1.1%
R14	<0.1	<0.1%		2.0	1.1%
R15	<0.1	<0.1%		2.0	1.1%
R16	<0.1	<0.1%		2.0	1.1%
R17	<0.1	<0.1%		2.0	1.1%
R18	<0.1	<0.1%		2.0	1.1%
R19	<0.1	<0.1%		2.0	1.1%
R20	<0.1	<0.1%		2.0	1.1%
R21	<0.1	<0.1%		2.0	1.1%
R22	<0.1	<0.1%		2.0	1.1%
R23	<0.1	<0.1%		2.0	1.1%
R24	<0.1	<0.1%		2.0	1.1%
R25	<0.1	<0.1%		2.0	1.1%
R26	<0.1	<0.1%		2.0	1.1%
R27	<0.1	<0.1%		2.0	1.1%
R28	<0.1	<0.1%		2.0	1.1%
R29	<0.1	<0.1%		2.0	1.1%
R30	<0.1	<0.1%		2.0	1.1%
R31	<0.1	<0.1%		2.0	1.1%
R32	<0.1	<0.1%		2.0	1.1%
R33	<0.1	<0.1%		2.0	1.1%
R34	<0.1	<0.1%		2.0	1.1%
R35	<0.1	<0.1%		2.0	1.1%
R36	<0.1	<0.1%		2.0	1.1%
R37	<0.1	<0.1%		2.0	1.1%
R38	<0.1	<0.1%		2.0	1.1%
R39	<0.1	<0.1%		2.0	1.1%
R40	<0.1	<0.1%		2.0	1.1%
R41	<0.1	<0.1%		2.0	1.1%
R42	<0.1	<0.1%		2.0	1.1%
R43	<0.1	<0.1%		2.0	1.1%
R44	<0.1	<0.1%		2.0	1.1%
R3_Cement	<0.1	<0.1%		2.0	1.1%
R6_Cement	<0.1	<0.1%		2.0	1.1%
1_ICT	<0.1	<0.1%		2.0	1.1%
9_ICT	<0.1	<0.1%		2.0	1.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
Maximum	<0.1	<0.1%		2.0	1.1%

ES 180 µg/m³

Table 5-22: Predicted Process Contribution Maximum 1 Hour NH_3 Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R1	0.1	<0.1%	4.0	4.1	0.2%
R2	0.1	<0.1%		4.1	0.2%
R3	0.5	<0.1%		4.5	0.2%
R4	0.3	<0.1%		4.3	0.2%
R5	0.3	<0.1%		4.3	0.2%
R6	0.4	<0.1%		4.4	0.2%
R7	0.4	<0.1%		4.4	0.2%
R8	0.7	<0.1%		4.7	0.2%
R9	0.7	<0.1%		4.7	0.2%
R10	0.6	<0.1%		4.6	0.2%
R11	0.6	<0.1%		4.6	0.2%
R12	0.6	<0.1%		4.6	0.2%
R13	0.4	<0.1%		4.4	0.2%
R14	0.4	<0.1%		4.4	0.2%
R15	0.4	<0.1%		4.4	0.2%
R16	0.4	<0.1%		4.4	0.2%
R17	0.4	<0.1%		4.4	0.2%
R18	0.5	<0.1%		4.5	0.2%
R19	0.4	<0.1%		4.4	0.2%
R20	0.4	<0.1%		4.4	0.2%
R21	0.4	<0.1%		4.4	0.2%
R22	0.4	<0.1%		4.4	0.2%
R23	0.4	<0.1%		4.4	0.2%
R24	0.3	<0.1%		4.3	0.2%
R25	0.5	<0.1%		4.5	0.2%
R26	0.4	<0.1%		4.4	0.2%
R27	0.4	<0.1%		4.4	0.2%
R28	0.3	<0.1%		4.3	0.2%
R29	0.4	<0.1%		4.4	0.2%

Receptor	Proposed Installation PC (µg/m³)	PC/ ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ ES (%)
R30	0.4	<0.1%		4.4	0.2%
R31	0.4	<0.1%		4.4	0.2%
R32	0.4	<0.1%		4.4	0.2%
R33	0.4	<0.1%		4.4	0.2%
R34	0.3	<0.1%		4.3	0.2%
R35	0.4	<0.1%		4.4	0.2%
R36	0.4	<0.1%		4.4	0.2%
R37	0.1	<0.1%		4.1	0.2%
R38	0.1	<0.1%		4.1	0.2%
R39	0.5	<0.1%		4.5	0.2%
R40	0.3	<0.1%		4.3	0.2%
R41	0.3	<0.1%		4.3	0.2%
R42	0.4	<0.1%		4.4	0.2%
R43	0.4	<0.1%		4.4	0.2%
R44	0.7	<0.1%		4.7	0.2%
R3_Cement	0.7	<0.1%		4.7	0.2%
R6_Cement	0.6	<0.1%		4.6	0.2%
1_ICT	0.6	<0.1%		4.6	0.2%
9_ICT	0.6	<0.1%		4.6	0.2%
Maximum	0.4	<0.1%		4.4	0.2%

ES 2,500 µg/m³

Table 5-23: Predicted Process Contribution 30-min Maximum Formaldehyde Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	0.01	<0.1%	No data available	0.01	<0.1%
R2	0.01	<0.1%		0.01	<0.1%
R3	0.09	0.1%		0.09	0.1%
R4	0.05	0.1%		0.05	0.1%
R5	0.06	0.1%		0.06	0.1%
R6	0.07	0.1%		0.07	0.1%
R7	0.07	0.1%		0.07	0.1%
R8	0.13	0.1%		0.13	0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R9	0.13	0.1%		0.13	0.1%
R10	0.12	0.1%		0.12	0.1%
R11	0.12	0.1%		0.12	0.1%
R12	0.10	0.1%		0.10	0.1%
R13	0.07	0.1%		0.07	0.1%
R14	0.07	0.1%		0.07	0.1%
R15	0.07	0.1%		0.07	0.1%
R16	0.07	0.1%		0.07	0.1%
R17	0.08	0.1%		0.08	0.1%
R18	0.10	0.1%		0.10	0.1%
R19	0.08	0.1%		0.08	0.1%
R20	0.08	0.1%		0.08	0.1%
R21	0.07	0.1%		0.07	0.1%
R22	0.07	0.1%		0.07	0.1%
R23	0.07	0.1%		0.07	0.1%
R24	0.06	0.1%		0.06	0.1%
R25	0.09	0.1%		0.09	0.1%
R26	0.08	0.1%		0.08	0.1%
R27	0.07	0.1%		0.07	0.1%
R28	0.07	0.1%		0.07	0.1%
R29	0.08	0.1%		0.08	0.1%
R30	0.07	0.1%		0.07	0.1%
R31	0.08	0.1%		0.08	0.1%
R32	0.08	0.1%		0.08	0.1%
R33	0.08	0.1%		0.08	0.1%
R34	0.07	0.1%		0.07	0.1%
R35	0.10	0.1%		0.10	0.1%
R36	0.07	0.1%		0.07	0.1%
R37	0.09	0.1%		0.09	0.1%
R38	0.09	0.1%		0.09	0.1%
R39	0.09	0.1%		0.09	0.1%
R40	0.08	0.1%		0.08	0.1%
R41	0.11	0.1%		0.11	0.1%
R42	0.09	0.1%		0.09	0.1%
R43	0.09	0.1%		0.09	0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R44	0.10	0.1%		0.10	0.1%
R3_Cement	0.07	0.1%		0.07	0.1%
R6_Cement	0.07	0.1%		0.07	0.1%
1_ICT	0.10	0.1%		0.10	0.1%
9_ICT	0.10	0.1%		0.10	0.1%
Maximum	0.17	0.2%		0.17	0.2%

ES 100 µg/m³

Table 5-24: Predicted Process Contribution Annual Mean Formaldehyde Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.1%
R17	<0.01	<0.1%		<0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R24	<0.01	<0.1%		<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	<0.01	0.1%		<0.01	0.1%

ES 5 µg/m³

5.2.12 The annual average changes at all human health receptors for NO_2, NH_3 and formaldehyde are less than 1% of the relevant ES and therefore can be screened out from the need for further assessment.

5.2.13 The short-term NO_2 PC is less than the 10% of the relevant ES at discrete receptors, except R9 to R11 inclusive and R18. At these locations, the hourly NO_2 concentrations is still less than 20% of the ES minus twice the long-term background concentration and therefore can be screened out from the need for further assessment. At the maximum in the study area, the PC as a percentage of the ES minus twice the long-term background is 21.3% of the AQAL. However, the PEC is 26.4% of the ES and therefore there would not be a risk of the ES being exceeded.

5.2.14 The short-term PCs for CO, NH_3 and formaldehyde are less than the 10% of the relevant ES at discrete receptors. The maximum in the study area the hourly NO_2 concentrations is less than 20% of the ES minus twice the long-term background concentration and therefore can be screened out from the need for further assessment.

5.2.15 Predicted concentrations at all human health receptors, except R1 and R2, for N-Amines are more than 1% of the NDMA EAL. PECs are below 50% of NDMA EAL at all discrete receptors and at the maximum within the study area, therefore they can be screened out from the need for further assessment.

5.2.16 As with the Abated FEED 1 scenario, this assessment for N-Amines should be regarded as extremely conservative as it incorporates a number of robust assumptions, namely:

- the Proposed Installation is assumed to run two trains at full load during every hour of the year, whereas in practice the load factor is likely to be substantially lower due the plant providing dispatchable power when required;
- the assessment is based on the highest annual impact at each receptor out of the five years modelled;
- the assessment assumed no depletion of plume concentrations due to wet or dry deposition;
- the assessment assumes that all nitramines and nitrosamines emitted from the stack or formed in the atmosphere have the same toxicity as NDMA, known to be one of the most toxic nitrosamine species. In particular current studies suggest that nitramines are substantially less toxic than their corresponding nitrosamines; and
- all buildings have been modelled at their maximum anticipated dimensions ensuring the potential for impacting on plume dispersion is captured in the dispersion model.

5.2.17 Based on the above, N-Amines impacts would be substantially lower than those presented.

Human Health Receptor Results - Unabated FEED 1 Scenario

5.2.18 The results at the identified human health receptors for the unabated scenario are shown in **Table 5-25** to **Table 5-28.**

Table 5-25: Predicted Process Contribution Annual Mean NO_2 Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	6.5	0.1	6.6	16.4%
R2	<0.01	<0.1%	6.5	0.1	6.6	16.4%
R3	0.02	0.1%	6.5	0.1	6.6	16.5%
R4	0.01	0.1%	6.5	0.1	6.6	16.6%
R5	0.12	0.2%	6.5	0.1	6.7	16.8%
R6	0.16	0.2%	6.5	0.1	6.7	16.8%
R7	0.22	0.2%	6.5	0.1	6.7	16.7%
R8	0.04	0.1%	6.5	0.1	6.6	16.6%
R9	0.04	0.1%	6.5	0.1	6.6	16.6%
R10	0.05	0.1%	6.5	0.0	6.6	16.6%
R11	0.05	0.0%	6.5	0.1	6.6	16.5%
R12	0.06	0.3%	6.5	0.1	6.8	17.0%
R13	0.08	0.4%	6.5	0.1	6.9	17.3%
R14	0.08	0.7%	6.5	0.1	7.1	17.8%
R15	0.29	0.7%	6.5	0.1	7.1	17.9%
R16	0.31	0.8%	6.5	0.1	7.2	18.0%
R17	0.26	0.2%	6.5	0.1	6.7	16.7%
R18	0.19	0.1%	6.5	0.1	6.6	16.5%
R19	0.03	0.4%	6.5	0.1	6.9	17.3%
R20	0.04	0.2%	6.5	0.0	6.7	16.8%
R21	0.31	0.1%	6.5	0.1	6.6	16.5%
R22	0.27	0.6%	6.5	0.1	7.1	17.8%
R23	0.27	0.5%	6.5	0.1	7.0	17.5%
R24	0.26	0.5%	6.5	0.1	7.0	17.4%
R25	0.29	0.7%	6.5	0.1	7.2	17.9%
R26	0.24	0.5%	6.5	0.1	7.0	17.5%
R27	0.08	0.5%	6.5	0.1	7.0	17.4%
R28	0.07	0.6%	6.5	0.0	7.1	17.7%
R29	0.08	0.4%	6.5	0.1	7.0	17.4%
R30	0.06	0.1%	6.5	0.0	6.7	16.6%
R31	0.07	0.2%	6.5	0.0	6.7	16.7%
R32	0.09	0.2%	6.5	0.1	6.7	16.8%
R33	0.04	0.2%	6.5	0.0	6.7	16.8%
R34	0.20	0.7%	6.5	0.1	7.2	17.9%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R35	0.16	0.6%	6.5	0.1	7.1	17.7%
R36	0.18	0.1%	6.5	0.1	6.6	16.5%
R37	0.24	0.8%	6.5	0.1	7.2	18.0%
R38	0.25	0.6%	6.5	0.1	7.0	17.6%
R39	0.07	0.6%	6.5	0.1	7.1	17.7%
R40	0.17	0.5%	6.5	0.1	7.0	17.5%
R41	0.20	0.4%	6.5	0.1	6.9	17.3%
R42	0.11	0.2%	6.5	1.2	6.7	16.8%
R43	0.17	0.3%	6.5	0.1	7.9	19.8%
R44	0.13	0.3%	6.5	0.3	7.0	17.6%
R3_Cement	0.04	0.1%	6.5	0.0	6.6	16.5%
R6_Cement	0.05	0.1%	6.5	0.0	6.6	16.6%
1_ICT	0.10	0.3%	6.5	0.7	7.4	18.5%
9_ICT	0.11	0.3%	6.5	1.8	8.5	21.4%
Maximum	0.32	0.8%	6.5	0.1	7.3	18.1%

ES 40 µg/m³

Table 5-26: Predicted Process Contribution 1-hour Mean 99.79th Percentile NO_2 Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R1	0.4	0.2%	15.0	1.6	16.9	8.5%	0.2%
R2	0.6	0.3%	16.1	1.5	18.2	9.1%	0.3%
R3	4.8	2.4%	13.0	0.6	18.4	9.2%	2.6%
R4	2.8	1.4%	14.8	0.2	17.8	8.9%	1.5%
R5	8.1	4.1%	16.7	<0.1	24.8	12.4%	4.4%
R6	10.2	5.1%	16.6	<0.1	26.8	13.4%	5.6%
R7	12.8	6.4%	14.2	<0.1	27.0	13.5%	6.9%
R8	8.9	4.4%	13.0	0.7	22.6	11.3%	4.8%
R9	8.4	4.2%	13.0	0.2	21.6	10.8%	4.5%
R10	10.3	5.1%	13.0	0.3	23.6	11.8%	5.5%
R11	10.5	5.3%	13.0	0.6	24.1	12.1%	5.6%
R12	11.1	5.6%	13.0	0.6	24.7	12.4%	5.9%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R13	12.4	6.2%	15.0	0.5	27.9	14.0%	6.7%
R14	12.5	6.3%	18.0	0.4	30.8	15.4%	6.9%
R15	14.9	7.5%	19.6	<0.1	34.5	17.3%	8.3%
R16	14.6	7.3%	13.9	<0.1	28.5	14.2%	7.8%
R17	14.5	7.3%	17.1	<0.1	31.6	15.8%	7.9%
R18	14.6	7.3%	13.0	<0.1	27.6	13.8%	7.8%
R19	5.9	2.9%	13.9	<0.1	19.8	9.9%	3.2%
R20	8.1	4.1%	13.0	<0.1	21.1	10.6%	4.3%
R21	13.2	6.6%	13.0	<0.1	26.2	13.1%	7.1%
R22	13.0	6.5%	18.4	<0.1	31.4	15.7%	7.1%
R23	12.9	6.5%	19.6	<0.1	32.6	16.3%	7.2%
R24	11.7	5.8%	14.6	<0.1	26.3	13.2%	6.3%
R25	11.2	5.6%	13.0	<0.1	24.2	12.1%	6.0%
R26	11.2	5.6%	13.0	<0.1	24.2	12.1%	6.0%
R27	11.1	5.5%	13.0	0.2	24.2	12.1%	5.9%
R28	9.6	4.8%	13.0	0.4	23.0	11.5%	5.2%
R29	9.1	4.5%	13.0	0.3	22.4	11.2%	4.9%
R30	8.1	4.0%	13.0	0.5	21.6	10.8%	4.3%
R31	8.2	4.1%	13.0	0.3	21.5	10.8%	4.4%
R32	7.7	3.8%	13.0	0.2	20.9	10.4%	4.1%
R33	7.1	3.6%	13.0	0.3	20.4	10.2%	3.8%
R34	9.3	4.6%	17.5	<0.1	26.8	13.4%	5.1%
R35	8.7	4.3%	13.5	<0.1	22.2	11.1%	4.7%
R36	8.3	4.2%	19.3	<0.1	27.7	13.8%	4.6%
R37	8.9	4.5%	17.0	<0.1	26.0	13.0%	4.9%
R38	9.2	4.6%	15.0	<0.1	24.2	12.1%	5.0%
R39	8.0	4.0%	15.6	<0.1	23.6	11.8%	4.3%
R40	7.3	3.7%	13.2	<0.1	20.5	10.3%	3.9%
R41	8.3	4.2%	13.0	<0.1	21.3	10.7%	4.5%
R42	7.2	3.6%	13.0	2.6	22.8	11.4%	3.8%
R43	8.6	4.3%	13.0	0.1	21.7	10.9%	4.6%
R44	6.4	3.2%	13.0	<0.1	19.4	9.7%	3.4%
R3_Cement	5.8	2.9%	13.0	0.1	18.9	9.5%	3.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R6_Cement	6.2	3.1%	13.0	<0.1	19.2	9.6%	3.3%
1_ICT	7.1	3.6%	13.0	0.1	20.2	10.1%	3.8%
9_ICT	6.5	3.2%	13.0	8.8	28.3	14.1%	3.5%
Max	23.2	11.6%	13.0	<0.1	36.2	18.1%	12.4%

ES 200 µg/m³

Table 5-27: Predicted Process Contribution 8-hour Rolling Maximum CO Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R1	<0.1	<0.1%	0.6	0.6	6.1%
R2	<0.1	<0.1%	0.6	0.6	6.1%
R3	<0.1	0.4%	0.5	0.5	5.3%
R4	<0.1	0.2%	0.5	0.5	5.2%
R5	0.1	0.7%	0.5	0.6	5.6%
R6	0.1	0.8%	0.5	0.6	5.7%
R7	0.1	0.9%	0.5	0.6	5.9%
R8	<0.1	0.4%	0.5	0.5	5.5%
R9	0.1	0.7%	0.5	0.6	5.6%
R10	0.1	0.5%	0.5	0.6	5.5%
R11	<0.1	0.5%	0.5	0.6	5.5%
R12	0.1	0.6%	0.5	0.6	5.8%
R13	0.1	0.6%	0.5	0.6	5.8%
R14	0.1	0.6%	0.5	0.6	5.8%
R15	0.1	1.0%	0.5	0.6	6.0%
R16	0.1	1.0%	0.5	0.6	6.0%
R17	0.1	0.7%	0.5	0.6	5.9%
R18	0.1	1.0%	0.5	0.6	6.0%
R19	<0.1	0.2%	0.5	0.5	5.4%
R20	<0.1	0.5%	0.5	0.5	5.5%
R21	0.1	0.8%	0.5	0.6	6.1%
R22	0.1	0.7%	0.5	0.6	5.9%
R23	0.1	0.7%	0.5	0.6	5.9%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R24	0.1	0.6%	0.6	0.6	6.2%
R25	0.1	0.7%	0.5	0.6	6.0%
R26	0.1	0.6%	0.5	0.6	6.0%
R27	0.1	0.5%	0.5	0.6	5.6%
R28	<0.1	0.5%	0.5	0.6	5.5%
R29	0.1	0.5%	0.5	0.6	5.6%
R30	<0.1	0.4%	0.5	0.5	5.5%
R31	<0.1	0.4%	0.5	0.5	5.4%
R32	<0.1	0.3%	0.5	0.5	5.4%
R33	<0.1	0.3%	0.5	0.5	5.3%
R34	<0.1	0.4%	0.6	0.6	6.0%
R35	<0.1	0.4%	0.6	0.6	6.0%
R36	<0.1	0.4%	0.6	0.6	6.0%
R37	<0.1	0.5%	0.6	0.6	6.0%
R38	<0.1	0.5%	0.6	0.6	6.3%
R39	<0.1	0.4%	0.6	0.6	6.0%
R40	<0.1	0.3%	0.6	0.6	6.3%
R41	<0.1	0.3%	0.6	0.6	6.3%
R42	<0.1	0.3%	0.6	0.6	6.3%
R43	<0.1	0.3%	0.6	0.6	6.2%
R44	<0.1	0.3%	0.5	0.6	5.8%
R3_Cement	<0.1	0.2%	0.5	0.5	5.5%
R6_Cement	<0.1	0.2%	0.5	0.5	5.4%
1_ICT	<0.1	0.3%	0.6	0.6	6.3%
9_ICT	<0.1	0.3%	0.6	0.6	6.3%
Maximum	0.1	1.2%	0.6	0.7	7.3%

ES 10 mg/m³

Table 5-28: Predicted Process Contribution 1-hour Maximum CO Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R1	<0.1	0.1%	0.6	0.6	2.1%
R2	<0.1	0.1%	0.6	0.6	2.1%
R3	0.1	0.3%	0.5	0.6	1.9%

Receptor	Proposed Installation PC (mg/m^3)	PC/ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ES (%)
R4	0.1	0.2%	0.5	0.5	1.8%
R5	0.1	0.4%	0.5	0.6	2.2%
R6	0.1	0.5%	0.5	0.7	2.2%
R7	0.1	0.5%	0.5	0.6	2.1%
R8	0.1	0.3%	0.5	0.6	2.0%
R9	0.1	0.4%	0.5	0.6	2.0%
R10	0.1	0.3%	0.5	0.6	2.0%
R11	0.1	0.3%	0.5	0.6	2.0%
R12	0.1	0.3%	0.5	0.6	2.0%
R13	0.1	0.3%	0.5	0.6	2.0%
R14	0.1	0.3%	0.5	0.6	2.0%
R15	0.1	0.4%	0.5	0.6	2.1%
R16	0.1	0.4%	0.5	0.6	2.1%
R17	0.1	0.4%	0.5	0.6	2.1%
R18	0.1	0.4%	0.5	0.6	2.1%
R19	0.1	0.2%	0.5	0.6	1.9%
R20	0.1	0.2%	0.5	0.6	1.9%
R21	0.1	0.3%	0.5	0.6	2.1%
R22	0.1	0.3%	0.5	0.6	2.0%
R23	0.1	0.3%	0.5	0.6	2.0%
R24	0.1	0.3%	0.6	0.6	2.1%
R25	0.1	0.3%	0.5	0.6	2.1%
R26	0.1	0.3%	0.5	0.6	2.1%
R27	0.1	0.3%	0.5	0.6	1.9%
R28	0.1	0.2%	0.5	0.6	1.9%
R29	0.1	0.2%	0.5	0.6	1.9%
R30	0.1	0.2%	0.5	0.6	1.9%
R31	0.1	0.2%	0.5	0.6	1.9%
R32	0.1	0.2%	0.5	0.6	1.9%
R33	0.1	0.2%	0.5	0.6	1.9%
R34	0.1	0.2%	0.6	0.6	2.1%
R35	0.1	0.2%	0.6	0.6	2.1%
R36	0.1	0.2%	0.6	0.6	2.1%
R37	0.1	0.3%	0.6	0.7	2.2%
R38	0.1	0.3%	0.6	0.7	2.2%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R39	0.1	0.2%	0.6	0.6	2.1%
R40	0.1	0.2%	0.6	0.7	2.2%
R41	0.1	0.3%	0.6	0.7	2.4%
R42	0.1	0.3%	0.6	0.7	2.3%
R43	0.1	0.3%	0.6	0.7	2.3%
R44	0.1	0.3%	0.5	0.7	2.2%
R3_Cement	0.1	0.2%	0.5	0.6	1.9%
R6_Cement	0.1	0.2%	0.5	0.6	2.0%
1_ICT	0.1	0.3%	0.6	0.7	2.3%
9_ICT	0.1	0.3%	0.6	0.7	2.3%
Max	0.2	0.6%	0.6	0.8	2.5%

ES 30 mg/m³

5.2.19 The predicted annual mean change at all human health receptors for NO_2 are less than 1% of the ES.

5.2.20 The short-term PCs for CO and NO_2 are less than the 10% of the relevant ES, with the exception of 1-hour NO_2 at the location of maximum impact. The maximum 1-hour NO_2 is less than 20% of the headroom. Predicted impacts on short-term pollutant concentrations are therefore below the screening threshold and can be considered to be insignificant.

Human Health Receptor Results - Unabated FEED 2 Scenario

5.2.21 The results at the identified human health receptors for the unabated scenario are shown in **Table 5-29** to **Table 5-32.**

Table 5-29: Predicted Process Contribution Annual Mean NO_2 Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	6.5	0.07	6.57	16.4%
R2	<0.01	<0.1%	6.5	0.07	6.57	16.4%
R3	0.01	<0.1%	6.5	0.06	6.58	16.5%
R4	0.01	0.1%	6.5	0.07	6.63	16.6%
R5	0.07	0.2%	6.5	0.07	6.72	16.8%
R6	0.11	0.2%	6.5	0.07	6.72	16.8%
R7	0.16	0.2%	6.5	0.08	6.69	16.7%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R8	0.03	0.1%	6.5	0.06	6.65	16.6%
R9	0.03	0.1%	6.5	0.05	6.62	16.6%
R10	0.04	0.1%	6.5	0.05	6.61	16.5%
R11	0.05	<0.1%	6.5	0.05	6.58	16.5%
R12	0.07	0.2%	6.5	0.05	6.72	16.8%
R13	0.08	0.3%	6.5	0.05	6.80	17.0%
R14	0.08	0.6%	6.5	0.05	7.09	17.7%
R15	0.25	0.6%	6.5	0.09	7.10	17.7%
R16	0.28	0.7%	6.5	0.09	7.18	18.0%
R17	0.23	0.2%	6.5	0.08	6.70	16.7%
R18	0.16	0.1%	6.5	0.08	6.60	16.5%
R19	0.02	0.4%	6.5	0.06	6.91	17.3%
R20	0.03	0.2%	6.5	0.04	6.71	16.8%
R21	0.30	0.1%	6.5	0.09	6.61	16.5%
R22	0.25	0.6%	6.5	0.10	7.09	17.7%
R23	0.25	0.4%	6.5	0.10	6.91	17.3%
R24	0.25	0.4%	6.5	0.10	6.89	17.2%
R25	0.29	0.7%	6.5	0.08	7.17	17.9%
R26	0.23	0.5%	6.5	0.07	6.99	17.5%
R27	0.08	0.5%	6.5	0.05	6.96	17.4%
R28	0.08	0.6%	6.5	0.04	7.09	17.7%
R29	0.08	0.4%	6.5	0.05	6.97	17.4%
R30	0.06	0.2%	6.5	0.04	6.66	16.7%
R31	0.08	0.2%	6.5	0.04	6.70	16.7%
R32	0.09	0.2%	6.5	0.05	6.71	16.8%
R33	0.04	0.2%	6.5	0.03	6.72	16.8%
R34	0.20	0.6%	6.5	0.09	7.10	17.7%
R35	0.15	0.6%	6.5	0.11	7.03	17.6%
R36	0.18	0.0%	6.5	0.09	6.60	16.5%
R37	0.25	0.7%	6.5	0.08	7.15	17.9%
R38	0.26	0.6%	6.5	0.07	7.04	17.6%
R39	0.07	0.6%	6.5	0.06	7.09	17.7%
R40	0.18	0.5%	6.5	0.11	7.04	17.6%
R41	0.22	0.5%	6.5	0.10	6.97	17.4%
R42	0.12	0.2%	6.5	1.22	6.73	16.8%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R43	0.20	0.3%	6.5	0.07	7.95	19.9%
R44	0.14	0.4%	6.5	0.25	7.04	17.6%
R3_Cement	0.05	0.1%	6.5	0.03	6.62	16.5%
R6_Cement	0.06	0.1%	6.5	0.03	6.64	16.6%
1_ICT	0.11	0.3%	6.5	0.67	7.39	18.5%
9_ICT	0.12	0.3%	6.5	1.82	8.56	21.4%
Maximum	0.30	0.7%	6.5	0.09	7.19	18.0%

ES 40 µg/m³

Table 5-30: Predicted Process Contribution 1-hour Mean 99.79th Percentile NO_2 Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R1	0.8	0.4%	15.0	1.3	17.0	8.5%	0.4%
R2	0.3	0.1%	16.1	1.6	18.0	9.0%	0.2%
R3	3.1	1.5%	13.0	0.6	16.7	8.4%	1.7%
R4	1.5	0.7%	14.8	0.7	17.0	8.5%	0.8%
R5	6.9	3.5%	16.7	0.0	23.6	11.8%	3.8%
R6	10.5	5.3%	16.6	0.0	27.1	13.6%	5.7%
R7	13.0	6.5%	14.2	0.0	27.2	13.6%	7.0%
R8	7.6	3.8%	13.0	0.6	21.2	10.6%	4.1%
R9	6.1	3.0%	13.0	0.3	19.3	9.7%	3.3%
R10	9.1	4.5%	13.0	0.5	22.6	11.3%	4.8%
R11	11.1	5.5%	13.0	0.5	24.5	12.3%	5.9%
R12	13.9	7.0%	13.0	0.4	27.3	13.7%	7.5%
R13	14.1	7.0%	15.0	0.5	29.6	14.8%	7.6%
R14	13.9	6.9%	18.0	0.4	32.2	16.1%	7.6%
R15	16.0	8.0%	19.6	0.0	35.7	17.8%	8.9%
R16	16.4	8.2%	13.9	0.0	30.4	15.2%	8.8%
R17	14.4	7.2%	17.1	0.0	31.5	15.7%	7.9%
R18	12.8	6.4%	13.0	0.0	25.8	12.9%	6.9%
R19	4.3	2.1%	13.9	0.0	18.2	9.1%	2.3%
R20	7.4	3.7%	13.0	0.0	20.4	10.2%	4.0%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PC from Cumulative Sources (µg/m³)	PEC (µg/m³)	PEC/ES (%)	PC as % of headroom
R21	15.2	7.6%	13.0	0.0	28.2	14.1%	8.2%
R22	13.7	6.9%	18.4	0.0	32.1	16.1%	7.6%
R23	13.5	6.8%	19.6	0.0	33.2	16.6%	7.5%
R24	12.4	6.2%	14.6	0.0	27.1	13.5%	6.7%
R25	13.5	6.8%	13.0	0.0	26.5	13.3%	7.2%
R26	12.5	6.2%	13.0	0.0	25.5	12.7%	6.7%
R27	12.5	6.3%	13.0	0.2	25.7	12.9%	6.7%
R28	11.4	5.7%	13.0	0.3	24.7	12.4%	6.1%
R29	10.0	5.0%	13.0	0.2	23.2	11.6%	5.3%
R30	9.4	4.7%	13.0	0.5	22.9	11.4%	5.0%
R31	9.6	4.8%	13.0	0.4	22.9	11.5%	5.1%
R32	8.8	4.4%	13.0	0.2	22.1	11.0%	4.7%
R33	8.4	4.2%	13.0	0.3	21.7	10.8%	4.5%
R34	10.5	5.2%	17.5	0.0	28.0	14.0%	5.7%
R35	9.9	5.0%	13.5	0.0	23.4	11.7%	5.3%
R36	9.5	4.8%	19.3	0.0	28.9	14.4%	5.3%
R37	10.5	5.2%	17.0	0.0	27.5	13.7%	5.7%
R38	10.5	5.3%	15.0	0.0	25.6	12.8%	5.7%
R39	8.6	4.3%	15.6	0.0	24.2	12.1%	4.7%
R40	8.4	4.2%	13.2	0.0	21.6	10.8%	4.5%
R41	8.8	4.4%	13.0	0.0	21.8	10.9%	4.7%
R42	7.3	3.7%	13.0	2.4	22.7	11.4%	3.9%
R43	9.2	4.6%	13.0	0.0	22.3	11.1%	4.9%
R44	7.4	3.7%	13.0	0.0	20.4	10.2%	4.0%
R3_Cement	6.9	3.5%	13.0	0.2	20.2	10.1%	3.7%
R6_Cement	7.2	3.6%	13.0	0.1	20.3	10.1%	3.8%
1_ICT	7.5	3.7%	13.0	0.1	20.5	10.3%	4.0%
9_ICT	7.2	3.6%	13.0	8.2	28.4	14.2%	3.9%
Max	20.6	10.3%	13.0	0.0	33.6	16.8%	11.0%

ES 200 µg/m³

Table 5-31: Predicted Process Contribution 8-hour Rolling Maximum CO Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (mg/m^3)	PC/ES (%)	Background Concentration (mg/m^3)	PEC (mg/m^3)	PEC/ES (%)
R1	<0.01	0.0%	0.60	0.61	6.1%
R2	<0.01	0.0%	0.60	0.61	6.1%
R3	0.03	0.3%	0.51	0.53	5.3%
R4	0.01	0.1%	0.51	0.52	5.2%
R5	0.05	0.5%	0.51	0.56	5.6%
R6	0.06	0.6%	0.51	0.57	5.7%
R7	0.07	0.7%	0.52	0.59	5.9%
R8	0.04	0.4%	0.51	0.55	5.5%
R9	0.04	0.4%	0.52	0.56	5.6%
R10	0.05	0.5%	0.51	0.55	5.5%
R11	0.05	0.5%	0.50	0.55	5.5%
R12	0.08	0.8%	0.50	0.58	5.8%
R13	0.08	0.8%	0.50	0.58	5.8%
R14	0.08	0.8%	0.50	0.58	5.8%
R15	0.08	0.8%	0.52	0.60	6.0%
R16	0.07	0.7%	0.52	0.60	6.0%
R17	0.07	0.7%	0.52	0.59	5.9%
R18	0.08	0.8%	0.52	0.60	6.0%
R19	0.02	0.2%	0.51	0.54	5.4%
R20	0.05	0.5%	0.50	0.55	5.5%
R21	0.07	0.7%	0.53	0.61	6.1%
R22	0.07	0.7%	0.52	0.59	5.9%
R23	0.07	0.7%	0.52	0.59	5.9%
R24	0.06	0.6%	0.55	0.62	6.2%
R25	0.07	0.7%	0.53	0.60	6.0%
R26	0.06	0.6%	0.53	0.60	6.0%
R27	0.06	0.6%	0.50	0.56	5.6%
R28	0.06	0.6%	0.50	0.55	5.5%
R29	0.06	0.6%	0.50	0.56	5.6%
R30	0.05	0.5%	0.50	0.55	5.5%
R31	0.04	0.4%	0.50	0.54	5.4%
R32	0.04	0.4%	0.50	0.54	5.4%
R33	0.03	0.3%	0.50	0.53	5.3%
R34	0.05	0.5%	0.55	0.60	6.0%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R35	0.05	0.5%	0.55	0.60	6.0%
R36	0.05	0.5%	0.55	0.60	6.0%
R37	0.05	0.5%	0.55	0.60	6.0%
R38	0.05	0.5%	0.57	0.63	6.3%
R39	0.04	0.4%	0.55	0.60	6.0%
R40	0.04	0.4%	0.59	0.63	6.3%
R41	0.04	0.4%	0.60	0.63	6.3%
R42	0.03	0.3%	0.60	0.63	6.3%
R43	0.03	0.3%	0.59	0.62	6.2%
R44	0.03	0.3%	0.55	0.58	5.8%
R3_Cement	0.03	0.3%	0.52	0.55	5.5%
R6_Cement	0.02	0.2%	0.52	0.54	5.4%
1_ICT	0.04	0.4%	0.60	0.63	6.3%
9_ICT	0.03	0.3%	0.60	0.63	6.3%
Maximum	0.12	1.2%	0.60	0.73	7.3%

ES 10 mg/m³

Table 5-32: Predicted Process Contribution 1-hour Maximum CO Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R1	0.03	0.1%	0.60	0.63	2.1%
R2	0.03	0.1%	0.60	0.63	2.1%
R3	0.06	0.2%	0.51	0.56	1.9%
R4	0.04	0.1%	0.51	0.55	1.8%
R5	0.14	0.5%	0.51	0.65	2.2%
R6	0.14	0.5%	0.51	0.65	2.2%
R7	0.12	0.4%	0.52	0.64	2.1%
R8	0.11	0.4%	0.51	0.61	2.0%
R9	0.09	0.3%	0.52	0.60	2.0%
R10	0.09	0.3%	0.51	0.59	2.0%
R11	0.11	0.4%	0.50	0.61	2.0%
R12	0.11	0.4%	0.50	0.61	2.0%
R13	0.11	0.4%	0.50	0.61	2.0%
R14	0.11	0.4%	0.50	0.61	2.0%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)
R15	0.11	0.4%	0.52	0.64	2.1%
R16	0.11	0.4%	0.52	0.63	2.1%
R17	0.11	0.4%	0.52	0.63	2.1%
R18	0.12	0.4%	0.52	0.64	2.1%
R19	0.06	0.2%	0.51	0.58	1.9%
R20	0.07	0.2%	0.50	0.57	1.9%
R21	0.10	0.3%	0.53	0.63	2.1%
R22	0.09	0.3%	0.52	0.61	2.0%
R23	0.09	0.3%	0.52	0.61	2.0%
R24	0.08	0.3%	0.55	0.63	2.1%
R25	0.08	0.3%	0.53	0.62	2.1%
R26	0.08	0.3%	0.53	0.62	2.1%
R27	0.08	0.3%	0.50	0.58	1.9%
R28	0.07	0.2%	0.50	0.57	1.9%
R29	0.07	0.2%	0.50	0.57	1.9%
R30	0.07	0.2%	0.50	0.57	1.9%
R31	0.07	0.2%	0.50	0.57	1.9%
R32	0.07	0.2%	0.50	0.57	1.9%
R33	0.08	0.3%	0.50	0.58	1.9%
R34	0.06	0.2%	0.55	0.62	2.1%
R35	0.08	0.3%	0.55	0.64	2.1%
R36	0.07	0.2%	0.55	0.62	2.1%
R37	0.10	0.3%	0.55	0.65	2.2%
R38	0.09	0.3%	0.57	0.67	2.2%
R39	0.08	0.3%	0.55	0.63	2.1%
R40	0.07	0.2%	0.59	0.66	2.2%
R41	0.11	0.4%	0.60	0.71	2.4%
R42	0.09	0.3%	0.60	0.69	2.3%
R43	0.10	0.3%	0.59	0.69	2.3%
R44	0.10	0.3%	0.55	0.65	2.2%
R3_Cement	0.06	0.2%	0.52	0.58	1.9%
R6_Cement	0.07	0.2%	0.52	0.59	2.0%
1_ICT	0.10	0.3%	0.60	0.70	2.3%
9_ICT	0.10	0.3%	0.60	0.70	2.3%
Max	0.15	0.5%	0.60	0.76	2.5%

Receptor	Proposed Installation PC (mg/m³)	PC/ES (%)	Background Concentration (mg/m³)	PEC (mg/m³)	PEC/ES (%)

ES 10 mg/m³

5.2.22 The predicted annual mean change at all human health receptors for NO_2 are less than 1% of the ES.

5.2.23 The short-term PCs for CO and NO_2 are less than the 10% of the relevant ES, with the exception of 1-hour NO_2 at the location of maximum impact. The maximum 1-hour NO_2 impact is less than 20% of the headroom. Predicted impacts on short-term pollutant concentrations are therefore below the screening threshold and can be considered to be insignificant.

5.3 Ecological Receptor Results

5.3.1 The impacts of the Proposed Installation have been modelled at the emission parameters detailed in **Table 3-2** and **Table 3-3**, which present the impacts from the Proposed Installation alone for the Abated and Unabated scenarios, respectively. The identity of the receptor is indicated within parentheses in column 1. Concentration and deposition isopleths are presented in:

- **Figures 12** to **14** for the Abated FEED 1 scenario;
- **Figures 21 to 23** for the Abated FEED 2 scenario;
- **Figures 27** to **28** for the Unabated FEED 1 scenario; and
- **Figures 32** to **33** for the Unabated FEED 2 scenario.

5.3.2 Where the long-term concentrations from the Proposed Installation alone exceed 1% of the ESs, results from the change in concentration between the Proposed Installation and the existing Connah's Quay Power Plant are also presented. These tables set out the predicted change compared to the atmospheric concentrations of NO_X, NH_3 and deposition.

5.3.3 The modelled concentrations have been compared to the ES or Critical Loads for each pollutant released.

Ecological Receptor Results – Abated FEED 1 Scenario

5.3.4 The results at the identified ecological receptors for the Abated FEED 1 scenario are shown in **Table 5-33 to Table 5-38**.

5.3.5 For all receptors, the predicted annual average NOx concentration PC is less than 1% of the ES and therefore the impacts are considered insignificant without the need for further assessment by an ecologist. It is important to note that the background concentrations are likely to already include to some degree the contribution from the existing Connah's Quay Power Station, and therefore it is considered that the actual PECs would be below the values presented.

5.3.6 The daily mean NO_X concentrations show a PC for all receptors, except for OE02 and OE29, that is less than 10% of the ES and effects can be screened out as insignificant without requiring further assessment. At OE02 and OE29, the PC of 11.1% (for both receptors) is slightly above the 10% screening threshold, however the PEC is 45.0% and 39.8% respectively and therefore would not be at risk of exceeding the ES. Moreover, the NRW guidance (Ref 1) proposes that a critical level of 200 µg/m^3 is appropriate, unless in locations where SO_2 and ozone are above their critical levels, which is not the case at these receptors. Using this criteria, the predicted PCs drop to 4.2% which is small enough that effects would be insignificant without requiring further assessment.

5.3.7 For all receptors, except OE11, the predicted annual average ammonia concentrations do not exceed 1% of the ES at nationally designated sites, and are below 100% of the ES at locally designated sites and therefore are considered insignificant without requiring further assessment. The background values at all receptors are higher than the ES, therefore the PEC's at OE11 is greater than the ES and can't be screened out and required further assessment by an ecologist. The significance of this change is discussed in the "Detailed Assessment of Impacts on Ecological Receptors" section below.

5.3.8 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Abated FEED 1) are less than the 1% threshold to demonstrate further assessment is not required for all ecological receptors except OE02, OE11, OE29 and OE30 (further details on these are provided below).

5.3.9 OE30 is not a statutory site and nitrogen deposition there is less than 100% of the ES and effects can also be screened out as insignificant without further assessment.

5.3.10 Site investigation has confirmed that, at the impacted area of OE2, the feature present is "saltmarsh" and not "coastal sand dunes", therefore a critical load of 10 kg/ha/yr applies for nitrogen deposition. The process contributions from the Proposed Installation when assessed against this higher critical load are less than the 1% threshold for nationally designated sites to demonstrate further assessment is not required.

5.3.11 At receptors OE11 and OE29, the background values are higher than the critical loads and the PECs are greater than 70%, therefore these can't be screened out and require further assessment by an ecologist. The significance of the change at these eight receptors is discussed in in the "Detailed Assessment of Impacts on Ecological Receptors" section below.

5.3.12 For acid deposition, results show that the predicted impacts from the Proposed Installation (Abated FEED 1) are less than the 1% threshold to demonstrate insignificance without the need for further assessment for all ecological receptors.

Table 5-33: Predicted Process Contribution Annual Mean NO_X Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	Cumulative PC (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
OE01	<0.1	0.1%	9.1	0.2	9.4	31.2%
OE02	0.1	0.4%	12.7	0.8	13.6	45.4%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE03	Not Sensitive					
OE04	<0.1	0.1%	7.3	0.2	7.5	25.1%
OE05	<0.1	0.1%	12.2	0.1	12.3	40.9%
OE06	<0.1	0.1%	21.0	0.1	21.1	70.3%
OE07	<0.1	0.1%	20.1	0.1	20.2	67.4%
OE08	<0.1	0.1%	10.0	0.1	10.2	33.9%
OE09	0.1	0.2%	10.0	0.6	10.7	35.6%
OE10	0.1	0.3%	8.8	0.4	9.4	31.2%
OE11	0.1	0.4%	9.8	0.1	10.1	33.6%
OE12	<0.1	0.1%	7.4	0.1	7.5	25.0%
OE13	<0.1	0.1%	11.5	0.1	11.6	38.7%
OE14	<0.1	<0.1%	5.9	<0.1	5.9	19.8%
OE15	<0.1	<0.1%	4.6	<0.1	4.7	15.6%
OE16	<0.1	<0.1%	5.7	<0.1	5.7	19.0%
OE17	<0.1	0.1%	4.9	<0.1	4.9	16.5%
OE18	<0.1	0.1%	7.3	<0.1	7.4	24.5%
OE19	<0.1	0.1%	4.7	<0.1	4.7	15.8%
OE20	<0.1	0.1%	4.7	<0.1	4.8	15.8%
OE21	<0.1	<0.1%	4.5	<0.1	4.5	15.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	<0.1	<0.1%	5.2	<0.1	5.2	17.3%
OE25	<0.1	<0.1%	4.8	<0.1	4.8	16.1%
OE26	<0.1	<0.1%	5.1	<0.1	5.1	17.1%
OE27	<0.1	0.1%	7.8	0.1	7.8	26.2%
OE28	<0.1	0.1%	7.2	<0.1	7.3	24.3%
OE29	0.1	0.3%	10.8	0.3	11.2	37.3%
OE30	0.1	0.4%	10.0	0.1	10.3	34.2%

ES 30 µg/m³

Table 5-34: Predicted Process Contribution 24-hour Maximum NOx Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	1.4	1.9%	18.2	0.6	20.3	27.0%
OE02	8.3	11.1%	25.5	<0.1	33.8	45.0%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE03	Not Sensitive					
OE04	1.3	1.8%	14.6	0.5	16.5	22.0%
OE05	1.2	1.5%	24.3	0.3	25.8	34.4%
OE06	1.5	1.9%	41.9	0.4	43.8	58.4%
OE07	1.0	1.3%	40.3	0.3	41.5	55.4%
OE08	1.9	2.6%	20.0	0.6	22.6	30.1%
OE09	3.8	5.1%	20.1	0.2	24.1	32.1%
OE10	6.6	8.8%	17.7	3.3	27.6	36.8%
OE11	5.4	7.2%	19.6	<0.1	25.0	33.3%
OE12	2.4	3.2%	14.9	0.2	17.4	23.2%
OE13	2.1	2.8%	23.0	0.4	25.5	34.0%
OE14	1.2	1.7%	11.8	0.3	13.4	17.8%
OE15	1.0	1.4%	9.3	0.4	10.7	14.3%
OE16	1.2	1.7%	11.3	0.4	12.9	17.2%
OE17	1.7	2.3%	9.8	0.3	11.8	15.7%
OE18	1.9	2.5%	14.6	0.6	17.0	22.7%
OE19	1.5	2.0%	9.4	0.2	11.2	14.9%
OE20	1.6	2.2%	9.4	0.2	11.3	15.1%
OE21	1.2	1.6%	9.0	0.4	10.7	14.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	1.3	1.8%	10.3	0.5	12.1	16.1%
OE25	1.3	1.8%	9.6	0.5	11.4	15.2%
OE26	1.5	2.0%	10.2	0.5	12.1	16.2%
OE27	3.4	4.5%	15.5	0.6	19.5	26.0%
OE28	1.8	2.5%	14.4	0.5	16.8	22.4%
OE29	8.3	11.1%	21.6	<0.1	29.9	39.8%
OE30	5.2	7.0%	20.0	0.9	26.1	34.8%

ES 75 µg/m³

Table 5-35: Predicted Process Contribution Annual Mean NH_3 Concentrations – Abated FEED 1 Scenario

Receptor	ES (µg/m³) (1 used as default)	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Conc (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	1	<0.01	0.4%	1.5	1.5	152.4%
OE02	1	0.01	1.0%	1.9	1.9	193.0%

Receptor	ES ($\mu g/m^3$) (1 used as default)	Proposed Installation PC ($\mu g/m^3$)	PC/ES (%)	Background Conc ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/ES (%)
OE03	Not Sensitive					
OE04	1	<0.01	0.4%	1.5	1.5	146.4%
OE05	1	<0.01	0.2%	1.8	1.8	180.2%
OE06	1 or 3	<0.01	0.2%	1.9	1.9	189.2%
OE07	1 or 3	<0.01	0.1%	1.7	1.7	169.1%
OE08	3	<0.01	0.1%	2.0	2.0	199.3%
OE09	1	0.01	0.6%	1.9	1.9	192.6%
OE10	3	0.01	0.3%	1.7	1.7	173.9%
OE11	1	0.01	1.1%	1.8	1.8	185.1%
OE12	1	<0.01	0.2%	1.7	1.7	174.2%
OE13	1	<0.01	0.3%	1.9	1.9	191.3%
OE14	1	<0.01	0.1%	1.5	1.5	145.1%
OE15	1	<0.01	0.1%	1.2	1.2	117.1%
OE16	Not Sensitive					
OE17	1	<0.01	0.1%	1.4	1.4	143.1%
OE18	1	<0.01	0.2%	1.6	1.6	162.2%
OE19	1	<0.01	0.1%	1.3	1.3	131.1%
OE20	1	<0.01	0.1%	1.3	1.3	131.1%
OE21	1	<0.01	0.1%	1.5	1.5	147.1%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	3	<0.01	<0.1%	1.4	1.4	142.1%
OE25	1	<0.01	0.1%	1.4	1.4	138.1%
OE26	1	<0.01	0.1%	1.4	1.4	139.1%
OE27	1	<0.01	0.2%	1.5	1.5	154.2%
OE28	1	<0.01	0.2%	1.5	1.5	145.2%
OE29	1	0.01	0.7%	1.9	1.9	187.7%
OE30	1	0.01	1.1%	1.9	1.9	195.1%

Table 5-36: Predicted Process Contribution Nitrogen Deposition – Abated FEED 1 Scenario

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ ES (%)	Cumulative PC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ES (%)
OE01	5	15.0	0.03	0.5%	0.03	15.03	300.5%
OE02	5	16.3	0.07	1.5%	0.11	16.50	330.1%
OE03	Not sensitive						
OE04	5	14.1	0.03	0.5%	0.02	14.19	283.8%
OE05	10	29.2	0.02	0.2%	0.03	29.29	292.9%
OE06	5	17.3	0.02	0.3%	0.01	17.29	345.8%
OE07	10	16.0	0.01	0.1%	0.01	16.00	160.0%
OE08	Not Sensitive						
OE09	10	16.2	0.05	0.5%	0.08	16.34	163.4%
OE10	10	16.2	0.07	0.7%	0.06	16.32	163.2%
OE11	10	30.6	0.13	1.3%	0.04	30.78	307.8%
OE12	6	17.5	0.01	0.2%	0.01	17.51	291.9%
OE13	5	18.2	0.02	0.5%	0.01	18.25	364.9%
OE14	5	17.6	0.01	0.2%	<0.01	17.59	351.8%
OE15	5	17.0	0.01	0.1%	<0.01	17.03	340.6%
OE16	10	28.7	0.01	0.1%	0.01	28.75	287.5%
OE17	10	28.5	0.02	0.2%	0.01	28.53	285.3%
OE18	5	15.8	0.01	0.3%	0.01	15.77	315.4%
OE19	10	16.7	0.01	0.1%	<0.01	16.74	167.4%
OE20	6	16.7	0.01	0.2%	<0.01	16.74	279.1%

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ ES (%)	Cumulative PC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ES (%)
OE21	15	28.5	0.01	0.1%	0.01	28.52	190.2%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	10	16.6	0.01	0.1%	0.00	16.57	165.7%
OE25	5	16.6	0.01	0.1%	0.00	16.62	332.4%
OE26	5	16.6	0.01	0.2%	0.00	16.63	332.6%
OE27	6	16.1	0.02	0.3%	0.01	16.10	268.3%
OE28	6	16.1	0.01	0.2%	0.01	16.10	268.3%
OE29	5	16.4	0.06	1.1%	0.04	16.54	330.8%
OE30	10	31.1	0.14	1.4%	0.04	31.28	312.8%

Table 5-37: Predicted Change in Nitrogen Deposition – Abated FEED 1 Scenario (Change in PC is predicted PC from Proposed Installation minus PC from the existing Connah's Quay Power Station)

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted Change in PC (kg/ha/yr)	Change in PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (kg/ha/yr)	PEC/ES (%)
OE02	5	16.3	0.06	1.3%	0.11	16.49	329.9%
OE11	10	30.6	0.09	0.9%	0.04	30.74	307.4%
OE29	5	16.4	0.04	0.8%	0.04	16.53	330.5%

Table 5-38: Predicted Process Contribution Acid Deposition– Abated FEED 1 Scenario

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (μg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE01	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.23	<0.01	0.1%	<0.01	1.23	92.6%
OE02	Min CL min N 0.499 Min CL Max N 1.564 Min CL Max S 0.83	0.95	0.01	<0.1%	0.01	0.96	<0.1%
OE03	Not Sensitive						
OE04	Min CL min N 0.499 Min CL Max N 1.052 Min CL Max S 0.91	1.16	<0.01	0.2%	<0.01	1.16	110.6%
OE05	Min CL min N 0.499 Min CL Max N 1.721 Min CL Max S 1.364	2.33	<0.01	0.1%	<0.01	2.33	135.6%
OE06	Min CL min N 0.499 Min CL Max N 0.511 Min CL Max S 0.19	1.08	<0.01	0.2%	<0.01	1.08	211.8%
OE07	Not Sensitive						
OE08	Not Sensitive						
OE09	Not Sensitive						
OE10	Not Sensitive						
OE11	Min CL min N 0.499 Min CL Max N 1.72 Min CL Max S 1.448	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m³)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE12	Min CL min N 0.499 Min CL Max N 1.834 Min CL Max S 1.477	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE13	Min CL min N 0.499 Min CL Max N 1.828 Min CL Max S 1.471	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE14	Min CL min N 0.499 Min CL Max N 0.634 Min CL Max S 0.349	2.35	<0.01	0.1%	<0.01	2.35	370.8%
OE15	Min CL min N 0.499 Min CL Max N 6.197 Min CL Max S 6.055	1.37	<0.01	<0.1%	<0.01	1.37	22.1%
OE16	Min CL min N 0.499 Min CL Max N 1.769 Min CL Max S 1.627	2.25	<0.01	<0.1%	<0.01	2.25	127.3%
OE17	Min CL min N 0.499 Min CL Max N 1.863 Min CL Max S 1.721	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE18	Min CL min N 0.499 Min CL Max N 1.006 Min CL Max S 0.721	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE19	Min CL min N 0.499 Min CL Max N 4.856 Min CL Max S 4	1.35	<0.01	<0.1%	<0.01	1.35	27.8%
OE20	Min CL min N 0.499 Min CL Max N 4.856 Min CL Max S 4	1.35	<0.01	<0.1%	<0.01	1.35	27.8%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE21	Min CL min N 0.499 Min CL Max N 5.989 Min CL Max S 5.847	2.23	<0.01	<0.1%	<0.01	2.23	37.3%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	Not Sensitive						
OE25	Min CL min N 0.499 Min CL Max N 6.023 Min CL Max S 5.881	1.34	<0.01	<0.1%	<0.01	1.34	22.3%
OE26	Min CL min N 0.499 Min CL Max N 4.268 Min CL Max S 4.09	1.34	<0.01	<0.1%	<0.01	1.34	31.4%
OE27	Min CL min N 0.499 Min CL Max N 1.811 Min CL Max S 1.454	2.29	<0.01	0.1%	<0.01	2.29	126.6%
OE28	Min CL min N 0.499 Min CL Max N 5.071 Min CL Max S 4	1.3	<0.01	<0.1%	<0.01	1.30	25.7%
OE29	Min CL min N 0.499 Min CL Max N 5.071 Min CL Max S 4	1.02	<0.01	<0.1%	<0.01	1.03	<0.1%
OE30	Min CL min N 0.499 Min CL Max N 1.72 Min CL Max S 1.448	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Ecological Receptor Results – Abated FEED 2 Scenario

5.3.13 The results at the identified ecological receptors for the Abated FEED 2 scenario are shown in **Table 5-39 to Table 5-44**.

5.3.14 For all receptors, the predicted annual average NO_X concentration PC is less than 1% of the ES and therefore the impacts are considered insignificant without the need for further assessment by an ecologist. It is important to note that the background concentrations are likely to already include to some degree the contribution from the existing Connah's Quay Power Station, and therefore it is considered that the actual PECs would be below these values.

5.3.15 The daily mean NO_X concentrations show a PC for all receptors, except for OE02, OE11 and, OE29, that is less than 10% of the ES. At these three sites, the total concentrations are predicted to be 58%, 37.6% and, 42.4% of the ES respectively, well below the objective. Moreover, the NRW guidance (Ref 1) proposes that a critical level of 200 µg/m^3 is appropriate, unless in locations where SO_2 and ozone are above their critical levels, which is not the case at these receptors. Using this criteria, the predicted PCs are below 10% of the ES and hence are small enough that effects would be insignificant without requiring further assessment.

5.3.16 At receptor OE30, the daily mean NO_X PC and PEC concentrations are 16.7% and 43.5% of the ES which are below the screening criteria of 100% of the ES at a locally designated site, and the impacts can therefore be considered as insignificant without requiring further assessment.

5.3.17 For all receptors, except OE02, the predicted annual average ammonia PCs do not exceed 1% of the ES at nationally designated sites, and below 100% of the ES at locally designated sites and therefore are considered insignificant without requiring further assessment.

5.3.18 Site investigation has confirmed that, at the impacted area of OE2, the feature present is "saltmarsh" and not "coastal sand dunes". Saltmarsh does not typically support a notable lower plant assemblage and therefore an ammonia critical level of 3 µgm^{-3} is appropriate, which means the predicted annual average ammonia PC is below 1% of the ES at OE02 and is therefore considered insignificant without requiring further assessment.

5.3.19 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Abated FEED 2) are less than the 1% threshold to demonstrate further assessment is not required for all ecological receptors except OE2, OE11, and OE30 (further details provided below).

5.3.20 Site investigation has confirmed that, at the impacted area of OE2, the feature present is "saltmarsh" and not "coastal sand dunes", therefore a critical load of 10 kg/ha/yr applies for nitrogen deposition.

5.3.21 OE30 is not a site with a statutory designation and predicted nitrogen deposition PC there is less than 100% of the ES and effects can be screened out from further assessment. At receptors OE02 and OE11, the background values are higher than the critical loads and the PEC's are greater than 70%, therefore these can't be screened out and require further assessment by an ecologist. The significance of the change at these receptors is discussed in the "Detailed Assessment of Impacts on Ecological Receptors" section below.

5.3.22 For acid deposition rates, the assessment has demonstrated that the predicted impacts from the Proposed Installation (Abated FEED 2) are less than the 1% threshold to demonstrate insignificance without the need for further assessment for all ecological receptors.

Table 5-39: Predicted Process Contribution Annual Mean NOx Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	0.1	0.2%	9.1	0.2	9.4	31.3%
OE02	0.2	0.8%	12.7	0.7	13.7	45.5%
OE03	Not Sensitive					
OE04	0.1	0.2%	7.3	0.2	7.5	25.2%
OE05	<0.1	0.1%	12.2	0.1	12.3	41.0%
OE06	<0.1	0.1%	21.0	0.1	21.1	70.3%
OE07	<0.1	0.1%	20.1	<0.1	20.2	67.4%
OE08	0.1	0.2%	10.0	0.1	10.2	34.0%
OE09	0.1	0.4%	10.0	0.6	10.7	35.7%
OE10	0.1	0.4%	8.8	0.4	9.4	31.3%
OE11	0.2	0.5%	9.8	0.1	10.1	33.7%
OE12	<0.1	0.1%	7.4	0.1	7.5	25.1%
OE13	<0.1	0.2%	11.5	0.1	11.6	38.7%
OE14	<0.1	0.1%	5.9	<0.1	6.0	19.8%
OE15	<0.1	<0.1%	4.6	<0.1	4.7	15.6%
OE16	<0.1	0.1%	5.7	<0.1	5.7	19.0%
OE17	<0.1	0.1%	4.9	<0.1	4.9	16.5%
OE18	<0.1	0.1%	7.3	<0.1	7.4	24.5%
OE19	<0.1	0.1%	4.7	<0.1	4.8	15.9%
OE20	<0.1	0.1%	4.7	<0.1	4.8	15.9%
OE21	<0.1	<0.1%	4.5	<0.1	4.6	15.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	<0.1	0.1%	5.2	<0.1	5.2	17.3%
OE25	<0.1	0.1%	4.8	<0.1	4.8	16.1%
OE26	<0.1	0.1%	5.1	<0.1	5.1	17.1%
OE27	<0.1	0.1%	7.8	0.1	7.9	26.2%
OE28	<0.1	0.1%	7.2	<0.1	7.3	24.3%
OE29	0.1	0.3%	10.8	0.3	11.2	37.3%
OE30	0.2	0.5%	10.0	0.1	10.3	34.3%

ES 30 µg/m³

Table 5-40: Predicted Process Contribution 24-hour Maximum NOx Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	2.2	2.9%	18.2	0.6	21.1	28.1%
OE02	18.0	24.0%	25.5	<0.1	43.5	58.0%
OE03	Not Sensitive					
OE04	2.0	2.7%	14.6	0.5	17.2	22.9%
OE05	1.7	2.2%	24.3	0.2	26.2	34.9%
OE06	2.0	2.7%	41.9	0.4	44.4	59.1%
OE07	1.4	1.9%	40.3	0.3	42.0	56.0%
OE08	2.8	3.7%	20.0	0.6	23.4	31.3%
OE09	6.7	8.9%	20.1	<0.1	26.8	35.7%
OE10	6.5	8.6%	17.7	3.4	27.6	36.8%
OE11	8.5	11.4%	19.6	<0.1	28.2	37.6%
OE12	3.1	4.2%	14.9	0.2	18.2	24.2%
OE13	3.0	4.0%	23.0	0.3	26.2	35.0%
OE14	1.7	2.3%	11.8	0.2	13.7	18.3%
OE15	1.5	2.0%	9.3	0.3	11.1	14.8%
OE16	1.8	2.4%	11.3	0.4	13.5	18.0%
OE17	2.7	3.6%	9.8	0.3	12.8	17.1%
OE18	2.7	3.6%	14.6	0.5	17.8	23.8%
OE19	2.4	3.2%	9.4	0.2	11.9	15.9%
OE20	2.5	3.4%	9.4	0.2	12.2	16.3%
OE21	1.7	2.3%	9.0	0.4	11.2	14.9%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	2.1	2.8%	10.3	0.5	12.9	17.2%
OE25	2.0	2.7%	9.6	0.4	12.0	16.0%
OE26	2.2	2.9%	10.2	0.5	12.8	17.0%
OE27	5.4	7.2%	15.5	0.9	21.8	29.0%
OE28	2.5	3.3%	14.4	0.5	17.5	23.3%
OE29	10.2	13.6%	21.6	<0.1	31.8	42.4%
OE30	12.5	16.7%	20.0	0.1	32.6	43.5%

ES 75 µg/m³

Table 5-41: Predicted Process Contribution Annual Mean NH_3 Concentrations – Abated FEED 2 Scenario

Receptor	ES (µg/m^3) (1 used as default)	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Conc (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
OE01	1	<0.01	0.4%	1.5	1.5	152.4%
OE02	1	0.02	1.6%	1.9	1.9	193.6%
OE03	Not Sensitive					
OE04	1	<0.01	0.4%	1.5	1.5	146.4%
OE05	1	<0.01	0.2%	1.8	1.8	180.2%
OE06	1 or 3	<0.01	0.2%	1.9	1.9	189.2%
OE07	1 or 3	<0.01	0.2%	1.7	1.7	169.2%
OE08	3	<0.01	0.1%	2.0	2.0	199.4%
OE09	1	0.01	0.7%	1.9	1.9	192.7%
OE10	3	0.01	0.3%	1.7	1.7	173.8%
OE11	1	0.01	1.0%	1.8	1.9	185.0%
OE12	1	<0.01	0.2%	1.7	1.7	174.2%
OE13	1	<0.01	0.3%	1.9	1.9	191.3%
OE14	1	<0.01	0.1%	1.5	1.5	145.1%
OE15	1	<0.01	0.1%	1.2	1.2	117.1%
OE16	Not Sensitive					
OE17	1	<0.01	0.2%	1.4	1.4	143.2%
OE18	1	<0.01	0.2%	1.6	1.6	162.2%
OE19	1	<0.01	0.1%	1.3	1.3	131.1%
OE20	1	<0.01	0.2%	1.3	1.3	131.2%
OE21	1	<0.01	0.1%	1.5	1.5	147.1%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	3	<0.01	<0.1%	1.4	1.4	142.1%
OE25	1	<0.01	0.1%	1.4	1.4	138.1%
OE26	1	<0.01	0.1%	1.4	1.4	139.1%
OE27	1	<0.01	0.2%	1.5	1.5	154.2%
OE28	1	<0.01	0.2%	1.5	1.5	145.2%
OE29	1	0.01	0.6%	1.9	1.9	187.6%
OE30	1	0.01	1.1%	1.9	2.0	195.1%

Table 5-42: Predicted Process Contribution Nitrogen Deposition – Abated FEED 2 Scenario

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ ES (%)	Cumulative PC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ES (%)
OE01	5	15.0	0.03	0.7%	0.03	0.06	300.7%
OE02	5	16.3	0.13	2.6%	0.10	0.23	330.9%
OE03	Not Sensitive						
OE04	5	14.1	0.03	0.7%	0.02	0.06	284.0%
OE05	10	29.2	0.02	0.2%	0.03	0.05	292.9%
OE06	5	17.3	0.02	0.4%	0.01	0.03	345.8%
OE07	10	16.0	0.01	0.1%	0.01	0.02	160.0%
OE08	Not Sensitive						
OE09	10	16.2	0.06	0.6%	0.08	0.14	163.5%
OE10	10	16.2	0.06	0.6%	0.06	0.13	163.2%
OE11	10	30.6	0.14	1.4%	0.04	0.18	307.9%
OE12	6	17.5	0.01	0.2%	0.01	0.02	291.9%
OE13	5	18.2	0.03	0.5%	0.01	0.04	365.0%
OE14	5	17.6	0.01	0.2%	<0.01	0.01	351.9%
OE15	5	17.0	0.01	0.1%	<0.01	0.01	340.6%
OE16	10	28.7	0.01	0.1%	0.01	0.02	287.5%
OE17	10	28.5	0.02	0.2%	0.01	0.03	285.3%
OE18	5	15.8	0.02	0.3%	0.01	0.02	315.5%
OE19	10	16.7	0.01	0.1%	<0.01	0.02	167.5%
OE20	6	16.7	0.01	0.2%	<0.01	0.02	279.1%

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ ES (%)	Cumulative PC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ES (%)
OE21	15	28.5	0.01	0.1%	0.01	0.02	190.2%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	10	16.6	0.01	0.1%	<0.01	0.01	165.7%
OE25	5	16.6	0.01	0.2%	<0.01	0.01	332.4%
OE26	5	16.6	0.01	0.2%	<0.01	0.01	332.7%
OE27	6	16.1	0.02	0.3%	0.01	0.03	268.3%
OE28	6	16.1	0.01	0.2%	0.01	0.02	268.3%
OE29	5	16.4	0.05	1.0%	0.05	0.10	330.7%
OE30	10	31.1	0.14	1.4%	0.04	0.18	312.8%

Table 5-43: Predicted Change in Nitrogen Deposition – Abated FEED 2 Scenario (Change in PC is predicted PC from Proposed Installation minus PC from the existing Connah's Quay Power Station)

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted Change in PC (kg/ha/yr)	Change in PC/ ES (%)	Cumulative PC (μg/m^3)	PEC (kg/ha/yr)	PEC/ES (%)
OE02	5	16.3	0.11	2.3%	0.10	16.53	330.6%
OE11	10	30.6	0.09	0.9%	0.04	30.74	307.4%

Table 5-44: Predicted Process Contribution Acid Deposition – Abated FEED 2 Scenario

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE01	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.23	<0.01	0.2%	<0.01	1.23	92.7%
OE02	Min CL min N 0.499 Min CL Max N 1.564 Min CL Max S 0.83	0.95	0.01	<0.1%	0.01	0.97	0.0%
OE03	Not Sensitive						
OE04	Min CL min N 0.499 Min CL Max N 1.052 Min CL Max S 0.91	1.16	<0.01	0.2%	<0.01	1.16	110.7%
OE05	Min CL min N 0.499 Min CL Max N 1.721 Min CL Max S 1.364	2.33	<0.01	0.1%	<0.01	2.33	135.6%
OE06	Min CL min N 0.499 Min CL Max N 0.511 Min CL Max S 0.19	1.08	<0.01	0.3%	<0.01	1.08	211.8%
OE07	Not Sensitive						
OE08	Not Sensitive						
OE09	Not Sensitive						
OE10	Not Sensitive						
OE11	Min CL min N 0.499 Min CL Max N 1.72 Min CL Max S 1.448	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m³)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE12	Min CL min N 0.499 Min CL Max N 1.834 Min CL Max S 1.477	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE13	Min CL min N 0.499 Min CL Max N 1.828 Min CL Max S 1.471	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE14	Min CL min N 0.499 Min CL Max N 0.634 Min CL Max S 0.349	2.35	<0.01	0.1%	<0.01	2.35	370.8%
OE15	Min CL min N 0.499 Min CL Max N 6.197 Min CL Max S 6.055	1.37	<0.01	<0.1%	<0.01	1.37	22.1%
OE16	Min CL min N 0.499 Min CL Max N 1.769 Min CL Max S 1.627	2.25	<0.01	0.1%	<0.01	2.25	127.3%
OE17	Min CL min N 0.499 Min CL Max N 1.863 Min CL Max S 1.721	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE18	Min CL min N 0.499 Min CL Max N 1.006 Min CL Max S 0.721	No Data Available	<0.01	<0.1%	<0.01	<0.01	<0.1%
OE19	Min CL min N 0.499 Min CL Max N 4.856 Min CL Max S 4	1.35	<0.01	<0.1%	<0.01	1.35	27.8%
OE20	Min CL min N 0.499 Min CL Max N 4.856 Min CL Max S 4	1.35	<0.01	<0.1%	<0.01	1.35	27.8%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC(Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE21	Min CL min N 0.499 Min CL Max N 5.989 Min CL Max S 5.847	2.23	<0.01	<0.1%	<0.01	2.23	37.3%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	Not Sensitive						
OE25	Min CL min N 0.499 Min CL Max N 6.023 Min CL Max S 5.881	1.34	<0.01	<0.1%	<0.01	1.34	22.3%
OE26	Min CL min N 0.499 Min CL Max N 4.268 Min CL Max S 4.09	1.34	<0.01	<0.1%	<0.01	1.34	31.4%
OE27	Min CL min N 0.499 Min CL Max N 1.811 Min CL Max S 1.454	2.29	<0.01	0.1%	<0.01	2.29	126.6%
OE28	Min CL min N 0.499 Min CL Max N 5.071 Min CL Max S 4	1.3	<0.01	<0.1%	<0.01	1.30	25.7%
OE29	Min CL min N 0.499 Min CL Max N 5.071 Min CL Max S 4	1.02	<0.01	<0.1%	<0.01	1.03	<0.1%
OE30	Min CL min N 0.499 Min CL Max N 1.72 Min CL Max S 1.448	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Ecological Receptor Results - Unabated FEED 1 Scenario

5.3.23 The results at the identified ecological receptors for the Unabated FEED 1 scenario are shown in **Table 5-45 to Table 5-48.**

5.3.24 For all ecological receptors, the predicted annual mean NO_X concentration PC is less than 1% of the ES or the PEC is less than 70% of the ES and therefore the effects can be considered insignificant without further assessment by an ecologist. It is important to note that the background concentrations are likely to already include to some degree the contribution from the existing Connah's Quay Power Station, and therefore it is considered that the actual PECs would be below these reported concentration values.

5.3.25 The daily mean NOx concentrations PC for all receptors except OE02, OE10 and OE29 is less than 10% of the ES. At OE02, OE10 and OE29, the total predicted concentrations are below the ES. Moreover, the NRW guidance (Ref 1) proposes that a critical level of 200 µg/m^3 is appropriate, unless in locations where SO_2 and ozone are above their critical levels, which is not the case at these receptors. Using this criteria, the predicted PCs are below 10% of the ES and hence are small enough that effects would be insignificant without requiring further assessment.

5.3.26 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Unabated Scenario) are less than the 1% or 100% thresholds (for nationally and locally designated sites respectively) to demonstrate further assessment is not required for all ecological receptors except OE2.

5.3.27 Site investigation has confirmed that, at the impacted area of OE2, the feature present is "saltmarsh" and not "coastal sand dunes", therefore a critical load of 10 kg/ha/yr applies for nitrogen deposition. The process contributions from the Proposed Installation when assessed against this higher critical load are less than the 1% thresholds for nationally designated sites to demonstrate further assessment is not required.

5.3.28 The predicted change in acid deposition rates from the Proposed Installation are less than the 1% threshold, to demonstrate insignificance without the need for further assessment, for all ecological receptors.

Table 5-45: Predicted Process Contribution Annual Mean NO_X Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	Cumulative PC (µg/m^3)	PEC/ES (%)
OE01	0.1	0.4%	9.1	0.2	9.4	31.5%
OE02	0.4	1.2%	12.7	0.8	13.9	46.4%
OE03	Not Sensitive					
OE04	0.1	0.4%	7.3	0.2	7.6	25.4%
OE05	0.1	0.2%	12.2	0.1	12.3	41.1%
OE06	0.1	0.3%	21.0	0.1	21.1	70.4%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	Cumulative PC (µg/m³)	PEC/ES (%)
OE07	0.1	0.2%	20.1	0.1	20.2	67.5%
OE08	0.1	0.4%	10.0	0.1	10.3	34.2%
OE09	0.2	0.7%	10.0	0.6	10.8	36.1%
OE10	0.3	0.9%	8.8	0.5	9.6	32.0%
OE11	0.3	1.1%	9.8	0.1	10.3	34.2%
OE12	<0.1	0.2%	7.4	0.1	7.5	25.1%
OE13	0.1	0.3%	11.5	0.1	11.7	38.8%
OE14	<0.1	0.1%	5.9	<0.1	6.0	19.9%
OE15	<0.1	0.1%	4.6	<0.1	4.7	15.6%
OE16	<0.1	0.1%	5.7	<0.1	5.7	19.1%
OE17	<0.1	0.2%	4.9	<0.1	5.0	16.6%
OE18	0.1	0.2%	7.3	<0.1	7.4	24.7%
OE19	<0.1	0.1%	4.7	<0.1	4.8	15.9%
OE20	<0.1	0.1%	4.7	<0.1	4.8	15.9%
OE21	<0.1	0.1%	4.5	<0.1	4.6	15.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	<0.1	0.1%	5.2	<0.1	5.2	17.4%
OE25	<0.1	0.1%	4.8	<0.1	4.8	16.1%
OE26	<0.1	0.1%	5.1	<0.1	5.1	17.1%
OE27	0.1	0.2%	7.8	0.1	7.9	26.3%
OE28	0.1	0.2%	7.2	<0.1	7.3	24.4%
OE29	0.3	0.8%	10.8	0.3	11.4	37.9%
OE30	0.3	1.1%	10.0	0.1	10.5	34.9%

ES 30 µg/m³

Table 5-46: Predicted Process Contribution 24-hour Maximum NOx Concentrations – Unabated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	1.4	1.9%	18.2	1.2	20.9	27.8%
OE02	17.3	23.1%	25.5	5.8	48.6	64.7%
OE03	Not Sensitive					
OE04	1.3	1.8%	14.6	1.0	17.0	22.6%
OE05	1.1	1.5%	24.3	0.8	26.3	35.0%
OE06	1.4	1.8%	41.9	0.7	44.1	58.7%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE07	1.0	1.3%	40.3	0.5	41.7	55.6%
OE08	1.9	2.5%	20.0	1.0	22.9	30.6%
OE09	4.3	5.7%	20.1	3.1	27.4	36.5%
OE10	13.3	17.8%	17.7	9.9	40.9	54.6%
OE11	6.2	8.3%	19.6	2.9	28.7	38.2%
OE12	1.8	2.4%	14.9	1.2	17.9	23.8%
OE13	1.9	2.6%	23.0	1.6	26.5	35.3%
OE14	1.2	1.5%	11.8	0.6	13.6	18.1%
OE15	1.0	1.3%	9.3	0.6	10.9	14.5%
OE16	1.1	1.5%	11.3	0.8	13.2	17.6%
OE17	1.7	2.3%	9.8	0.8	12.3	16.4%
OE18	1.7	2.3%	14.6	0.8	17.1	22.8%
OE19	1.5	2.0%	9.4	0.7	11.6	15.5%
OE20	1.6	2.2%	9.4	0.7	11.8	15.7%
OE21	1.2	1.6%	9.0	0.4	10.6	14.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	1.3	1.7%	10.3	0.7	12.2	16.3%
OE25	1.3	1.7%	9.6	0.5	11.3	15.1%
OE26	1.4	1.9%	10.2	0.5	12.1	16.2%
OE27	3.1	4.1%	15.5	1.3	19.9	26.5%
OE28	1.7	2.3%	14.4	0.9	17.0	22.7%
OE29	10.7	14.3%	21.6	3.7	36.0	48.0%
OE30	6.0	7.9%	20.0	2.4	28.4	37.9%

ES 75 µg/m³

Table 5-47: Predicted Process Contribution Nitrogen Deposition – Unabated FEED 1 Scenario

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ES %	Cumulative PC (µg/m^3)	PEC (kg/ha/yr)	PEC/ES (%)
OE01	5	15.0	0.02	0.3%	0.03	15.02	300%
OE02	5	16.3	0.05	1.1%	0.12	16.49	330%
OE03	Not Sensitive						
OE04	5	14.1	0.02	0.3%	0.02	14.18	284%
OE05	10	29.2	0.02	0.2%	0.03	29.28	293%
OE06	5	17.3	0.01	0.2%	0.01	17.28	346%
OE07	10	16.0	0.01	0.1%	0.01	16.00	160%
OE08	Not Sensitive						
OE09	10	16.2	0.03	0.3%	0.09	16.33	163%
OE10	10	16.2	0.04	0.4%	0.07	16.30	163%
OE11	10	30.6	0.09	0.9%	0.04	30.74	307%
OE12	6	17.5	0.01	0.1%	0.01	17.51	292%
OE13	5	18.2	0.01	0.3%	0.01	18.23	365%
OE14	5	17.6	0.01	0.1%	<0.01	17.59	352%
OE15	5	17.0	<0.01	0.1%	<0.01	17.03	341%
OE16	10	28.7	0.01	0.1%	0.01	28.75	287%
OE17	10	28.5	0.01	0.1%	0.01	28.52	285%
OE18	5	15.8	0.01	0.2%	0.01	15.77	315%
OE19	10	16.7	0.01	0.1%	<0.01	16.74	167%
OE20	6	16.7	0.01	0.1%	<0.01	16.74	279%

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ES %	Cumulative PC ($\mu g/m^3$)	PEC (kg/ha/yr)	PEC/ES (%)
OE21	15	28.5	0.01	0.1%	0.01	28.52	190%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	10	16.6	0.01	0.1%	<0.01	16.57	166%
OE25	5	16.6	<0.01	0.1%	<0.01	16.62	332%
OE26	5	16.6	<0.01	0.1%	<0.01	16.63	333%
OE27	6	16.1	0.01	0.2%	0.01	16.09	268%
OE28	6	16.1	0.01	0.1%	0.01	16.09	268%
OE29	5	16.4	0.04	0.7%	0.05	16.52	330%
OE30	10	31.1	0.10	1.0%	0.04	31.23	312%

Table 5-48: Predicted Process Contribution Acid Deposition– Unabated FEED 1 Scenario

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC ($\mu g/m^3$)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE01	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.23	<0.01	0.1%	<0.01	1.23	92.6%
OE02	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	0.95	<0.01	<0.1%	<0.01	0.96	<0.1%
OE03	Not Sensitive						
OE04	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.16	<0.01	0.1%	<0.01	1.16	110.5%
OE05	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.33	<0.01	0.1%	<0.01	2.33	135.6%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE06	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.08	<0.01	0.2%	<0.01	1.08	211.7%
OE07	Not Sensitive						
OE08	Not Sensitive						
OE09	Not Sensitive						
OE10	Not Sensitive						
OE11	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%
OE12	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE13	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE14	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.35	<0.01	0.1%	<0.01	2.35	370.8%
OE15	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.37	<0.01	<0.1%	<0.01	1.37	22.1%
OE16	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.25	<0.01	<0.1%	<0.01	2.25	127.3%
OE17	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE18	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE19	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.35	<0.01	<0.1%	<0.01	1.35	27.8%
OE20	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.35	<0.01	<0.1%	<0.01	1.35	27.8%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE21	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.23	<0.01	<0.1%	<0.01	2.23	37.3%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	Not Sensitive						
OE25	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.34	<0.01	<0.1%	<0.01	1.34	22.3%
OE26	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.34	<0.01	<0.1%	<0.01	1.34	31.4%
OE27	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.29	<0.01	<0.1%	<0.01	2.29	126.5%
OE28	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.3	<0.01	<0.1%	<0.01	1.30	25.7%
OE29	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.02	<0.01	<0.1%	<0.01	1.03	<0.1%
OE30	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Ecological Receptor Results - Unabated FEED 2 Scenario

5.3.29 The results at the identified ecological receptors for the Unabated FEED 2 scenario are shown in **Table 5-49 to Table 5-52.**

5.3.30 For all ecological receptors, the predicted annual mean NO_X concentration PC is less than 1% of the ES or the PEC is less than 70% of the ES and therefore the effects can be considered insignificant without further assessment by an ecologist. It is important to note that the background concentrations are likely to already include to some degree the contribution from the existing Connah's Quay Power Station, and therefore it is considered that the actual PECs would be below these reported concentration values.

5.3.31 The daily mean NOx concentrations PC for all receptors except OE02, OE10 and OE29, is less than 10% of the ES. At OE02, OE10 and OE29, the total predicted concentrations are below the ES. Moreover, the NRW guidance (Ref 1) proposes that a critical level of 200 µg/m^3 is appropriate, unless in locations where SO_2 and ozone are above their critical levels, which is not the case at these receptors. Using this criteria, the predicted PCs are less than 10% of the ES and hence are small enough that effects would be insignificant without requiring further assessment.

5.3.32 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Unabated Scenario) are within the 1% or 100% thresholds (for nationally and locally designated sites respectively) to demonstrate further assessment is not required for all ecological receptors.

5.3.33 The predicted change in acid deposition rates from the Proposed Installation are less than the 1% threshold, to demonstrate insignificance without the need for further assessment, for all ecological receptors.

Table 5-49: Predicted Process Contribution Annual Mean NO_X Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	Cumulative PC (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
OE01	0.1	0.4%	9.1	0.2	9.5	31.5%
OE02	0.3	1.0%	12.7	0.8	13.9	46.2%
OE03	Not Sensitive					
OE04	0.1	0.4%	7.3	0.2	7.6	25.4%
OE05	0.1	0.2%	12.2	0.1	12.3	41.1%
OE06	0.1	0.3%	21.0	0.1	21.1	70.5%
OE07	0.1	0.2%	20.1	0.1	20.3	67.5%
OE08	0.1	0.5%	10.0	0.1	10.3	34.3%
OE09	0.2	0.7%	10.0	0.6	10.8	36.2%
OE10	0.3	0.9%	8.8	0.5	9.6	32.0%
OE11	0.3	1.2%	9.8	0.1	10.3	34.3%
OE12	<0.1	0.2%	7.4	0.1	7.5	25.1%
OE13	0.1	0.3%	11.5	0.1	11.7	38.9%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE14	<0.1	0.1%	5.9	<0.1	6.0	19.9%
OE15	<0.1	0.1%	4.6	<0.1	4.7	15.7%
OE16	<0.1	0.1%	5.7	<0.1	5.7	19.1%
OE17	0.1	0.2%	4.9	<0.1	5.0	16.6%
OE18	0.1	0.2%	7.3	<0.1	7.4	24.7%
OE19	<0.1	0.2%	4.7	<0.1	4.8	15.9%
OE20	0.1	0.2%	4.7	<0.1	4.8	16.0%
OE21	<0.1	0.1%	4.5	<0.1	4.6	15.2%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	<0.1	0.1%	5.2	<0.1	5.2	17.4%
OE25	<0.1	0.1%	4.8	<0.1	4.8	16.2%
OE26	<0.1	0.1%	5.1	<0.1	5.1	17.2%
OE27	0.1	0.3%	7.8	0.1	7.9	26.3%
OE28	0.1	0.2%	7.2	<0.1	7.3	24.4%
OE29	0.3	1.0%	10.8	0.3	11.4	38.0%
OE30	0.4	1.2%	10.0	0.1	10.5	35.0%

Table 5-50: Predicted Process Contribution 24-hour Maximum NOx Concentrations – Unabated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE01	1.7	2.2%	18.2	1.2	21.1	28.1%
OE02	16.4	21.8%	25.5	5.8	47.6	63.5%
OE03	Not Sensitive					
OE04	1.6	2.1%	14.6	1.0	17.2	23.0%
OE05	1.5	2.0%	24.3	0.8	26.6	35.5%
OE06	1.8	2.4%	41.9	0.7	44.5	59.3%
OE07	1.2	1.7%	40.3	0.5	42.0	56.0%
OE08	2.3	3.1%	20.0	1.0	23.3	31.1%
OE09	4.6	6.1%	20.1	3.1	27.7	37.0%
OE10	14.5	19.3%	17.7	9.9	42.0	56.1%
OE11	6.7	8.9%	19.6	2.9	29.2	38.9%
OE12	2.0	2.7%	14.9	1.2	18.0	24.1%
OE13	2.1	2.8%	23.0	1.6	26.7	35.6%
OE14	1.5	1.9%	11.8	0.6	13.9	18.5%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	Cumulative PC (µg/m³)	PEC (µg/m³)	PEC/ES (%)
OE15	1.2	1.6%	9.3	0.6	11.1	14.8%
OE16	1.3	1.7%	11.3	0.8	13.3	17.8%
OE17	1.7	2.3%	9.8	0.8	12.3	16.4%
OE18	2.0	2.7%	14.6	0.8	17.4	23.2%
OE19	1.6	2.1%	9.4	0.7	11.7	15.6%
OE20	1.7	2.3%	9.4	0.7	11.9	15.8%
OE21	1.5	2.0%	9.0	0.4	11.0	14.6%
OE22	Not Sensitive					
OE23	Not Sensitive					
OE24	1.5	1.9%	10.3	0.7	12.4	16.6%
OE25	1.6	2.1%	9.6	0.5	11.6	15.5%
OE26	1.8	2.4%	10.2	0.5	12.5	16.6%
OE27	4.3	5.7%	15.5	1.3	21.1	28.1%
OE28	2.0	2.7%	14.4	0.9	17.3	23.1%
OE29	13.1	17.4%	21.6	3.7	38.3	51.1%
OE30	6.3	8.4%	20.0	2.4	28.7	38.3%

ES 75 µg/m³

Table 5-51: Predicted Process Contribution Nitrogen Deposition – Unabated FEED 2 Scenario

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ES %	Cumulative PC (µg/m^3)	PEC (kg/ha/yr)	PEC/ES (%)
OE01	5	15.0	0.02	0.4%	0.03	15.02	300%
OE02	5	16.3	0.04	0.9%	0.12	16.48	330%
OE03	Not Sensitive						
OE04	5	14.1	0.02	0.4%	0.02	14.18	284%
OE05	10	29.2	0.02	0.2%	0.03	29.28	293%
OE06	5	17.3	0.01	0.3%	0.01	17.29	346%
OE07	10	16.0	0.01	0.1%	0.01	16.00	160%
OE08	Not Sensitive						
OE09	10	16.2	0.03	0.3%	0.09	16.33	163%
OE10	10	16.2	0.04	0.4%	0.07	16.30	163%
OE11	10	30.6	0.10	1.0%	0.04	30.75	307%
OE12	6	17.5	0.01	0.1%	0.01	17.51	292%
OE13	5	18.2	0.01	0.3%	0.01	18.23	365%
OE14	5	17.6	0.01	0.1%	<0.01	17.59	352%
OE15	5	17.0	<0.01	0.1%	<0.01	17.03	341%
OE16	10	28.7	0.01	0.1%	0.01	28.75	288%
OE17	10	28.5	0.02	0.2%	0.01	28.52	285%
OE18	5	15.8	0.01	0.2%	0.01	15.77	315%
OE19	10	16.7	0.01	0.1%	<0.01	16.74	167%
OE20	6	16.7	0.01	0.1%	<0.01	16.74	279%

Receptor	Critical Load (ES) (kg/ha/yr)	Background Concentration (kg/ha/yr)	Predicted PC (kg/ha/yr)	PC/ES %	Cumulative PC (µg/m^3)	PEC (kg/ha/yr)	PEC/ES (%)
OE21	15	28.5	0.01	0.1%	0.01	28.53	190%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	10	16.6	0.01	0.1%	<0.01	16.57	166%
OE25	5	16.6	0.01	0.1%	<0.01	16.62	332%
OE26	5	16.6	0.01	0.1%	<0.01	16.63	333%
OE27	6	16.1	0.01	0.2%	0.01	16.09	268%
OE28	6	16.1	0.01	0.2%	0.01	16.10	268%
OE29	5	16.4	0.04	0.8%	0.05	16.53	331%
OE30	10	31.1	0.10	1.0%	0.04	31.24	312%

Table 5-52: Predicted Process Contribution Acid Deposition– Unabated FEED 2 Scenario

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE01	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.23	<0.01	0.1%	<0.01	1.23	92.6%
OE02	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	0.95	<0.01	<0.1%	0.01	0.96	0.0%
OE03	Not Sensitive						

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE04	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.16	<0.01	0.1%	<0.01	1.16	110.6%
OE05	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.33	<0.01	0.1%	<0.01	2.33	135.6%
OE06	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.08	<0.01	0.2%	<0.01	1.08	211.7%
OE07	Not Sensitive						
OE08	Not Sensitive						
OE09	Not Sensitive						
OE10	Not Sensitive						
OE11	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%
OE12	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE13	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE14	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.35	<0.01	0.1%	<0.01	2.35	370.8%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (μg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE15	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.37	<0.01	<0.1%	<0.01	1.37	22.1%
OE16	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.25	<0.01	<0.1%	<0.01	2.25	127.3%
OE17	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE18	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	<0.01	<0.1%	<0.01	0.00	<0.1%
OE19	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.35	<0.01	<0.1%	<0.01	1.35	27.8%
OE20	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.35	<0.01	<0.1%	<0.01	1.35	27.8%
OE21	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.23	<0.01	<0.1%	<0.01	2.23	37.3%
OE22	Not Sensitive						
OE23	Not Sensitive						
OE24	Not Sensitive						
OE25	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.34	<0.01	<0.1%	<0.01	1.34	22.3%

Receptor	Lower Value of Applicable Critical Load Range (ES)	Background Concentration (kg/ha/yr)	Predicted PC (Keq/ha/yr)	PC/ ES (%)	Cumulative PC (µg/m^3)	PEC (Keq/ha/yr)	PEC/ ES (%)
OE26	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.34	<0.01	<0.1%	<0.01	1.34	31.4%
OE27	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	2.29	<0.01	<0.1%	<0.01	2.29	126.5%
OE28	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.3	<0.01	<0.1%	<0.01	1.30	25.7%
OE29	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	1.02	<0.01	<0.1%	<0.01	1.03	<0.1%
OE30	Min CL min N 0.499 Min CL Max N 1.332 Min CL Max S 0.44	No Data Available	0.01	<0.1%	<0.01	0.01	<0.1%

Detailed Assessment of Impacts on Ecological Receptors

5.3.34 All scenarios as defined in Section 1.2 are discussed in this section.

5.3.35 At no point are total long-term or short-term NO_X concentrations forecast to exceed the critical level for this pollutant, with a maximum short-term PEC across all assessed scenarios of 64.7% of the ES and a maximum long-term PEC of 70.3%. All long-term NOx impacts screen out against the EA significance criteria and when the higher critical level of 200 µg/m^3 applicable for locations where SO_2 and ozone are above their critical levels, which is the case in the locality of the Proposed Installation, all short-term NOx impacts also screen out. Therefore, no likely significant effect will arise.

5.3.36 With regard to ammonia, the contribution of the Proposed Installation is below the screening criteria at all sites, with the exception of Connah's Quay Ponds and Woodland SSSI. However, even for this SSSI the Process Contribution is only 1.1% of the critical level for the Abated FEED 1 scenario and 1% or less for the other scenarios. It is evident that background concentrations of ammonia at this location arise from sources other than the Proposed Installation and that an impact of this magnitude will not prevent the success of any wider actions to reduce total ammonia levels within the catchment. Given the marginal exceedance and the numerous conservative assumptions used in the assessment, it is reasonable to conclude that effects can be considered not significant.

5.3.37 With regard to nitrogen deposition, no sites exceed the imperceptible threshold of 1% of the critical load for either of the unabated scenarios.

5.3.38 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Abated FEED 1) are less than the 1% threshold to demonstrate further assessment is not required for all ecological receptors except OE11 and OE29. At receptors OE11 and OE29, the background values are higher than the critical loads and this is the only reason that the PECs are greater than 70%, as the PCs from the Proposed Installation are 1.3% (OE11) and 1.1% (OE29). Taking into consideration the removal of the existing power plant, PCs would be below 1% at all receptors, and therefore no significant effects are expected at these sites, as shown in **Table 5-37**.

5.3.39 The nitrogen deposition results show that the predicted impacts from the Proposed Installation (Abated FEED 2) are less than the 1% threshold to demonstrate further assessment is not required for all ecological receptors except OE2 and OE11. At receptors OE02 and OE11, the background values are higher than the critical loads and this is the only reason that the PECs are greater than 70%, as the PCs are 1.3% (OE2), 1.4% (OE11). Taking into consideration the removal of the existing power plant, PCs would be below 1% at OE11, and less than 1.2% at OE2, as shown in **Table 5-43**. It is evident that background concentrations of nitrogen at this location arise from sources other than the proposed installation. Given the marginal exceedance and the numerous conservative assumptions used in the assessment it is reasonable to conclude that there would be no significant effects are expected at these sites.

5.3.40 For acid deposition, results show that the process contributions for all scenarios are less than the 1% threshold to demonstrate insignificance without the need for further assessment, for all ecological receptors.

5.3.41 The Habitats Regulation Assessment (HRA) considers the wider ecological issues for each of the Habitat Sites and proposes measures that would offset relatively subtle ecological effects identified where necessary (Ref 52). These measures would be secured through the DCO consent and for the purposes of this permit application, it can be concluded that there are no significant effects at any ecological sites.

5.3.42 Overall, the impacts of the development on local ecological sites are very limited and below screening thresholds at the majority of these sites. Where long-term impacts are above the threshold, they comprise a low proportion of the ES (less than 2%) and any exceedances of the ES are dominated by background sources. Where short-term impacts exceed the screening threshold they remain below the ES by a significant margin. Taking into account the numerous robust assumptions used in the assessment, it is reasonable to conclude that the air quality impacts will not have significant effects on the local ecological sites.

6. Conclusion

6.1.1 This assessment has considered the operation of the Connah's Quay Combined Cycle Gas Turbine power plant fitted with Carbon Capture Plant. Dispersion modelling of operational point source emissions from the Proposed Installation has been carried out, and the potential for likely significant effects on air quality assessed.

6.1.2 The impact of emissions on human health receptors has been considered in the context of the relevant Air Quality Standards and Environmental Assessment Levels. The magnitude of air quality impacts at sensitive ecological receptors has been considered in the context of relevant critical levels and critical loads for designated and non-designated ecological sites.

6.1.3 An assessment of stack height has demonstrated that a release height of 145 m for the absorber stacks and 120m to 130m above ground level for the HRSG stacks is predicted to provide a sufficient degree of dispersion such that ground level PCs are below NRW's significance screening criteria for long term and short-term health impacts.

6.1.4 For the Abated FEED1 and Abated FEED2 scenarios, the predicted annual average and short-term impacts at all human health receptors can be screened out from the need for further assessment. In the case of N-Amine, impacts of greater than 1% of the NDMA EAL are predicted at discrete receptors, however the PECs are below 70% of the EAL and can therefore be screened out from the need for further assessment.

6.1.5 For the unabated scenario, the predicted annual average and short-term impacts at all human health receptors can be screened out from the need for further assessment.

6.1.6 The Habitats Regulation Assessment (HRA) considers the wider ecological issues for each of the Habitat Sites and proposes measures that would offset relatively subtle ecological effects identified. These measures would be secured through the DCO consent and for the purposes of this permit application, it can be concluded that there are no significant effects at any ecological sites.

6.1.7 Overall, the impacts of the Proposed Installation on local ecological sites are very limited and below screening thresholds at the majority of these sites. Where long-term impacts are above the threshold, they comprise a low proportion of the ES (less than 2%) and any exceedances of the ES are dominated by background sources. Where short-term impacts exceed the screening threshold they remain below the ES by a significant margin. Taking into account the numerous robust assumptions used in the assessment, it is reasonable to conclude that the air quality impacts will not have significant effects on the local ecological sites.

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Annex A - Assessment of Amine Degradation Products

A.1 Introduction

A.1.1 The air quality assessment of emissions of amines from the Proposed Installation on human health and the environment has been included in this appendix in a similar way that other pollutants are considered. However, amines can degrade to form other species, including nitrosamines and nitramines (collectively referred to as N-amines) which can potentially impact human health, therefore consideration of these species is also required within the air quality assessment. The assessment of these species is complex and therefore additional details are included separately within this annex.

A.1.2 The assessment of N-amines includes direct N-amine emissions from the CCP absorber stacks. These are N-amines that form as a result of degradation within the carbon capture process itself and therefore are released directly from the stack as N-amines. The assessment also considered indirect N-amine impacts, which are the N-amines that form as a result of atmospheric processes following the release of amines from the CCP absorber stacks. This Annex has been prepared to describe the atmospheric processes effecting both these species. Their potential impacts at receptor locations are considered above in the main section of this appendix.

A.2 Scope

CCP Emissions

A.2.1 When the Proposed Installation is operating with carbon capture, an amine-based solvent would be utilised as the scrubbing medium within the CCPs, to remove the carbon dioxide (CO_2) within the flue gas streams. 'Amine slip' can occur during the carbon capture process, resulting in direct emission of amines from the absorber stacks. Over time, the amine solvent used in the CCPs can degrade, through for example, reaction with nitrogen dioxide (NO_2) within the flue gases, which can result in the generation of N-amines within the amine solvent. Degradation is minimised through continuous solvent replenishment, monitoring and process control, as would be required by the Guidance on Post-Combustion Carbon Dioxide Capture: Guidance on Emerging Techniques (GET) (Ref 18). Nevertheless, the amine slip emission from the CCPs is likely to include a very small fraction of N-amines, which is considered in this assessment as the 'direct' N-amine emission.

A.2.2 Amines released from the CCPs absorber stacks can also degrade in the atmosphere following emission to form N-amines. This is considered in the assessment as the 'indirect' N-amine emission.

A.2.3 The atmospheric chemistry of amines and N-amines is complex, dependent on atmospheric ozone and NO_2 concentrations, and with the generation of hydroxyl radical intermediates and other unstable intermediate species in UV light, however the principal mechanisms are understood and many studies have been made of the primary reaction rates and subsequent interactions between degradation products and these atmospheric species.

A.2.4 This annex details the amine chemistry mechanisms likely to occur following release of amines and N-amines from the CCPs absorber stacks, and the specific parameters used for the modelling assessment for N-amines from the Proposed Installation.

A.2.5 The assessment has considered the impact of emissions on local air quality, under normal operating conditions, with the Proposed Installation operating in carbon capture mode for 8,760 hours per year.

A.2.6 A comparison has been made between predicted model output concentrations, and the environmental standards (ES) for N-nitroso-dimethylamine (NDMA), as detailed in the Section 5 of this assessment).

A.3 Sources of Information

A.3.1 The assessment of N-amine emissions from the Proposed Installation has been undertaken using the advanced dispersion model ADMS (version V6.0.2), supplied by Cambridge Environmental Research Consultants Limited (CERC), as described in the main sections of this report. CERC have developed an Amine Chemistry module to simulate the atmospheric chemistry of amines and N-amines following their release from stacks. The chemistry scheme is based on the reactions initiated by the attack of an emitted gaseous amine or N-amine by a hydroxyl radical, and predicts the subsequent formation of nitrosamines and nitramines.

A.3.2 The assessment includes pertinent information from:

- data on the amine and N-amine emission concentrations to atmosphere from the Applicant;
- details on the Proposed Installation's layout;
- Ordnance Survey mapping;
- reaction rate constants required for the ADMS Amines Chemistry module, as specified by the Applicant's FEED contractors;
- other constants required for the ADMS Amines Chemistry module derived from literature sources (as detailed throughout the text);
- Environment Agency 'AQMAU recommendations for the regulation of impacts to air quality from amine-based post-combustion carbon capture plant' AQMAU-C2025-RP01 (Ref 23);
- Environment Agency 'AQMAU Proposed assessment method to include amines and degradation products in nutrient nitrogen deposition estimations at ecological sites' AQMAU-C2600-RP01 (Ref 28); and
- meteorological data supplied by ADM Ltd.

A.4 Discussion of Amines and N-amines

General amine information

A.4.1 The group of chemicals known as amines are based on ammonia (NH_3). Primary amines have one hydrogen (H) atom replaced with an organic (hydrocarbon-based) functional group, secondary amines have two H atoms replaced, and tertiary amines have three H atoms replaced.

A.4.2 Typical amine solvents used in carbon capture plant tend to be primary or secondary amine compounds consisting of hydroxyl (OH) and amino functional groups (referred to as 'alkanolamines'). Examples of typical solvents used are Monoethanolamine (MEA) and Monomethylamine (MMA), both primary amines, and Dimethylamine (DMA) a secondary amine.

A.4.3 That said, amine solvents are being optimised and improved over time to improve their performance, in terms of their carbon capture efficiency, lower energy requirements and also to reduce emissions. This has led to some amine solvents now comprising tertiary amines and alkanolamines, and cyclic amines, such as Piperazine (Pz).

A.4.4 Amines can react to create new compounds, both within the carbon capture process itself, and after they are emitted to the environment in the absorber exhaust gas. The fate of the released amines is determined by atmospheric processes such as chemical transformation, dispersion and deposition.

General N-amine information

A.4.5 Nitrosamines typically comprise nitroso- (NO-) compounds of the original alkanolamine solvent. The stability of the N-amines produced through amine degradation varies, for example, primary amines MEA and MMA are not considered to form stable nitrosamines, such that, following formation, the nitrosamine either reverts to the amine radical intermediate or rapidly isomerises (changes structure) and then reacts very quickly with O_2 to form an imine (R-N group) (Ref 37). However, MEA can degrade to the nitrosamine NDELA via the secondary amine DEA.

A.4.6 Secondary amines can form more stable nitrosamines (Ref 37), as can tertiary amines although they are less likely to do so than secondary amines.

A.4.7 N-nitroso-dimethylamine (NDMA) is the nitrosamine formed from DMA degradation, and is the most widely studied nitrosamine, due to its toxicity and carcinogenicity. The proposed EAL for the assessment of N-amines in the UK has been derived for NDMA. In the absence of other published values for N-amines, the ES for NDMA has been applied to all N-amines, in order to carry out a conservative assessment.

Toxicity of N-Amines

A.4.8 Many nitrosamines and nitramines are known or potential carcinogens. Whilst there is toxicity data available for a few of the more generally researched substances (e.g. NDMA and Nitrosodiethanolamine (NDELA)), the environmental toxicity of many of the other individual compounds is not well understood (Ref 38). NDMA is understood to be the most mutagenic (having the ability to cause a permanent change in an organism's genes) of the nitrosamines tested (Ref 39).

A.4.9 The World Health Organization has published a Concise International Chemical Assessment Document on NDMA (Ref 40), which states that NDMA is carcinogenic.

A.4.10 NDMA can be produced during water treatment processes involving chlorination and is also present at low concentrations in cured meat, fish, beer and tobacco smoke.

A.4.11 There is less information available on the toxicity of nitramines, which include nitro (-NO_2) compounds of the amine, such as dimethylnitramine (DMNA), however it is generally considered that they are of lower toxicity than nitrosamines. Although they are suspected carcinogens, none are classified as such by the International Agency for Research on Cancer (IARC). Animal carcinogenicity studies have indicated that DMNA is at least 6 times less toxic than NDMA (Ref 41). This paper goes on to state that further quantitative evaluation of relevant nitramines is required to rank them against nitrosamine toxicity, in order that more refined and less conservative assessments, where currently all N-amines are assumed to be as toxic as the most toxic nitrosamine, can be carried out.

A.4.12 Based on information provided by the Applicants FEED contractors for the Proposed Installation it is considered that the toxicity of the N-amines potentially formed is significantly lower than NDMA. Further information is provided in Annex F and Annex G. Given the likely lower toxicity of nitramines and the higher toxicity of NDMA relative to other nitrosamines, comparison of the predicted process contributions to the NDMA ES is considered to be very conservative.

A.5 N-Amine Emissions from Carbon Capture Processes

Direct N-Amine Emission

A.5.1 The amine solvent used in the CCPs is contained and recycled within the CCP. Within the process, the amine solvent can degrade to N-amines through oxidation, thermal degradation and acid gas/ trace impurity reactions. Losses via the CCP absorber stack can therefore occur through entrainment of the solvent within the exhaust gas.

A.5.2 The main cause of degradation of the amine solvent is understood to be thermal degradation and therefore this can be reduced by making sure that the maximum operating temperature of the re-boiler and stripper in the CCP is carefully controlled.

A.5.3 Acid gas reactions can occur due to the other trace pollutant species present in the emission, in particular the NO_2 within the exhaust gases from the Main Development Area. High NO_2 concentrations in the exhaust gas increases the rate of amine degradation to N-amines, and therefore the lower the overall NOx release, the less N-amines would be generated by this mechanism.

A.5.4 The facility will require the addition of Selective Catalytic Reduction (SCR) abatement to reduce the NO_2 within the exhaust gas, prior to it entering the CCP. Appropriate measures to reduce sulphur dioxide (SO_2) emissions would also be applied, if required, and therefore reduce degradation of the solvent.

A.5.5 The solvent inventory would be managed to minimise the formation and release of degradation products through continuous bleed and regeneration of solvent within the process.

A.5.6 It is considered that through best practice storage and management measures for the amine solvent, that its degradation within the CCPs can be minimised, and this requirement would be managed through the Environmental Permit for the Proposed Installation. As a result, the direct emissions of N-amines into the atmosphere from the CCPs absorber stacks, are expected to be at very low levels (i.e. in the parts per billion (ppb) range).

Indirect N-Amine Emission

A.5.7 The majority of N-amines resulting from releases from the carbon capture process are considered to form through reactions in the atmosphere post release. These atmospheric reactions are complex, and the rate of N-amine formation and subsequent destruction depends upon a range of factors.

A.5.8 The amine degradation process in the atmosphere requires the presence of either an OH or a nitrate (NO_3) radical. The primary method for formation of N-amines in the atmosphere is a two-step process:

- an OH radical (daytime) or an NO_3 radical (night-time) removes a single hydrogen atom in the amine molecule to form a highly unstable amine radical; then
- the amine radical reacts with either an NO group to form a nitrosamine, or an NO_2 group to form a nitramine.

A.5.9 A variety of competing reactions can also take place, preventing the formation of N-amines:

- the amine can degrade to other radical species via removal of a non-amine hydrogen, or methyl group (this potential is known as the branching ratio);
- the amine radical can undergo competing reactions, with NO_2 and O_2 to form an imine (stable, and not toxic (Ref 42)); and
- the nitrosamine or nitramine can undergo further degradation or reverse reaction to the radical.

A.5.10 During daylight hours, atmospheric amine degradation is initiated by reaction with the OH radical (generated by photolysis of water (H_2O) by the action of ultraviolet light from sunlight). At night, in the absence of UV light, no OH radical is generated. Night-time reactions instead proceed by the much slower pathway of NO with ozone (O_3) to form NO_2 and subsequent reaction of NO_2 with O_3 to form the NO_3 radical; amine degradation is then initiated by reaction with the NO_3 radical to form N-amines. The nitrate radical is rapidly photolyzed (decomposed or separated by the action of light) in daylight and does not represent a likely reaction pathway during the daytime.

A.5.11 The concentration of NO_X and O_3 available in the atmosphere therefore influences the reaction of amine to N-amines. The night-time reactions are slower than the daytime reactions as a result of the intermediate reaction step, therefore a higher rate of formation of N-amines results from daytime reactions.

A.5.12 The steady state concentration of N-amines can be calculated using reaction rate constants, usually derived through experimental studies. Such studies have indicated that not all amines released would convert to N-amines in the atmosphere, and the conversion of those amines that would degrade in the atmosphere to N-amines can take many hours to occur. Typical conversion rates are <1% although chamber experiments show a range of between 0 and 10%.

A.5.13 The ratio of reaction coefficients in the formation of (1) the amine radical (that can proceed to N-amine formation) or (2) an alternative species radical (that does not form N-amine) is described as the branching ratio; and for several amine species these have been published, although values range between published sources. The higher the branching ratio of the amine, the more likely it is to form N-amines.

Table A- 1: Amine Branching Ratios

Amine Species	Branching Ratio	Source
Monoethanolamine (MEA)	0.05 – 0.15	Ref 43 and Ref 44
Monomethylamine (MMA)	0.25	Ref 46
Dimethylamine (DMA)	0.38 - 0.42	Ref 43
Piperazine	0.09	Ref 45

A.5.14 As can be seen in **Table A- 1**, the branching ratios for the primary amines MEA and MMA, and piperazine, are lower than those for the secondary amine, DMA, therefore secondary amines are more likely to form N-amines. Tertiary amines must first degrade to a primary or secondary amine, through elimination of a hydrocarbon group, before further reaction to N-amine or other species can occur. Therefore, as other competing reactions may also occur, the likelihood of forming N-amine must also be lower than for a secondary amine; however, there is limited published data for tertiary amine reaction constants.

A.5.15 In addition to the branching ratio, the concentration of ambient NOx also influences the generation of N-amines from amines. From laboratory tests, it is known that when more NOx is present, more amines are converted into N-amines. This function is called the "amino radical/NO_2 reaction rate constant [k4]".

A.5.16 There is a relatively limited data set available for establishing the proportion of amine that forms N-amines, upon which a simulation of atmospheric chemistry can be based. The reaction rate data that has been identified from laboratory experiments for DMA is set out in **Table A- 2**. Within this data set, the NOx concentrations, and whether the simulation is undertaken for daytime or night-time simulations, is identified.

Table A- 2: Amine Conversion Proportions

Final Species	NOx/NO_2 Concentration in Experiment	Proportion Of Amine Converted To N-Amine	Reference	Comments
Nitramines	0.2 – 10ppb	<2.5%	Ref 46	Daytime simulation
	20 – 50ppb	<8%	Ref 46	Daytime simulation
Nitrosamines	0.2 – 10ppb	<0.6%	Ref 46	Daytime simulation
	20 – 50ppb	<2.3%	Ref 46	Daytime simulation
	0.08ppm NO - 0.16ppm NO_2	1%	Ref 47	Night-time simulation
	2ppm NO_2 - 2ppm NO	10 – 30%	Ref 47	

A.5.17 In the flue gas from the CCPs, the NO_X is composed of around 90-95% NO to 5-10% NO_2. Once in the atmosphere, the NO would react with OH to form NO_2. The reaction of OH is preferential to NO rather than the amine as NO is more reactive. Therefore, as NO concentrations decrease spatially due to reaction with OH, there becomes more available OH radicals to react with the amines, so amine reaction would occur at greater distance from the stack. The details of this process are too uncertain to be accurately represented in the ADMS amines chemistry model and therefore the model does not include this time-delay in the initiation of the amine degradation reaction, assuming that this occurs instantly on release, therefore potentially resulting in higher concentrations in close proximity to the stack. This is therefore considered to be very conservative.

A.5.18 Only a proportion of the N-amines released or generated would remain as N-amines, as during daylight hours, N-amines are degraded to more basic amines, amides, ethanoic acid, ketones and simple nitrogen compounds in the presence of sunlight. At night no destruction of N-amines occurs.

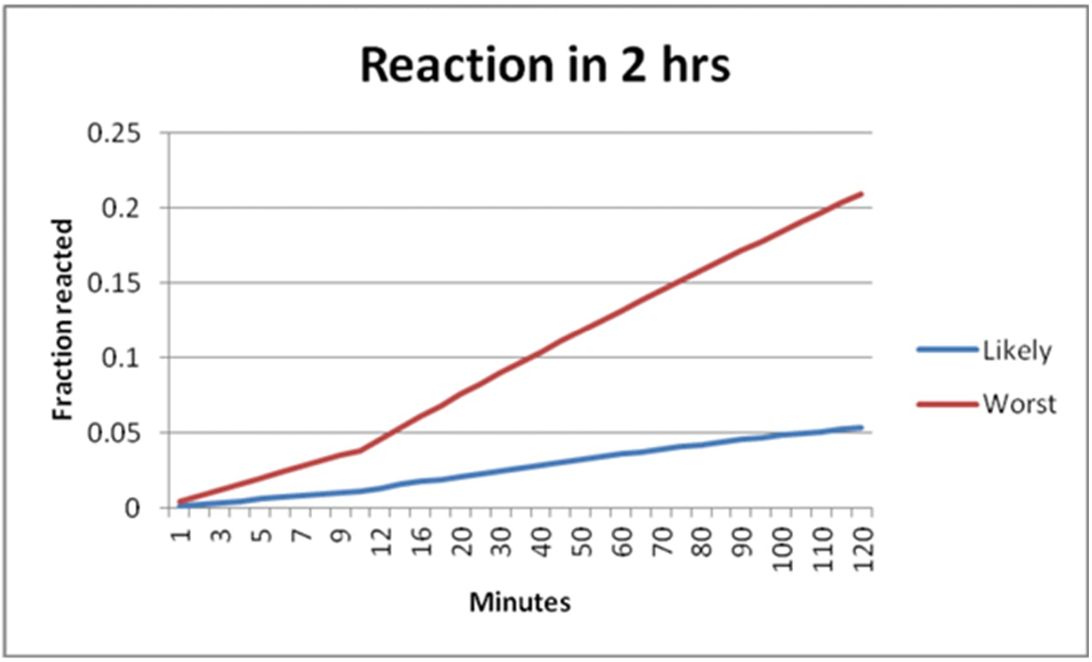
A.5.19 The WHO document (Ref 40) states that photolysis is the major pathway for the removal of NDMA from surface water, air, and land and that it is unlikely to be transported over long distances in air or to partition to soil and sediments.

A.5.20 Not all amines released would convert to N-amine in the environment and the conversion of those amines that would degrade in the atmosphere to N-amine can take many hours to occur. This is described by the work carried out by Tonnesen (Ref 48), which demonstrated that less than 5% of the amines that would convert to N-amines would have do so in the first 10 minutes after release. After 2 hours, only 20% of the amines that would convert to N-amine would have done so. The work then goes on to estimate that it would take in the order of 10 hours for 100% conversion to occur. A graph showing this process is provided in.

A.5.21 The fact that this time-delay is not taken into account in the ADMS amines chemistry module therefore is considered to result in an over-prediction in the process contributions predicted by the model.

A.5.22 The conversion fraction of amines to N-Amine in the atmosphere over time is shown in **Plate 3.**

Plate 3: Conversion of Amines to N-Amine in the Atmosphere Over Time



A.5.23 At night-time the NO_3 radical is formed from the reaction of O_3 with NO, and then NO_2. Therefore, the reaction of NO to NO_2 is likely to be preferential to the reaction of NO_2 to NO_3 or NO_3 reacting with amines, which again would slow down the formation of N-amines. These details again are too uncertain to be accurately represented in the amines chemistry module and therefore are not included.

A.5.24 Only a proportion of the N-amines released or generated would remain as N-amines, as during daylight hours, N-amines are degraded to more basic amines, amides, ethanoic acid, ketones and simple nitrogen compounds in the presence of sunlight. At night no destruction of N-amines occurs.

A.6 Assessment Methodology

Dispersion Model Input Parameters

A.6.1 As discussed above, the treatment of chemistry within the ADMS amines model requires a suite of reaction rate parameters derived from laboratory studies and other sources. The parameters required by the model in order to simulate amine chemistry for a specific amine(s) are detailed in **Table A-3**.

Table A- 3: Amine Chemistry Model Input Parameters

Parameter	Units	Notes
Amines Release	g/s	Emission concentrations for Amine 1 and Amine 2 present in the solvent have been provided by Shell.
Direct N-amine Release	g/s	Emission concentrations for N-amine 1 and N-amine 2 present in the solvent have been provided by Shell.
k1 = Amine/OH radical reaction rate constant	ppb/s	Rate constant provided by Shell for the reaction of the amine with the hydroxyl radical ('●') (OH●).
k2 = Amino radical/O2 reaction rate constant	ppb/s	Rate constant provided by Shell for the reaction of the amine● with O_2 (to form imine).
k3 = Rate constant for formation of nitrosamine	ppb/s	Rate constant provided by Shell for formation of nitrosamine from amine● and NO.
k4a = Rate constant for formation of nitramine	ppb/s	Rate constant provided by Shell for formation of nitramine from amine● and NO_2
k4 = Amino radical/NO_2 reaction rate constant	ppb/s	Rate constant provided by Shell for the reaction of the amine● with NO_2 (to form imine or nitramine).
Branching Ratio	dimensionless	Branching ratio provided by Shell for the amine/ OH● reaction – representing the reaction split, in formation of amine radical (amine● which further reacts to nitrosamine/ nitramine) and alternative hydrocarbyl radical species.
Ratio of J (nitrosamine) to NO_2	dimensionless	The ratio of the photolysis rate constants for the nitrosamine and NO_2 - representing the relative atmospheric fluctuations of NO_2 and nitrosamine formation as a result of UV light action.
c = OH concentration constant	s	OH concentration constant, derived for typical daytime atmosphere for the Sites' location. Site specific value calculated following the derivation of J (NO_2).
Atmospheric oxygen concentration	ppb	Representing 21% O_2 in air.
NOx baseline	µg/m³	Hourly values obtained for South Killingholme automatic monitor for the years of meteorological data used in the model.
NO_2 baseline	µg/m³	
Ozone Baseline	µg/m³	Hourly values obtained for Hull Freetown automatic monitor (being the closest site with O3 data available) for the years of meteorological data used in the model

A.6.2 These parameters are entered into an ADMS Additional Information (AAI) file, which characterises the amine chemistry for the amine or N-amine species being assessed.

A.6.3 The majority of published data for amine degradation to nitrosamine and nitramines are presented as relative rates of reaction (for example for the reaction of the amine radical to form either the imine or nitramines, and the k1a/k1 branching ratio), rather than the absolute rates for each reaction required for the Amines module (i.e. k1, k2, k3, k4a and k4). The absolute rates of reaction may be derived through scientific research through experimental observation, for the more stable intermediate reaction species, or through theoretical computational calculations such as Transition State Theory.

A.6.4 In 2022 (updated in 2023), the CCSA published a Position Paper on Carbon Capture Chemistry Parameters, N-Amines Chemistry (Ref 49), in which they recognise that the chemistry data required for amine modelling has been derived from laboratory experiments, sometimes dating back to the 1970s. They state that "These cover a range of conditions depending upon the objective of the experiment and as such the chemistry parameters identified have a range of values. The objective of this paper is to provide single values for use in modelling of amines. Therefore, the data available from these experiments has been reviewed to provide values considered to be the 'best fir to experimental data'. This considers the need to capture real world chemistry as best as possible and the functionality of the ADMS model module".

A.6.5 The FEED contractors have provided kinetic parameters developed specifically for the ADMS chemistry model. These have been compiled based on expert judgement and in collaboration with recognised experts in the field of amine kinetics. Further details can be found in Annex F and Annex G. The parameters applies in this assessment are shown in **Table A-4**.

Table A- 4: N-Amine Chemistry Parameters

Parameter	Units	FEED 1 - Amine 1	FEED 1 - Amine 2	FEED 2 - Amine 1	FEED 2 - Amine 2	Source
Ratio of NO_X to NO_2 in the exhaust gas	%	5	5	5	5	Typical range in combustion emissions
k1 = Amine/OH radical reaction rate constant	ppb/s	0.7	7.0	6.25	5.95	Technology supplier
k2 = Amino radical/O_2 reaction rate constant	ppb/s	3.75×10^{-9}	3.75×10^{-11}	1.25×10^{-9}	1.25×10^{-9}	Technology supplier
k3 = Rate constant for formation of nitrosamine	ppb/s	2.00×10^{-3}	1.25×10^{-3}	1.35×10^{-2}	1.35×10^{-2}	Technology supplier
k4a = Rate constant for formation of nitramine	ppb/s	8.00×10^{-3}	8.00×10^{-3}	7.95×10^{-3}	7.95×10^{-3}	Technology supplier
k4 = Amino radical/NO_2	ppb/s	8.00×10^{-3}	8.00×10^{-3}	7.95×10^{-3}	7.95×10^{-3}	Technology supplier

Parameter	Units	FEED 1 - Amine 1	FEED 1 - Amine 2	FEED 2 - Amine 1	FEED 2 - Amine 2	Source
reaction rate constant						
Branching Ratio	dimensionless	0.30	0.20	0.17	0.18	Technology supplier
Ratio of J (nitrosamine) to NO_2	dimensionless	0.50	0.30	0.34	0.34	Technology supplier
OH concentration constant c	Seconds	2019 – $1.24x10^{-3}$ 2020 – $1.19\ x10^{-3}$ 2021 – $1.22x10^{-3}$ 2022 – $1.37x10^{-3}$ 2023 – $1,36x10^{-3}$				Specifically derived for the Sites location following CERC methodology

A.6.6 The model includes an option to take into account the effects of dilution of pollutant species and the entrainment of background pollutants. This 'dilution and entrainment' effect can be switched on and off, however it is recommended that it is switched on for all model runs involving amine chemistry. This is employed in the ADMS chemistry module (and recommended by CERC for low concentration plumes for the amines module) to represent slower mixing of the ambient air within the plume – rather than instantaneous mixing with an ambient air 'parcel' at plume release. The use of the dilution and entrainment option leads to a higher process contribution. The dilution and entrainment option has therefore been included for the main assessment for conservatism.

A.6.7 In addition, the amine module includes an option for modelling unstable nitrosamines, which can be employed when modelling primary amines that do not form stable nitrosamines. In effect, this means that the model results generated when this option is selected include no nitrosamine component, with only nitramines being predicted to form. This option has not been included in the assessment, as it is considered that the results would also be valid for predicting likely concentrations of tertiary amines, as they are more likely to form stable nitrosamines than primary amines.

Hydroxyl radical (OH) annual concentration

A.6.8 There is very limited information on OH concentrations as they are not possible to measure and need to be derived through modelling. For the purposed of this assessment, the local OH concentration was extracted from a run carried by the UK Centre for Ecology & Hydrology (UKCEH) for 2019, using the atmospheric chemistry transport model, EMEP4UK (Ref 50), and presented in CERC's report on Improving Post-Combustion Carbon Capture Air Quality Risk Assessment Techniques (Ref 43).

Nutrient Nitrogen Deposition Estimations

A.6.9 In October 2023, AQMAU published a proposed assessment method to include amines and degradation products in nutrient nitrogen deposition estimations at ecological sites (Ref 28). This guidance has been followed for this assessment and is summarised below.

A.6.10 Overall, the framework recommended by AQMAU is:

- step 1: identification of pollutants with nutrifying effect;
- step 2: approaching potential screening; and
- step 3: detailed assessment.

Step 1: Identification of pollutants with nutrifying effect

A.6.11 Identify the pollutants with nitrogen in their chemical structure, the amine(s) chemical reaction(s) and their molecular weight(s). In this case, the substances are:

- directly emitted pollutants (direct) with nitrogen in their chemical structure: amines, nitrosamines, in addition to NO_2 and NH_3; and
- pollutants formed through atmospheric reactions (indirect) with nitrogen in their chemical structure: nitrosamines, nitramines.

Step 2: Approaching potential screening

A.6.12 Calculate the nutrient nitrogen PCs per pollutant with the assumption that emitted amines do not react and the directly emitted nitrosamines are stable (i.e., pollutants only transport and disperse modelling).

A.6.13 Evaluate how much each pollutant contributes to the total nutrient nitrogen deposition at the ecological receptor. Use these results, contour plots and air dispersion modelling knowledge to estimate the level of uncertainty in the total nutrient nitrogen PCs and judge whether you may need to carry out a detailed assessment using the available transformation and deposition models (i.e., Step 3).

Step 3: Detailed assessment

A.6.14 As deposition cannot be modelled in conjunction with amine chemistry in ADMS, the CERC ADMS 6 amines chemistry supplement proposes the following method to estimate the deposition fluxes (µg/m²/s), D:

$$D = C1 \times (\frac{D2}{C3})$$

Where:

- C1 is the output concentration from run with the amines chemistry ON (Run 1)
- D2 is the output deposition flux from run with amines chemistry OFF and deposition ON (Run 2)
- C3 is the output concentration from run with amines chemistry OFF and deposition OFF (Run 3)

A.6.15 Following the ADMS amines chemistry supplement, add the deposition velocity in the pollutants palette (Ref 29).

A.6.16 Carry out the suggested model runs and calculations to judge the significance of your results:

- estimate the deposition fluxes, D, according to the equation presented above. Then convert to kg N/ha-y to calculate the nutrient nitrogen deposition PCs and
- evaluate the significance of your nutrient nitrogen deposition PCs against the critical loads at the ecological site.

A.7 Assessment Limitations and Assumptions

A.7.1 This section outlined the potential limitations associated with the dispersion modelling assessment. Where assumptions have been made, this is also detailed here.

A.7.2 The greatest uncertainty associated with any air quality modelling assessment arises through the inherent uncertainty of the dispersion modelling process itself. The use of dispersion modelling is nevertheless a useful and widely applied and accepted approach for the prediction of impacts from industrial sources.

A.7.3 We understand that NRW agrees with the Environment Agency position of recognising that the level of uncertainty within the ADMS amines chemistry model is high (Ref 30), however, as the only commercially available model, recognises that it represents the best available technique and follows first principles based on currently available knowledge on the mechanisms of formation of toxic pollutants from amine emissions in ambient air.

ADMS Amines Chemistry Module

No time-delay in N-amine Formation

A.7.4 The amines chemistry module does not account for the time delay in the initiation of the amine degradation (Ref 48). This time delay indicates that only around 15% of the amines that react to form N-amines would have done so within 1 hour, as a worst-case. The ADMS model assumes that a 'steady state' is achieved within 1 hour (N-amine formation/ destruction). The time taken for the peak concentration to reach a receptor at 1km from the source is between 1 - 30 minutes. The model only calculates spatial dispersion, not temporal change. In the real world, as the plume travels further from the source, the amine concentration reduces but the OH concentration may increase (less NOx for the preferential reaction to occur) leading to higher potential N-amine formation, but when balanced against N-amine and amine dispersion, the nett result is a lower N-amine concentration with distance. The model has to assume reaction completion at the point of calculation, and therefore it is considered that this is overly conservative.

No interaction between different amine species

A.7.5 The amines chemistry module does not allow for any interactions between different amines/ degradation species as only one amine species can be modelled at a time. This could result in missing N-amine removal pathways and therefore result in higher predicted results.

No consideration of other potential radical species present

A.7.6 Other reactions with chlorine atoms, nitrate radicals are not taken into account, although these are considered to be less significant.

No further degradation assumed after the initial reactions

A.7.7 Once the N-amine has formed in the atmosphere, further degradation/ destruction processes would occur due to photolysis by sunlight, however this destruction of N-amine is not accounted for in the model. It is therefore considered that this leads to potentially significant overprediction of the potential impact.

A.7.8 Furthermore, no photolysis of the direct N-amine emission is considered in the model, and this would again lead to an overprediction of the potential impact.

A.7.9 The amines chemistry module also does not account for further amine degradation, for example the primary amine MEA can degrade to the secondary amine DEA (which could subsequently degrade into NDMA). This could result in an increase in N-amine formation but over longer time periods, which could be counterbalanced by the destruction of N-amine over time, as discussed above.

Only day-time reactions are considered

A.7.10 The amines chemistry module accounts for diurnal variation in the photolysis (OH) reaction but does not account for the slower NO_2 degradation reaction that occurs during night-time.

No consideration of phase partitioning

A.7.11 Once emitted to the air, amines, nitrosamines and nitramines undergo multiphase chemistry, i.e. gas, aqueous (aerosols, cloud droplets, fog and rain) and particle phase (aerosol). Therefore, the mass of starting amine may be partitioned (e.g. gas or aqueous phase). The amines chemistry module is only concerned with the gaseous phase, however it is considered that the solubility of amines would put them out of the gas phase (Ref 51) therefore decreasing the amount of amines in the ambient air.

Other Assessment Limitations

Limited reaction rate constants available

A.7.12 The majority of published data for amine degradation to nitrosamine and nitramines are presented as relative rates of reaction (for example for the reaction of the amine radical to form either the imine or nitramines, and the k1a/k1 branching ratio), rather than the absolute rates for each reaction required for the Amines module (i.e. k1, k2, k3, k4a and k4, described in **Table A- 4**. The absolute rates of reaction may be derived through scientific research through experimental observation, for the more stable intermediate reaction species, or through theoretical computational calculations such as Transition State Theory. A review of the available literature indicates that the availability of published absolute reaction rates for a whole amine reaction scheme is currently limited to a few primary and secondary amine species (namely MEA, DMA, Ethylamine and

Methylamine). In addition, some kinetic parameters reported for the same type of amine show different values in published reports. For this assessment, the kinetic parameters have been shared by each FEED supplier and used for the respective scenarios.

OH Value

A.7.13 The main reaction of amines in the atmosphere is with the OH radicals and it is this reaction on which the ADMS amine module is based. The model set up therefore requires a OH value to calculate the "c-value" for the reaction rate. The modelled predicted impact is directly proportional to c-value, and therefore it is important that local data is obtained and used in the model set-up. Halving of the OH value would result in a halving of the modelled N-amine impact.

A.7.14 There is limited data on OH concentrations in atmosphere and the concentration is highly variable with sunlight, ozone concentration, NOx concentration etc. and the radical is short-lived. This therefore represents a significant uncertainty in the modelled results.

Use of the NDMA EAL for all N-amines

A.7.15 The use of the NDMA EAL for the assessment of all N-amines is likely to lead to an over-prediction of the potential impact. As previously stated, NDMA is considered to be one of the most toxic nitrosamines, with nitramines being considered much less so (up to 15 times less toxic). It is therefore reasonable to assume that were EALs to be developed for other N-amine species that these would be higher (i.e. less stringent) than that proposed for NDMA.

A.7.16 For comparison against the EAL for the purpose of assessment, the nitrosamine and nitramine predicted process contributions have been combined. As stated previously, nitramines are known to be less toxic that nitrosamines, and therefore it is considered that this leads to an overly conservative assessment.

Annex B – Sensitivity Testing of Model Inputs

B.1.1 The maximum predicted concentrations of NO_2 at the worst-affected human health receptor and NO_X at the worst-affected statutory designated ecological receptor associated with different meteorological model inputs, are presented in **Table B- 1** as the percentage of maximum reported values in the main assessment for the Future Assessment.

Table B- 1: Model Sensitivity Testing, based on changes in concentrations from the PC

Variable	Human health receptor / Max anywhere		Ecological receptor	
	Short Term	Long Term	Short Term	Long Term
Meteorological data (five year min to max) NO_2	33%	56%	85%	63%

B.1.2 The main uncertainty associated with the model is considered to be the meteorological data, with a NO_2 process contribution variation of 56% in the annual mean NO_2 results; this is equivalent to an overall uncertainty at the worst-affected receptor of -0.06 µg/m^3 (or -0.1% of the relevant ES). For short-term NO_2, the variation of 33% is equivalent to an overall uncertainty at the worst-affected receptor of -17.3 µg/m^3 (or -8.7% of the relevant ES).

B.1.3 Whilst there are a number of inputs which could be varied in relation to dispersion modelling, experience has shown that the model sensitivity to variations in annual meteorology is substantially higher than that for other inputs such as surface roughness. It is recognised that the N-amine results may show significant sensitivity to the kinetic inputs, however it is difficult to address the sensitivity of a non-linear chemical scheme. The parameters selected are based on the best available information at the time and it is reasonable to assume that over-estimates in some parameters would be offset by under-estimates in others. The primary method of addressing the uncertainty relating to the amine module has been through the use of robust assumptions in the modelling, namely:

- the Proposed Installation is assumed to run two trains at full load during every hour of the year, whereas in practice the load factor is likely to be substantially lower due the plant providing dispatchable power when required;
- the assessment is based on the highest annual impact at each receptor out of the five years modelled;
- the assessment assumed no depletion of plume concentrations due to wet or dry deposition;
- the assessment assumes that all nitramines and nitrosamines emitted from the stack(s) or formed in the atmosphere have the same toxicity as NDMA, known to be one of the most toxic nitrosamine species. In particular current studies suggest that nitramines are substantially less toxic than their corresponding nitrosamines; and

- all buildings have been modelled at their maximum anticipated dimensions ensuring the potential for impacting on plume dispersion is captured in the dispersion model.

Annex C – Plume Visibility Assessment

C.1 Introduction

C.1.1 The proposed CCGT units would burn natural gas fuel, and water vapour would form part of the composition of the combustion gases released from the stacks, for all scenarios. Under certain conditions this water vapour can cool and condense in close enough proximity to the stack exit to form a visible plume. This annex contains an assessment of plume visibility to consider if plume grounding could occur, and if so with what frequency.

C.1.2 The ADMS dispersion model used to evaluate the impact on local air quality due to the operation of the Proposed Installation contains a plume visibility module and this has been used to evaluate the number of hours per year where a visible plume could form, using information on the emissions from the stacks and representative meteorological data from Hawarden Airport.

C.1.3 For the purposes of this assessment a stack plume is described as being 'visible' when condensed water is present in the plume. This definition does not take account of whether or not the plume can actually be seen (for example at night), and for this reason can be considered to be a precautionary approach likely to over-estimate the frequency of visible emissions. The procedure used in this assessment is based on that outlined in the 2003 version of the NRW's H1 horizontal guidance.

C.2 Modelling Methodology

C.2.1 The model setup is identical to that used for the assessment of pollutant emissions, except for the selection of the plume visibility module option and the input of initial water content in the plume. ADMS 6 defines the plume to be 'visible' at a particular downwind distance if the ambient humidity at the plume centreline is below 98%, above which it is considered the plume would be indistinguishable from clouds. The modelling was undertaken for the four scenarios assessed, namely Abated FEED 1 and FEED 2 and Unabated FEED 1 and FEED 2.

C.2.2 For the Abated FEED 1 scenario, the initial water vapour mixing ratio of the plume was 0.05 kg/kg (mass of water vapour per unit mass of dry release at the stacks), and was calculated on the following basis:

- The exhaust stack flow from each unit is 779.0 kg/s.
- The exhaust flow contains 7.7% of water, as a molar fraction of the total.
- This equates to 5% of the total flow on a mass basis.

C.2.3 For the Abated FEED 2 scenario, the initial water vapour mixing ratio of the plume was 0.06 kg/kg (mass of water vapour per unit mass of dry release at the stacks), and was calculated on the following basis:

- The exhaust stack flow from each unit is 979.2 kg/s.

- The exhaust flow contains 9.8% of water, as a molar fraction of the total.
- This equates to 6% of the total flow on a mass basis.

C.2.4 For the Unabated FEED 1 scenario, the initial water vapour mixing ratio of the plume was 0.05 kg/kg (mass of water vapour per unit mass of dry release at the stacks), and was calculated on the following basis:

- The exhaust stack flow from each unit is 839.4 kg/s.
- The exhaust flow contains 8.6% of water, as a molar fraction of the total.
- This equates to 5% of the total flow on a mass basis.

C.2.5 For the Unabated FEED 2 scenario, the initial water vapour mixing ratio of the plume was 0.06 kg/kg (mass of water vapour per unit mass of dry release at the stacks), and was calculated on the following basis:

- The exhaust stack flow from each unit is 1056.7 kg/s.
- The exhaust flow contains 9.3% of water, as a molar fraction of the total.
- This equates to 6% of the total flow on a mass basis.

C.3 Model Results

C.3.1 The results from the model have been summarised in **Table C- 1** to **Table C- 4,** for each scenario assessed. The results are per stack.

C.3.2 The results are different for each scenario, with the Unabated scenarios producing an overall less visible plume, due to their higher temperature, followed by the Abated FEED 1 scenario, which has a lower water content than Abated FEED 2, with the highest "percentage time plume is visible", due to the combined low temperature and higher water content, as well as a higher mass flow rate.

C.3.3 The modelling has not predicted any groundings of a visible plume, at any point in the 5 years of meteorological data assessed.

Table C- 1: Plume Visibility Assessment Results per Stack – Abated FEED 1

Met Data Year	Percentage Time Plume Is Visible	Longest Visible Plume Length (m)	Average Visible Plume Length (m)	Percentage of Time There Is A Visible Plume Over 100 m	Number of Visible Plume Groundings
2019	33.0%	984.3	25.4	7.4%	0
2020	28.9%	882.2	20.0	5.9%	0
2021	31.7%	792.2	26.0	7.6%	0
2022	26.4%	1,066.2	19.0	5.2%	0
2023	24.4%	1,125.6	19.4	5.0%	0

Table C- 2: Plume Visibility Assessment Results per Stack – Abated FEED 2

Met Data Year	Percentage Time Plume Is Visible	Longest Visible Plume Length (m)	Average Visible Plume Length (m)	Percentage of Time There Is A Visible Plume Over 100 m	Number of Visible Plume Groundings
2019	69.0%	2,831.3	63.4	17.4%	0
2020	68.2%	2,477.7	59.0	14.9%	0
2021	64.5%	1,647.2	61.8	16.8%	0
2022	62.4%	1,836.7	51.2	13.4%	0
2023	61.4%	1,738.7	51.0	12.3%	0

Table C- 3: Plume Visibility Assessment Results per Stack – Unabated FEED 1

Met Data Year	Percentage Time Plume Is Visible	Longest Visible Plume Length (m)	Average Visible Plume Length (m)	Percentage of Time There Is A Visible Plume Over 100 m	Number of Visible Plume Groundings
2019	3.6%	463.9	2.7	0.9%	0
2020	1.3%	404.1	1.3	0.5%	0
2021	4.5%	555.6	4.2	1.4%	0
2022	2.7%	386.7	2.0	0.7%	0
2023	3.2%	826.1	3.5	1.2%	0

Table C- 4: Plume Visibility Assessment Results per Stack – Unabated FEED 2

Met Data Year	Percentage Time Plume Is Visible	Longest Visible Plume Length (m)	Average Visible Plume Length (m)	Percentage of Time There Is A Visible Plume Over 100 m	Number of Visible Plume Groundings
2019	13.5%	1,000.5	13.8	4.5%	0
2020	8.9%	2,467.5	9.5	3.0%	0
2021	14.2%	1,118.9	16.0	5.0%	0
2022	10.2%	875.4	10.4	2.9%	0
2023	9.5%	1,392.6	11.0	3.0%	0

C.3.4 The reported longest 'visible' plume lengths are based on the physical properties of water at the plume centre line, i.e., if the water is present at conditions that would result in droplet formation. At distances beyond a few hundred metres the water droplets would be too dispersed for the plume to be visible to the eye.

C.3.5 The assessment is conservative because it includes night time and hours when ambient conditions are below the dew point (fog). The average visible plume length is within the site boundary which is located approximately 100 m from the point of release, at its closest.

Annex D – Cumulative Assessment Inputs

D.1 Introduction

D.1.1 This Annex provides the details of the developments considered within the point sources assessment to provide an inherently cumulative air quality assessment.

D.1.2 This section is presented to inform on the cumulative inputs for the air quality model which have been utilised within the main air quality assessment, as well as present the In-Combination results used in the Habitats Regulations Assessment (HRA).

D.1.3 Cumulative impacts from existing sources of pollution in the area are accounted for in the adoption of site-specific background pollutant concentrations from archive sources and a programme of project-specific baseline air quality monitoring in close proximity to the Proposed Installation site. It is recognised, however, that there is a potential impact on local air quality from emission sources which have either received or are about to receive planning permission but have yet to come into operation. Those that are relevant for consideration due to their potential operational air quality impacts are:

- ID 38: Enfinium Parc Adfer ERF Carbon Capture, SCO/000970/23;
- ID 55: Shotton Paper Mill CHP Facility, DNS/3279559;
- ID 103: Padeswood Cement Works Carbon Capture, DNS CAS-02009-W1R1Z7;
- ID 144: New Paper Processing Mill, 63721.

D.1.4 Although future emissions from the enfinium project would need to be considered for cumulative impacts, there is no available data aside from a scoping report at the time this assessment is completed. Therefore, this development cannot be included in the dispersion modelling and the project won't be considered further.

D.1.5 Information on the emissions from these sources has been derived from the available Planning Applications and has been included in the ADMS model. Due to the nature of these emissions, the cumulative assessment has only included emissions of NO_X, CO, NH_3, amines and N-amines when present, as these are the only pollutant species common to all the cumulative schemes.

D.2 Model Inputs

All cumulative model schemes have been assumed to run continuously at full output, therefore providing a robust assessment of the potential cumulative impact. The model inputs for the Proposed Installation are as described in

Table 3-1 and **Table 3-2**, and those for the cumulative schemes are shown in **Table D- 1** and **Table D- 2**.

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

Scheme	Shotton Paper Mill					Padeswood Cement Works
Source name	SPP_CHP1	SPP_CHP2	SPP_CHP3	SPP_CHP4	SPP_Dryer	Cement
Stack Location	330395, 371511	330408, 371514	330438, 371520	330452, 371522	330553, 371618	328914, 362078
Temp (°C)	130	130	130	130	183	100
Velocity (m/s)	19.3	19.3	18.2	18.2	17.0	15.1
Height (m)	106.0	106.0	106.0	106.0	35.5	117.9
Diameter (m)	2.10	2.10	2.00	2.00	1.57	3.10
NOx (g/s)	3.28	3.28	2.81	2.81	0.35	-
Amine 3 (g/s)	-	-	-	-	-	$2.08x10^{-2}$
Amine 4 (g/s)	-	-	-	-	-	$2.08 x10^{-2}$
Nitrosamine 4 (g/s)	-	-	-	-	-	$2.30 x10^{-3}$
Amine 5 (g/s)	-	-	-	-	-	$2.49 x10^{-2}$

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

Scheme	New Paper Processing Mill						
Source name	Cogen1	Cogen2	Cogen3	Boiler1A	Boiler1B	Boiler3A	Boiler3B
Stack Location	332020, 369755	332090, 369653	332108, 369628	332377, 369851	332375, 369855	332425, 369778	332423, 369781
Temperature (°C)	220	220	220	120	120	120	120
Velocity (m/s)	19.7	19.7	19.7	5.8	5.8	5.8	5.8
Height (m)	28.5	28.5	28.5	12.5	12.5	12.5	12.5
Diameter (m)	1.80	1.80	1.80	0.45	0.45	0.45	0.45
NOx (g/s)	2.50	2.50	2.50	0.09	0.09	0.09	0.09

D.2.1 The buildings for each of the cumulative schemes, that may affect the dispersion of the emissions from the stacks have been included in the model run for the assessment of cumulative impacts. The buildings included in the model are shown in **Table D- 3**.

Table D- 3: Modelled Buildings

Building	Building Centre (X)	Building Centre (Y)	Height (m)	Length (m)	Width (m)	Angle (°)
PackingPlant	329064	362063	101	25	20	287
ClinkerTransport	329256	362166	49	16	15	106
Quencher	328890	362094	46	7	7	113
Regenerator	328912	362097	46	6	6	NA
1	332177	369997	13	107	31	146
2	332086	369942	40	95	176	146
3	332147	369597	20	102	40	58
4	332067	369713	20	102	80	58
5	332129	369619	14	102	10	58
6	332092	369674	14	102	9	58
7	332039	369751	14	102	9	58
8	332353	369897	12	118	12	146
9	332300	369804	12	211	180	146
10	332083	369798	15	60	22	146
11	332189	369715	12	194	104	146

D.3 Cumulative Assessment Results – Human Health Receptors

D.3.1 Results of the cumulative assessment are as presented in Section 5. The results presented within the assessment are inherently cumulative, in that the Predicted Environmental Concentrations (PEC) presented include contributions from the committed developments listed above, as well as the background and Proposed Installation's contributions.

D.4 In Combination Assessment results – Ecological Receptors

D.4.1 Results of the cumulative assessment are as presented in Section 5. The results presented within the assessment are inherently cumulative, in that the Predicted Environmental Concentrations (PEC) presented include contributions from the committed developments listed above, as well as the background and Proposed Installation's contributions.

Annex E – Other Results

E.1 Abated FEED 1 Scenario

6.1.8 The results at the identified human health receptors for the Abated FEED 1 scenario are shown in **Table E- 1 to Table E- 4**.

Table E- 1: Predicted Process Contribution Annual Mean Acetaldehyde Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC(μg/m^3)	PC/ES (%)	Background Concentration (μg/m^3)	PEC (μg/m^3)	PEC/ES (%)
R1	<0.1	<0.1%	No Data Available	<0.1	<0.1%
R2	<0.1	<0.1%		<0.1	<0.1%
R3	<0.1	<0.1%		<0.1	<0.1%
R4	<0.1	<0.1%		<0.1	<0.1%
R5	<0.1	<0.1%		<0.1	<0.1%
R6	<0.1	<0.1%		<0.1	<0.1%
R7	0.1	<0.1%		0.1	<0.1%
R8	<0.1	<0.1%		<0.1	<0.1%
R9	<0.1	<0.1%		<0.1	<0.1%
R10	<0.1	<0.1%		<0.1	<0.1%
R11	<0.1	<0.1%		<0.1	<0.1%
R12	<0.1	<0.1%		<0.1	<0.1%
R13	<0.1	<0.1%		<0.1	<0.1%
R14	<0.1	<0.1%		<0.1	<0.1%
R15	0.1	<0.1%		0.1	<0.1%
R16	0.1	<0.1%		0.1	<0.1%
R17	0.1	<0.1%		0.1	<0.1%
R18	0.1	<0.1%		0.1	<0.1%
R19	<0.1	<0.1%		<0.1	<0.1%
R20	<0.1	<0.1%		<0.1	<0.1%
R21	0.1	<0.1%		0.1	<0.1%
R22	0.1	<0.1%		0.1	<0.1%
R23	0.1	<0.1%		0.1	<0.1%
R24	0.1	<0.1%		0.1	<0.1%
R25	0.1	<0.1%		0.1	<0.1%
R26	0.1	<0.1%		0.1	<0.1%
R27	<0.1	<0.1%		<0.1	<0.1%
R28	<0.1	<0.1%		<0.1	<0.1%
R29	<0.1	<0.1%		<0.1	<0.1%

Receptor	Proposed Installation PC(µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R30	<0.1	<0.1%		<0.1	<0.1%
R31	<0.1	<0.1%		<0.1	<0.1%
R32	<0.1	<0.1%		<0.1	<0.1%
R33	<0.1	<0.1%		<0.1	<0.1%
R34	0.1	<0.1%		0.1	<0.1%
R35	<0.1	<0.1%		<0.1	<0.1%
R36	0.1	<0.1%		0.1	<0.1%
R37	0.1	<0.1%		0.1	<0.1%
R38	0.1	<0.1%		0.1	<0.1%
R39	<0.1	<0.1%		<0.1	<0.1%
R40	<0.1	<0.1%		<0.1	<0.1%
R41	0.1	<0.1%		0.1	<0.1%
R42	<0.1	<0.1%		<0.1	<0.1%
R43	<0.1	<0.1%		<0.1	<0.1%
R44	<0.1	<0.1%		<0.1	<0.1%
R3_Cement	<0.1	<0.1%		<0.1	<0.1%
R6_Cement	<0.1	<0.1%		<0.1	<0.1%
1_ICT	<0.1	<0.1%		<0.1	<0.1%
9_ICT	<0.1	<0.1%		<0.1	<0.1%
Maximum	0.1	<0.1%		0.1	<0.1%

ES 370 µg/m³

Table E- 2: Predicted Process Contribution 1-hour Maximum Acetaldehyde Concentrations – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	0.4	<0.1%	No Data Available	0.4	<0.1%
R2	0.4	<0.1%		0.4	<0.1%
R3	2.7	<0.1%		2.7	<0.1%
R4	2.1	<0.1%		2.1	<0.1%
R5	2.3	<0.1%		2.3	<0.1%
R6	2.6	<0.1%		2.6	<0.1%
R7	2.6	<0.1%		2.6	<0.1%
R8	2.7	<0.1%		2.7	<0.1%
R9	2.9	<0.1%		2.9	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R10	2.8	<0.1%		2.8	<0.1%
R11	2.7	<0.1%		2.7	<0.1%
R12	2.6	<0.1%		2.6	<0.1%
R13	2.5	<0.1%		2.5	<0.1%
R14	2.5	<0.1%		2.5	<0.1%
R15	2.6	<0.1%		2.6	<0.1%
R16	2.5	<0.1%		2.5	<0.1%
R17	2.5	<0.1%		2.5	<0.1%
R18	2.6	<0.1%		2.6	<0.1%
R19	3.4	<0.1%		3.4	<0.1%
R20	3.5	<0.1%		3.5	<0.1%
R21	2.9	<0.1%		2.9	<0.1%
R22	2.8	<0.1%		2.8	<0.1%
R23	2.8	<0.1%		2.8	<0.1%
R24	3.1	<0.1%		3.1	<0.1%
R25	3.1	<0.1%		3.1	<0.1%
R26	2.5	<0.1%		2.5	<0.1%
R27	3.1	<0.1%		3.1	<0.1%
R28	2.9	<0.1%		2.9	<0.1%
R29	3.2	<0.1%		3.2	<0.1%
R30	2.8	<0.1%		2.8	<0.1%
R31	2.8	<0.1%		2.8	<0.1%
R32	2.6	<0.1%		2.6	<0.1%
R33	2.6	<0.1%		2.6	<0.1%
R34	2.7	<0.1%		2.7	<0.1%
R35	2.6	<0.1%		2.6	<0.1%
R36	2.6	<0.1%		2.6	<0.1%
R37	2.9	<0.1%		2.9	<0.1%
R38	2.6	<0.1%		2.6	<0.1%
R39	3.0	<0.1%		3.0	<0.1%
R40	2.5	<0.1%		2.5	<0.1%
R41	2.8	<0.1%		2.8	<0.1%
R42	2.3	<0.1%		2.3	<0.1%
R43	2.3	<0.1%		2.3	<0.1%
R44	2.8	<0.1%		2.8	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R3_Cement	1.8	<0.1%		1.8	<0.1%
R6_Cement	1.8	<0.1%		1.8	<0.1%
1_ICT	2.5	<0.1%		2.5	<0.1%
9_ICT	2.5	<0.1%		2.5	<0.1%
Maximum	3.8	<0.1%		3.8	<0.1%

ES 9,200 µg/m³

Table E- 3: Predicted Process Contribution Annual Mean Ketones Concentrations (against Methyl ethyl ketone ES) – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	0.01	<0.1%		0.01	<0.1%
R4	0.01	<0.1%		0.01	<0.1%
R5	0.04	<0.1%		0.04	<0.1%
R6	0.05	<0.1%		0.05	<0.1%
R7	0.07	<0.1%		0.07	<0.1%
R8	0.02	<0.1%		0.02	<0.1%
R9	0.01	<0.1%		0.01	<0.1%
R10	0.02	<0.1%		0.02	<0.1%
R11	0.02	<0.1%		0.02	<0.1%
R12	0.02	<0.1%		0.02	<0.1%
R13	0.03	<0.1%		0.03	<0.1%
R14	0.03	<0.1%		0.03	<0.1%
R15	0.10	<0.1%		0.10	<0.1%
R16	0.11	<0.1%		0.11	<0.1%
R17	0.10	<0.1%		0.10	<0.1%
R18	0.07	<0.1%		0.07	<0.1%
R19	0.01	<0.1%		0.01	<0.1%
R20	0.01	<0.1%		0.01	<0.1%
R21	0.12	<0.1%		0.12	<0.1%
R22	0.10	<0.1%		0.10	<0.1%
R23	0.10	<0.1%		0.10	<0.1%
R24	0.09	<0.1%		0.09	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R25	0.11	<0.1%		0.11	<0.1%
R26	0.09	<0.1%		0.09	<0.1%
R27	0.03	<0.1%		0.03	<0.1%
R28	0.03	<0.1%		0.03	<0.1%
R29	0.03	<0.1%		0.03	<0.1%
R30	0.02	<0.1%		0.02	<0.1%
R31	0.03	<0.1%		0.03	<0.1%
R32	0.03	<0.1%		0.03	<0.1%
R33	0.02	<0.1%		0.02	<0.1%
R34	0.07	<0.1%		0.07	<0.1%
R35	0.06	<0.1%		0.06	<0.1%
R36	0.07	<0.1%		0.07	<0.1%
R37	0.09	<0.1%		0.09	<0.1%
R38	0.10	<0.1%		0.10	<0.1%
R39	0.03	<0.1%		0.03	<0.1%
R40	0.06	<0.1%		0.06	<0.1%
R41	0.07	<0.1%		0.07	<0.1%
R42	0.04	<0.1%		0.04	<0.1%
R43	0.06	<0.1%		0.06	<0.1%
R44	0.05	<0.1%		0.05	<0.1%
R3_Cement	0.01	<0.1%		0.01	<0.1%
R6_Cement	0.02	<0.1%		0.02	<0.1%
1_ICT	0.04	<0.1%		0.04	<0.1%
9_ICT	0.04	<0.1%		0.04	<0.1%
Maximum	0.12	<0.1%		0.12	<0.1%

ES 6,000 µg/m³

Table E- 4: Predicted Process Contribution 1-hour Maximum Ketones Concentrations (against Methyl ethyl ketone ES) – Abated FEED 1 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	0.5	<0.1%	No Data Available	0.5	<0.1%
R2	0.6	<0.1%		0.6	<0.1%
R3	3.6	<0.1%		3.6	<0.1%
R4	2.8	<0.1%		2.8	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R5	3.0	<0.1%		3.0	<0.1%
R6	3.5	<0.1%		3.5	<0.1%
R7	3.5	<0.1%		3.5	<0.1%
R8	3.6	<0.1%		3.6	<0.1%
R9	3.8	<0.1%		3.8	<0.1%
R10	3.8	<0.1%		3.8	<0.1%
R11	3.5	<0.1%		3.5	<0.1%
R12	3.4	<0.1%		3.4	<0.1%
R13	3.3	<0.1%		3.3	<0.1%
R14	3.3	<0.1%		3.3	<0.1%
R15	3.5	<0.1%		3.5	<0.1%
R16	3.4	<0.1%		3.4	<0.1%
R17	3.3	<0.1%		3.3	<0.1%
R18	3.5	<0.1%		3.5	<0.1%
R19	4.6	<0.1%		4.6	<0.1%
R20	4.6	<0.1%		4.6	<0.1%
R21	3.9	<0.1%		3.9	<0.1%
R22	3.8	<0.1%		3.8	<0.1%
R23	3.7	<0.1%		3.7	<0.1%
R24	4.2	<0.1%		4.2	<0.1%
R25	4.2	<0.1%		4.2	<0.1%
R26	3.4	<0.1%		3.4	<0.1%
R27	4.1	<0.1%		4.1	<0.1%
R28	3.8	<0.1%		3.8	<0.1%
R29	4.2	<0.1%		4.2	<0.1%
R30	3.8	<0.1%		3.8	<0.1%
R31	3.7	<0.1%		3.7	<0.1%
R32	3.4	<0.1%		3.4	<0.1%
R33	3.4	<0.1%		3.4	<0.1%
R34	3.6	<0.1%		3.6	<0.1%
R35	3.4	<0.1%		3.4	<0.1%
R36	3.4	<0.1%		3.4	<0.1%
R37	3.9	<0.1%		3.9	<0.1%
R38	3.5	<0.1%		3.5	<0.1%
R39	4.1	<0.1%		4.1	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R40	3.4	<0.1%		3.4	<0.1%
R41	3.8	<0.1%		3.8	<0.1%
R42	3.1	<0.1%		3.1	<0.1%
R43	3.1	<0.1%		3.1	<0.1%
R44	3.8	<0.1%		3.8	<0.1%
R3_Cement	2.3	<0.1%		2.3	<0.1%
R6_Cement	2.4	<0.1%		2.4	<0.1%
1_ICT	3.3	<0.1%		3.3	<0.1%
9_ICT	3.3	<0.1%		3.3	<0.1%
Maximum	5.1	<0.1%		5.1	<0.1%

ES 89,900 µg/m³

E.2 Abated FEED 2 Scenario

6.1.9 The results at the identified human health receptors for the Abated FEED 2 scenario are shown in **Table E- 5 to Table E- 12.**

Table E- 5: Predicted Process Contribution Annual Mean Acetaldehyde Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	0.01	<0.1%		0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R16	0.01	<0.1%		0.01	<0.1%
R17	0.01	<0.1%		0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	0.01	<0.1%		0.01	<0.1%
R22	0.01	<0.1%		0.01	<0.1%
R23	0.01	<0.1%		0.01	<0.1%
R24	0.01	<0.1%		0.01	<0.1%
R25	0.01	<0.1%		0.01	<0.1%
R26	0.01	<0.1%		0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	0.01	<0.1%		0.01	<0.1%
R38	0.01	<0.1%		0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	0.01	<0.1%		0.01	<0.1%

ES 370 µg/m³

Table E- 6: Predicted Process Contribution 1-hour Maximum Acetaldehyde Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC ($\mu g/m^3$)	PC/ES (%)	Background Concentration ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/ES (%)
R1	<0.1	<0.1%	No Data Available	<0.1	<0.1%
R2	<0.1	<0.1%		<0.1	<0.1%
R3	0.2	<0.1%		0.2	<0.1%
R4	0.1	<0.1%		0.1	<0.1%
R5	0.2	<0.1%		0.2	<0.1%
R6	0.2	<0.1%		0.2	<0.1%
R7	0.2	<0.1%		0.2	<0.1%
R8	0.4	<0.1%		0.4	<0.1%
R9	0.4	<0.1%		0.4	<0.1%
R10	0.3	<0.1%		0.3	<0.1%
R11	0.3	<0.1%		0.3	<0.1%
R12	0.3	<0.1%		0.3	<0.1%
R13	0.2	<0.1%		0.2	<0.1%
R14	0.2	<0.1%		0.2	<0.1%
R15	0.2	<0.1%		0.2	<0.1%
R16	0.2	<0.1%		0.2	<0.1%
R17	0.2	<0.1%		0.2	<0.1%
R18	0.3	<0.1%		0.3	<0.1%
R19	0.2	<0.1%		0.2	<0.1%
R20	0.2	<0.1%		0.2	<0.1%
R21	0.2	<0.1%		0.2	<0.1%
R22	0.2	<0.1%		0.2	<0.1%
R23	0.2	<0.1%		0.2	<0.1%
R24	0.2	<0.1%		0.2	<0.1%
R25	0.2	<0.1%		0.2	<0.1%
R26	0.2	<0.1%		0.2	<0.1%
R27	0.2	<0.1%		0.2	<0.1%
R28	0.2	<0.1%		0.2	<0.1%
R29	0.2	<0.1%		0.2	<0.1%
R30	0.2	<0.1%		0.2	<0.1%
R31	0.2	<0.1%		0.2	<0.1%
R32	0.2	<0.1%		0.2	<0.1%
R33	0.2	<0.1%		0.2	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R34	0.2	<0.1%		0.2	<0.1%
R35	0.2	<0.1%		0.2	<0.1%
R36	0.2	<0.1%		0.2	<0.1%
R37	0.2	<0.1%		0.2	<0.1%
R38	0.2	<0.1%		0.2	<0.1%
R39	0.3	<0.1%		0.3	<0.1%
R40	0.2	<0.1%		0.2	<0.1%
R41	0.2	<0.1%		0.2	<0.1%
R42	0.2	<0.1%		0.2	<0.1%
R43	0.2	<0.1%		0.2	<0.1%
R44	0.2	<0.1%		0.2	<0.1%
R3_Cement	0.2	<0.1%		0.2	<0.1%
R6_Cement	0.2	<0.1%		0.2	<0.1%
1_ICT	0.2	<0.1%		0.2	<0.1%
9_ICT	0.2	<0.1%		0.2	<0.1%
Maximum	0.5	<0.1%		0.5	<0.1%

ES 9,200 µg/m³

Table E- 7: Predicted Process Contribution Annual Mean Acetone Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
R14	<0.01	<0.1%		<0.01	<0.1%
R15	0.01	<0.1%		0.01	<0.1%
R16	0.01	<0.1%		0.01	<0.1%
R17	0.01	<0.1%		0.01	<0.1%
R18	0.01	<0.1%		0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	0.01	<0.1%		0.01	<0.1%
R22	0.01	<0.1%		0.01	<0.1%
R23	0.01	<0.1%		0.01	<0.1%
R24	0.01	<0.1%		0.01	<0.1%
R25	0.01	<0.1%		0.01	<0.1%
R26	0.01	<0.1%		0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	0.01	<0.1%		0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	0.01	<0.1%		0.01	<0.1%
R37	0.01	<0.1%		0.01	<0.1%
R38	0.01	<0.1%		0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	0.01	<0.1%		0.01	<0.1%
R41	0.01	<0.1%		0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	0.01	<0.1%		0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
Maximum	0.01	<0.1%		0.01	<0.1%

ES 18,100 µg/m³

Table E- 8: Predicted Process Contribution 1-hour Maximum Acetone Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.1	<0.1%	No Data Available	<0.1	<0.1%
R2	<0.1	<0.1%		<0.1	<0.1%
R3	0.3	<0.1%		0.3	<0.1%
R4	0.2	<0.1%		0.2	<0.1%
R5	0.2	<0.1%		0.2	<0.1%
R6	0.2	<0.1%		0.2	<0.1%
R7	0.3	<0.1%		0.3	<0.1%
R8	0.5	<0.1%		0.5	<0.1%
R9	0.5	<0.1%		0.5	<0.1%
R10	0.4	<0.1%		0.4	<0.1%
R11	0.4	<0.1%		0.4	<0.1%
R12	0.4	<0.1%		0.4	<0.1%
R13	0.3	<0.1%		0.3	<0.1%
R14	0.3	<0.1%		0.3	<0.1%
R15	0.3	<0.1%		0.3	<0.1%
R16	0.3	<0.1%		0.3	<0.1%
R17	0.3	<0.1%		0.3	<0.1%
R18	0.4	<0.1%		0.4	<0.1%
R19	0.3	<0.1%		0.3	<0.1%
R20	0.3	<0.1%		0.3	<0.1%
R21	0.3	<0.1%		0.3	<0.1%
R22	0.2	<0.1%		0.2	<0.1%
R23	0.2	<0.1%		0.2	<0.1%
R24	0.2	<0.1%		0.2	<0.1%
R25	0.3	<0.1%		0.3	<0.1%
R26	0.3	<0.1%		0.3	<0.1%
R27	0.2	<0.1%		0.2	<0.1%
R28	0.2	<0.1%		0.2	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R29	0.3	<0.1%		0.3	<0.1%
R30	0.3	<0.1%		0.3	<0.1%
R31	0.3	<0.1%		0.3	<0.1%
R32	0.3	<0.1%		0.3	<0.1%
R33	0.3	<0.1%		0.3	<0.1%
R34	0.2	<0.1%		0.2	<0.1%
R35	0.3	<0.1%		0.3	<0.1%
R36	0.3	<0.1%		0.3	<0.1%
R37	0.3	<0.1%		0.3	<0.1%
R38	0.3	<0.1%		0.3	<0.1%
R39	0.3	<0.1%		0.3	<0.1%
R40	0.3	<0.1%		0.3	<0.1%
R41	0.3	<0.1%		0.3	<0.1%
R42	0.3	<0.1%		0.3	<0.1%
R43	0.3	<0.1%		0.3	<0.1%
R44	0.3	<0.1%		0.3	<0.1%
R3_Cement	0.2	<0.1%		0.2	<0.1%
R6_Cement	0.2	<0.1%		0.2	<0.1%
1_ICT	0.3	<0.1%		0.3	<0.1%
9_ICT	0.3	<0.1%		0.3	<0.1%
Maximum	0.6	<0.1%		0.6	<0.1%

ES 362,000 µg/m³

Table E- 9: Predicted Process Contribution Annual Mean Acetonitrile Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m^3)	PC/ES (%)	Background Concentration (µg/m^3)	PEC (µg/m^3)	PEC/ES (%)
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.1%
R17	<0.01	<0.1%		<0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.1%
R24	<0.01	<0.1%		<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.1%
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	<0.01	<0.1%		<0.01	<0.1%

ES 680 µg/m³

Table E- 10: Predicted Process Contribution 1-hour Maximum Acetonitrile Concentrations – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	0.01	<0.1%	No Data Available	0.01	<0.1%
R2	0.01	<0.1%		0.01	<0.1%
R3	0.12	<0.1%		0.12	<0.1%
R4	0.07	<0.1%		0.07	<0.1%
R5	0.08	<0.1%		0.08	<0.1%
R6	0.09	<0.1%		0.09	<0.1%
R7	0.09	<0.1%		0.09	<0.1%
R8	0.18	<0.1%		0.18	<0.1%
R9	0.17	<0.1%		0.17	<0.1%
R10	0.15	<0.1%		0.15	<0.1%
R11	0.15	<0.1%		0.15	<0.1%
R12	0.14	<0.1%		0.14	<0.1%
R13	0.09	<0.1%		0.09	<0.1%
R14	0.09	<0.1%		0.09	<0.1%
R15	0.10	<0.1%		0.10	<0.1%
R16	0.10	<0.1%		0.10	<0.1%
R17	0.10	<0.1%		0.10	<0.1%
R18	0.13	<0.1%		0.13	<0.1%
R19	0.10	<0.1%		0.10	<0.1%
R20	0.10	<0.1%		0.10	<0.1%
R21	0.09	<0.1%		0.09	<0.1%
R22	0.09	<0.1%		0.09	<0.1%
R23	0.09	<0.1%		0.09	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R24	0.08	<0.1%		0.08	<0.1%
R25	0.11	<0.1%		0.11	<0.1%
R26	0.11	<0.1%		0.11	<0.1%
R27	0.09	<0.1%		0.09	<0.1%
R28	0.08	<0.1%		0.08	<0.1%
R29	0.10	<0.1%		0.10	<0.1%
R30	0.10	<0.1%		0.10	<0.1%
R31	0.10	<0.1%		0.10	<0.1%
R32	0.10	<0.1%		0.10	<0.1%
R33	0.10	<0.1%		0.10	<0.1%
R34	0.08	<0.1%		0.08	<0.1%
R35	0.11	<0.1%		0.11	<0.1%
R36	0.09	<0.1%		0.09	<0.1%
R37	0.10	<0.1%		0.10	<0.1%
R38	0.11	<0.1%		0.11	<0.1%
R39	0.12	<0.1%		0.12	<0.1%
R40	0.09	<0.1%		0.09	<0.1%
R41	0.11	<0.1%		0.11	<0.1%
R42	0.09	<0.1%		0.09	<0.1%
R43	0.10	<0.1%		0.10	<0.1%
R44	0.11	<0.1%		0.11	<0.1%
R3_Cement	0.08	<0.1%		0.08	<0.1%
R6_Cement	0.08	<0.1%		0.08	<0.1%
1_ICT	0.10	<0.1%		0.10	<0.1%
9_ICT	0.10	<0.1%		0.10	<0.1%
Maximum	0.22	<0.1%		0.22	<0.1%

ES 10,200 µg/m³

Table E- 11: Predicted Process Contribution 24-hour Long Term Mean Amides (Amide 1 + Formamide 1) Concentrations (against MEA ES) – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC ($\mu g/m^3$)	PC/ES (%)	Background Concentration ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/ES (%)
R4	<0.01	<0.1%		<0.01	<0.1%
R5	<0.01	<0.1%		<0.01	<0.1%
R6	<0.01	<0.1%		<0.01	<0.1%
R7	<0.01	<0.1%		<0.01	<0.1%
R8	<0.01	<0.1%		<0.01	<0.1%
R9	<0.01	<0.1%		<0.01	<0.1%
R10	<0.01	<0.1%		<0.01	<0.1%
R11	<0.01	<0.1%		<0.01	<0.1%
R12	<0.01	<0.1%		<0.01	<0.1%
R13	<0.01	<0.1%		<0.01	<0.1%
R14	<0.01	<0.1%		<0.01	<0.1%
R15	<0.01	<0.1%		<0.01	<0.1%
R16	<0.01	<0.1%		<0.01	<0.1%
R17	<0.01	<0.1%		<0.01	<0.1%
R18	<0.01	<0.1%		<0.01	<0.1%
R19	<0.01	<0.1%		<0.01	<0.1%
R20	<0.01	<0.1%		<0.01	<0.1%
R21	<0.01	<0.1%		<0.01	<0.1%
R22	<0.01	<0.1%		<0.01	<0.1%
R23	<0.01	<0.1%		<0.01	<0.1%
R24	<0.01	<0.1%		<0.01	<0.1%
R25	<0.01	<0.1%		<0.01	<0.1%
R26	<0.01	<0.1%		<0.01	<0.1%
R27	<0.01	<0.1%		<0.01	<0.1%
R28	<0.01	<0.1%		<0.01	<0.1%
R29	<0.01	<0.1%		<0.01	<0.1%
R30	<0.01	<0.1%		<0.01	<0.1%
R31	<0.01	<0.1%		<0.01	<0.1%
R32	<0.01	<0.1%		<0.01	<0.1%
R33	<0.01	<0.1%		<0.01	<0.1%
R34	<0.01	<0.1%		<0.01	<0.1%
R35	<0.01	<0.1%		<0.01	<0.1%
R36	<0.01	<0.1%		<0.01	<0.1%
R37	<0.01	<0.1%		<0.01	<0.1%
R38	<0.01	<0.1%		<0.01	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R39	<0.01	<0.1%		<0.01	<0.1%
R40	<0.01	<0.1%		<0.01	<0.1%
R41	<0.01	<0.1%		<0.01	<0.1%
R42	<0.01	<0.1%		<0.01	<0.1%
R43	<0.01	<0.1%		<0.01	<0.1%
R44	<0.01	<0.1%		<0.01	<0.1%
R3_Cement	<0.01	<0.1%		<0.01	<0.1%
R6_Cement	<0.01	<0.1%		<0.01	<0.1%
1_ICT	<0.01	<0.1%		<0.01	<0.1%
9_ICT	<0.01	<0.1%		<0.01	<0.1%
Maximum	<0.01	<0.1%		<0.01	<0.1%

ES 100 µg/m³

Table E- 12: Predicted Process Contribution 1-hour Maximum Amides (Amide 1 + Formamide 1) Concentrations (against MEA ES) – Abated FEED 2 Scenario

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R1	<0.01	<0.1%	No Data Available	<0.01	<0.1%
R2	<0.01	<0.1%		<0.01	<0.1%
R3	0.02	<0.1%		0.02	<0.1%
R4	0.01	<0.1%		0.01	<0.1%
R5	0.01	<0.1%		0.01	<0.1%
R6	0.02	<0.1%		0.02	<0.1%
R7	0.02	<0.1%		0.02	<0.1%
R8	0.03	<0.1%		0.03	<0.1%
R9	0.03	<0.1%		0.03	<0.1%
R10	0.03	<0.1%		0.03	<0.1%
R11	0.03	<0.1%		0.03	<0.1%
R12	0.02	<0.1%		0.02	<0.1%
R13	0.02	<0.1%		0.02	<0.1%
R14	0.02	<0.1%		0.02	<0.1%
R15	0.02	<0.1%		0.02	<0.1%
R16	0.02	<0.1%		0.02	<0.1%
R17	0.02	<0.1%		0.02	<0.1%
R18	0.02	<0.1%		0.02	<0.1%

Receptor	Proposed Installation PC (µg/m³)	PC/ES (%)	Background Concentration (µg/m³)	PEC (µg/m³)	PEC/ES (%)
R19	0.02	<0.1%		0.02	<0.1%
R20	0.02	<0.1%		0.02	<0.1%
R21	0.02	<0.1%		0.02	<0.1%
R22	0.02	<0.1%		0.02	<0.1%
R23	0.02	<0.1%		0.02	<0.1%
R24	0.01	<0.1%		0.01	<0.1%
R25	0.02	<0.1%		0.02	<0.1%
R26	0.02	<0.1%		0.02	<0.1%
R27	0.02	<0.1%		0.02	<0.1%
R28	0.01	<0.1%		0.01	<0.1%
R29	0.02	<0.1%		0.02	<0.1%
R30	0.02	<0.1%		0.02	<0.1%
R31	0.02	<0.1%		0.02	<0.1%
R32	0.02	<0.1%		0.02	<0.1%
R33	0.02	<0.1%		0.02	<0.1%
R34	0.01	<0.1%		0.01	<0.1%
R35	0.02	<0.1%		0.02	<0.1%
R36	0.02	<0.1%		0.02	<0.1%
R37	0.02	<0.1%		0.02	<0.1%
R38	0.02	<0.1%		0.02	<0.1%
R39	0.02	<0.1%		0.02	<0.1%
R40	0.02	<0.1%		0.02	<0.1%
R41	0.02	<0.1%		0.02	<0.1%
R42	0.02	<0.1%		0.02	<0.1%
R43	0.02	<0.1%		0.02	<0.1%
R44	0.02	<0.1%		0.02	<0.1%
R3_Cement	0.01	<0.1%		0.01	<0.1%
R6_Cement	0.01	<0.1%		0.01	<0.1%
1_ICT	0.02	<0.1%		0.02	<0.1%
9_ICT	0.02	<0.1%		0.02	<0.1%
Maximum	0.04	<0.1%		0.04	<0.1%

ES 400 µg/m³