CORY

DECARBONISATION

ENVIRONMENTAL STATEMENT: 6.1 CHAPTER 5: AIR QUALITY

Cory Decarbonisation Project

PINS Reference: EN010128

March 2024

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations (2009) - Regulation 5(2)(a)

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5. AIR QUALITY

5.1. INTRODUCTION

5.1.1. This chapter reports the assessment of the likely significant effects of the Proposed Scheme on air quality during construction and operation and describes:

- relevant policy, legislation and guidance;
- consultation undertaken to date;
- the methodology for assessment;
- potential effects of the construction phase; and
- potential effects of the operation phase.

5.2. POLICY, LEGISLATION, AND GUIDANCE

5.2.1. The policy, legislation, and guidance relevant to the assessment of air quality for the Proposed Scheme is detailed in **Table 5-1**.

Table 5-1: Air Quality Summary of Key Policy, Legislation and Guidance

Policy, Legislation or Guidance	Description
Policy	
Overarching National Policy Statement (NPS) for Energy EN-1 2024[1]	This Overarching National Policy Statement for Energy (EN-1) is part of a suite of NPS designated by the Secretary of State of DESNZ in January 2024. The following paragraphs relate to the Applicant's assessment: • Paragraph 5.2.11 – "*Defra publishes future national projections of air quality based on estimates of future levels of emissions, traffic, and vehicle fleet. Projections are updated as the evidence base changes and the applicant should ensure these are current at the point of an application. The applicant's assessment should be consistent with this but may include more detailed modelling and evaluation to demonstrate local impacts and national impacts. If an applicant believes they have robust additional supporting evidence, to the extent they could affect the conclusions of the assessment, they should include this in their representations to the Examining Authority along with the source".* • Paragraph 5.2.12 – "*Where a proposed development is likely to lead to a breach of any statutory air quality limits, objectives or targets or affect the ability of a*

Policy, Legislation or Guidance	Description
	non-compliant area to achieve compliance within the timescales set out in the most recent relevant air quality plan/strategy at the time of the decision, the applicant should work with the relevant authorities to secure appropriate mitigation measures to ensure that those statutory limits , objectives or targets are not breached". • Paragraph 5.2.13 – "*The Secretary of State should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. A construction management plan may help codify mitigation at this stage. In doing so the Secretary of State should have regard to the Air Quality Strategy in England or the Clean Air Plan for Wales in Wales, or any successors to these and should consider relevant advice within Local Air Quality Management guidance and PM2.5 targets guidance".* • Paragraph 5.2.14 – "*The mitigations identified in Section 5.14 on traffic and transport impacts will help mitigate the effects of air emissions from transport".* Paragraph 4.9.16 states: "*There are several different capture techniques which might have slightly different environmental impacts and considerations, which should be set out in the application. For example, some capture technologies may require hazardous substances consent for solvents required during the capture process, such as nitrosamines, and fall under Control of Major Accident Hazards (COMAH), For example, the use of amine-based solvents in some types of post-combustion carbon capture can create degradation products such as nitrosamines which may have impacts on human health and the environment. Best Available Techniques Guidance, assessment tool Horizontal 1 and Environmental Assessment Levels should be used when understanding impacts from capture solvents. The ES should also reflect the latest research in areas such as amine degradation where understanding is still developing.*" **Appendix 5-2: Operational Phase Assessment (Volume 2)** sets out details on how the assessment complies with this.

Policy, Legislation or Guidance	Description
	Paragraph 4.12.10 is also important context given that the Proposed Scheme will seek an Environmental Permit, as it notes that: *"The Secretary of State should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. The Secretary of State should act to complement but not seek to duplicate them."*
National Planning Policy Framework (NPPF) 2023[2]	The NPPF sets out the Government's planning policies for England and how these should be applied, with the following paragraphs relating to air quality: • Paragraph 174 – "*Planning policies and decisions should contribute to and enhance the natural and local environment by … preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution".* • Paragraph 185 – "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".* • Paragraph 186 – "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objective for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management*

Policy, Legislation or Guidance	Description
	Areas and Clean Air Zones is consistent with the local air quality action plan". • Paragraph 188 – "*The focus of planning policies and decisions should be on whether Proposed Scheme is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.*"
The London Plan 2021[3]	The Spatial Development Strategy for Greater London setting out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth. Policy SI1 of the London Plan is the key policy specific to the air quality within Greater London. In summary, and in relation to the Proposed Scheme, it states that Proposed Schemes should not lead to further deterioration of existing poor air quality, create any new areas that exceed air quality limits or delay the date at which compliance with the limits are achieved. Design solutions should also be implemented to reduce exposure to poor air quality.
The Bexley Local Plan 2023[4]	The Local Plan, adopted on 26 April 2023, positively plans for sustainable development across the Borough. It is essential to the delivery of the Council's other key plans and strategies, including the Bexley Plan, the Growth Strategy and the Connected Communities Strategy. The local plan does not contain any specific policies related to air quality, noting that the intention to minimise air pollution is inherent throughout the Local Plan.
London Environment Strategy 2018[5]	The London Environment Strategy seeks to ensure that The London Environment Strategy contains the aim to ensure that "London will have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities".
UK Air Quality Strategy[6]	The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales, and Northern Ireland (AQS). The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union

Policy, Legislation or Guidance	Description
	legislation. The AQS sets out the following air quality objectives to be met (amongst others): • nitrogen dioxide (NO_2) – 40µg/m^3 annual mean, 200µg/m^3 hourly mean not to be exceeded more than 18 times a year; • particulate Matter (PM_{10}) – 40µg/m^3 annual mean, 50µg/m^3 daily mean not to be exceeded more than 35 times a year; and • particulate Matter ($PM_{2.5}$) – As per Environmental Improvement Plan 2023 below.
Clean Air Strategy 2019[7]	This sets out measures that aim to reduce emissions from all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The Clean Air Strategy also proposes tough new goals to cut public exposure to airborne particulate matter (PM), as per the recommendation made by the World Health Organisation (WHO).
Environmental Improvement Plan 2023[8]	The Environmental Improvement Plan sets out the UK Government's visions at improving the environment in the UK. Goal 2: Clean Air specifies how the government will improve air quality in the UK by setting out targets that are presented in the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[17]. These include an interim target for the $PM_{2.5}$ annual mean of 12 µg/m^3 by January 2028, and an annual mean $PM_{2.5}$ concentration target of 10 µg/m^3 by 2040.
South East Inshore Marine Plan 2021[9]	The South East Inshore Marine Plan area stretches from Felixstowe in Suffolk to west of Dover in Kent and incorporates the River Thames. It will help to enhance and protect the marine environment and achieve sustainable economic growth while respecting local communities both within and adjacent to the marine plan area. Policy SE-AIR-1 states that "*Proposals must assess their direct and indirect impacts upon local air quality and emissions of greenhouse gases."* In addition, Policy SE-AIR-1 advises that "*Proposals that are likely to result in increased air pollution or increased emissions of greenhouse gases must demonstrate that they will, in order of preference:* *a) avoid* *b) minimise* *c) mitigate*

Policy, Legislation or Guidance	Description
	air pollution and/or greenhouse gas emissions in line with current national and local air quality objectives and legal requirements."
Legislation	
Environment Act 1995[10]	The Environment Act 1995 makes provision about targets, plans and policies for improving the natural environment. The Environment Act 1995 requires local authorities and other public bodies to review and document local air quality within their area. Where there are areas which do not meet the UK air quality standards, the relevant area is declared an Air Quality Management Area (AQMA), and an Air Quality Action Plan (AQAP) must be drawn up to secure improvements in air quality.
Environment Act 2021[11]	Creates the legislative framework by which statutory air quality targets are set by reference to plans such as the Environmental Improvement Plan 2021.
Environmental Protection Act 1990[12]	Section 79 – Control of Dust and Particulates Associated with Construction gives the following definitions of statutory nuisance relevant to dust and particles: • "*Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*"; and • *"Any accumulation or deposit which is prejudicial to health or a nuisance".* Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Whether a nuisance has arisen is contextual and requires having regard to the existing conditions and the change which has occurred.
Air Quality (England) Regulations 2000[13]	Many of the objectives in the AQS have been made statutory in England for the purpose of Local Air Quality Management (LAQM).
Air Quality Standards Regulations 2010, as amended in 2016[14]	The Air Quality Standards Regulations were derived from the European Union Ambient Air Quality Directive[15] and set legally binding thresholds for the concentration of pollutants in air for the protection of health and

Policy, Legislation or Guidance	Description
	ecosystems. In the Standards Regulations the thresholds are referred to as 'limit values'. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 25µg/m^3.
Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[16]	Regulation 2 of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 updated the Air Quality Standards Regulations 2010 to include a limit value of 20µg/m^3 for $PM_{2.5}$ from 2020. The limit values for NO_2 and PM_{10} remained the same concentration levels as the relevant AQS objectives.
The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[17]	The legislation sets out targets to reduce concentrations of $PM_{2.5}$ to be equal to or less than 10µg/m^3 by 2040. It also states that exposure to $PM_{2.5}$ must be reduced by at least 35% by 2040.
Guidance	
National Planning Practice Guidance (2021)[18]	Explains the processes and tools that can be used through the planning system in England. Specific to air quality, it provides information on the types of assessment that may be required for new development as well as sources of information for planners.
London Local Air Quality Management Technical Guidance (LLAQM.TG(19)) 2019[19]	The Mayor of London has published guidance for use by the London Boroughs in their review and assessment work. This guidance, referred to in this document as LLAQM.TG(19), these have been used where appropriate to define the proposed assessment methodology presented herein.
London Councils Air Quality and Planning Guidance 2007[20]	The guidance provides technical advice for developers, consultants and London local authorities on how to deal with a planning application in London that may have an impact on air quality.
IAQM/EPUK Land-use Planning and Development Control: Planning for Air Quality 2017[21]	Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published guidance that offers comprehensive advice on: • when an air quality assessment may be required; • What should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and • The possible mitigation measures that may be implemented to minimise these impacts.

Policy, Legislation or Guidance	Description
IAQM Guidance on the Assessment of Dust from Demolition and Construction 2023[22]	This document was produced to provide guidance on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.
The Control of Dust and Emissions During Construction – Supplementary Planning Guidance 2011[23]	The Mayor of London's Supplementary Planning Guidance (SPG) builds on the voluntary guidance published in 2006 by the London Councils to establish best practice in mitigating impacts on air quality during construction and demolition work. The SPG incorporates more detailed guidance and best practice and seeks to address emissions from Non-Road Mobile Machinery (NRMM) through a Low Emission Zone, which was introduced in September 2015 and expanded in August 2023. The SPG provides a methodology for assessing the potential impact of construction and demolition activities on air quality following the same procedure as set out in the IAQM construction dust assessment guidance. It then identifies the relevant controls and mitigation measures that should be put in place to minimise any adverse impacts, which need to be set out, in draft, in an air quality assessment report submitted with the planning application, and then formalised post submission as an Air Quality and Dust Management Plan. Details of site air quality monitoring protocols are also provided with varying requirements depending on the size of the site and the potential risk of adverse impacts.
Environment Agency Guidance of Air Emissions Risk Assessment 2021[24]	This Environment Agency guidance provides details on how to assess emissions for an Environmental Permit.
AQTAG06 Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air[25]	The AQTAG06 Guidance advises on carrying out the assessment of air quality impacts for Stage 3 appropriate assessment under the Habitats Regulations[26]. The Guidance sets out modelling methodologies for stacks and road sources as well as relevant dry deposition flux conversion factors for nitrogen deposition.
Waste Incinerators: Guidance on Impact Assessment for	Provides details on how to assess group 3 metals from stack emissions from municipal waste incinerators and waste wood co-incinerators.

Policy, Legislation or Guidance	Description
Group 3 Metals Stack Emissions (2016)[27]	
European Environment Agency Guidance 1.A.3.d[28]	Sets out methodologies on how to model air quality impacts from marine vessels.
Environment Agency Guidance on Specified Generators[29]	Sets out methodologies on how to model air quality impacts from generators.
London Plan Guidance – Air Quality Positive 2021[30]	The guidance provides examples and best practice to inform the preparation of statements for developments taking an Air Quality Positive approach. The approach seeks to maximise the benefits to local air quality in and around a development site and to minimise the exposure to existing sources of poor air quality. Full planning applications for developments subject to an EIA require an Air Quality Positive Statement (see **Appendix 5-4: Air Quality Statement (Volume 3)**).
London Plan Guidance – Air Quality Neutral 2021[31]	The Air Quality Neutral planning guidance provides a methodology for assessing the air quality neutrality of development in London. It involves the calculation of Nitrogen Oxide (NO_x) and PM_{10} emissions for both transport and buildings sources and comparison of these against Air Quality Neutral benchmarks, which are derived from information provided in the guidance for each planning land-use class. Developments that do not exceed these benchmarks (considered separately) are considered 'Air Quality Neutral', whilst developments that exceed the benchmarks, after appropriate onsite mitigation measures have been incorporated, will be required to off-set any excess in emissions offsite.

5.3. CONSULTATION AND ENGAGEMENT

5.3.1. **Table 5-2** provides a summary of the consultation and engagement undertaken in support of the preparation of this assessment.

5.3.2. **Table 5-3** provides a summary of comments provided as part of the statutory consultation process and an appropriate response.

5.3.3. **Appendix 4-2: Scoping Opinion Responses (Volume 3)** provides a summary of the Planning Inspectorate and consultee comments on the EIA Scoping Opinion[32] and the Applicant's responses.

Table 5-2: Consultation and Engagement Summary Table in relation to Air Quality

Date and Method of Consultation	Consultee	Summary of Key Topics discussed and Key Outcomes
23rd May 2023, Meeting	London Borough of Bexley	Presented the approach to the air quality assessment. LBB in agreement with the approach.

Table 5-3: Summary of the Statutory Consultation Comments in relation to Air Quality

Statutory Consultee	Response
Dartford Borough Council	
"Dartford Borough Council (DBC) has considered the submitted documents and the PEIR. DBC are supportive of the scheme but have significant concerns with regard to the traffic and air quality impacts and how these are proposed to be assessed and mitigated as set out in the PEIR. *The scheme will generate significant levels of traffic during construction with the scheme also having a long construction phase. The submitted details suggest that a majority of the construction traffic, in particular HGV's will travel to/from the A282/M25 using Bronze Age Way and Thames Road (within Bexley) and Bob Dunn Way within Dartford. This route already suffers from significant traffic levels and regular congestion. The known traffic 'hot spots' being Craymill Bridge, the western end of Bob Dunn Way and the eastern end of Bib Dunn Way and junction 1a of the M25/A282. The Environmental Impact Assessment (EIA) and Transport Assessment should fully assess the impacts of construction traffic on this route.*	Estimated construction traffic flows are set out in ES **Chapter 18: Landside Transport (Volume 1)**. Based on the predicted flows a quantitative assessment using ADMS Roads (version 5.0) has been undertaken to assess the impact of construction traffic on the local road network. Concentrations are reported at sensitive receptors along the modelled road network which extends from the Site to Junction 1A of the M25. The modelled road network is displayed in **Figure 5-3: Construction Emissions Assessment Study Area (Volume 2)** and includes Bronze Age Way and Bob Dunn Way.
Linked to the above, are issues related to air quality. DBC have no objection to the proposed scoping out of operational traffic. However,	Estimated construction traffic flows are set out in **Chapter 18: Landside Transport (Volume 1)** and are considerably lower

Statutory Consultee	Response
impacts from the construction phase on air quality as well as operational impacts from the facility itself should be fully considered in the EIA. *The PEIR advises that, "…if the predicted numbers of construction or operational traffic movements generated by the Proposed Scheme alone or cumulatively would demonstrably not exceed the relevant indicative criteria for air quality assessment set out in the IAQM guidance, as relevant to each of the affected roads used for construction or operational traffic (once the route has been confirmed), the Inspectorate agrees that this matter can be scoped out of the ES." However, DBC do not accept this approach. "Where predicted construction or operational traffic flows meet the criteria, the Scoping Report confirms that this matter will be scoped into the ES."* *The above approach is not accepted. The scheme will generate significant traffic levels, contributing to increased congestion and queuing of vehicles which has significant potential to reduce air quality. Air quality in and around Dartford is primarily impacted by congestion and vehicles queuing. Impacts on air quality in existing AQMA's should be considered regardless of the quoted criteria. The Council notes that this is 'indicative' criteria.* *Whilst exact details are to be agreed, it is highly likely that a route through Dartford to/from the M25/A282 will be used by construction traffic. This would take the majority of construction traffic and a large amount of construction staff vehicles through an existing AQMA. The EIA should not therefore ignore this issue and should consider the impacts on Dartford. This is particularly important given existing traffic levels and regular congestion in this area. Additionally, the Borough suffers from significant impacts from incidences at Dartford Crossing. The severity and the*	than that which was presented within the PEIR[34]. The predicted construction traffic flows were compared to stringent IAQM/EPUK[21] criteria and based on the predicted flows a quantitative assessment using ADMS Roads (version 5.0) has been undertaken to assess the impact of construction traffic on the local road network, accounting for the presence of AQMA. The results of the assessment are presented in **Section 5.8**.

Statutory Consultee	Response
frequency of incidences at Dartford Crossing creates significant queuing and standing traffic on the local road network as well as the strategic highways and this impacts air quality in the local area. Without assessment of impacts of air quality on this area, the extent of the impact and importantly any necessary mitigation will not be known and secured."	
"The scheme is aimed at reducing CO2 emissions and this is of course welcomed but the impacts of achieving this CO2 reduction should be fully considered and this should include all construction impacts including air quality impacts arising as a result of construction traffic."	The predicted construction traffic flows were compared to stringent IAQM/EPUK[21] criteria and based on the predicted flows a quantitative assessment using ADMS Roads (version 5.0) has been undertaken to assess the impact of construction traffic on the local road network. The results of the assessment are presented in **Section 5.8**.
"As this is within a London Borough, the report refers to the GLA's Air Quality Neutral Assessment (AQNA) requirement and also the Air Quality Positive Statement. (AQPS). For both of these the PINS response on the scoping was *"The Scoping Report explains that Policy S1 1 of the London Plan ('Improving Air Quality') states that "development proposals must be at least air quality neutral" and that the Greater London Authority sets out requirements for developments to demonstrate measures taken to achieve the best possible outcomes for air quality, known as Air Quality Positive. An AQNA and AQPS are proposed for the operational phase, but not for construction.* *The Scoping Report does not provide evidence that these requirements relate to operation only or provide justification for why such a consideration*	The current methodology for assessing compliance with Air Quality Neutral guidance[31] is based on a series of benchmarks for emissions of NO_X and PM_{10} from buildings (e.g. energy provision) and transport. There are no applicable benchmarks for an industrial development such as the Proposed Scheme, neither for the specific development type nor that could be used as a proxy for the development type. Therefore, an Air Quality Neutral Assessment is not applicable nor indeed possible. Notwithstanding this, the principal source of emissions from the Proposed Scheme are combustion gases from the incineration of waste. The Proposed Scheme will not change the emissions of NO_X and PM_{10} from Riverside 1 and Riverside 2 and is therefore inherently Air Quality Neutral.

Statutory Consultee	Response
is not required and therefore, the Inspectorate is not in a position to scope out the need for an AQNA and AQPS relating to the construction phase." *DBC agree that both the AQNA and AQPS will be important assessments. DBC also agree with the response from PINS which raises concerns that whilst these are proposed for the operational phase, these should also be provided for the construction phase. This links to DBC's point above regarding the consideration of air quality impacts."*	An Air Quality Positive Statement for the operation of the Proposed Scheme has been produced and is presented in **Appendix 5-4: Air Quality Positive Statement (Volume 3)**. Air quality impacts during construction are minimised through the actions set out in the **Outline CoCP (Document Reference 7.4)**. **Appendix 5-4: Air Quality Positive Statement (Volume 3)** relates to the Proposed Scheme design, focussing on the operation phase.
"It is also important that these assessments include cross-boundary impacts, both in relation to the operational phase of development and also the construction phase."	The air quality assessment considers impacts across the Study Areas defined in **Section 5.5**. This covers multiple local authorities. Outside of the Study Area air quality impacts will be negligible.
Thames Water	
"Aquatic species in the area local to the Proposed Development are likely to experience the effects of air quality changes. This could include changes to water quality parameters through deposition of nitrogen compounds, ammonia and other polluting gases. This has the potential to result in increased eutrophication in watercourses. With 99 aquatic invertebrate species within the Crossness NR, of which 3 are Nationally Rare and 14 are Nationally Scarce (Plant, 2019), this is of particular concern since the species are important on a National level. Crossness NR also supports 718 terrestrial invertebrate species, of which 5 are Section 41 species, 5 are Nationally Rare, and 56 are Nationally Scarce (Plant, 2021). These could also be significantly impacted."	Deposition of airborne nitrogen to the Crossness LNR is assessed with respect to the published critical loads for the relevant terrestrial habitats within the Crossness LNR, in **Section 5.8**. The ecological impacts of this are set out in **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

Statutory Consultee	Response
Greater London Authority	
"The London Plan sets a desire for developments to work towards Air Quality Positive status or at least Air Quality Neutral. *It is noted that an Air Quality Neutral (AQN) Assessment has not been prepared as part of the PEIR on the basis that there are no applicable benchmarks for industrial developments such as the Proposed Scheme. While this may be the case, the developer should refer to the London Plan Guidance 'Air Quality Neutral'; notably footnote 9 refers to the use of benchmarks when the use class/land use type is not listed or specified. In addition, the development will introduce other new emissions' sources through new vehicle movements and generators on-site which need to be addressed through and AQN Assessment. As such, an AQN Assessment should have been provided in the PEIR and is required for the ES.* *Air Quality Positive guidance was not written directly for DCOs and therefore does not specifically mention PEIRs. However, given that for masterplan applications and development briefs for large-scale developments an AQP statement is required, albeit with the understanding that it will be further developed at the detailed stage, an AQP statement should have been included. A full, detailed AQP statement needs is expected to be submitted as part of the ES. Preliminary results from the PEIR highlight a potential significant negative impact of nitrogen oxides from the proposed development on ecological receptors (namely Ingrebourne Marshes and the Inner Thames Marshes SSSIs, and*	Riverside 1 and Riverside 2 are industrial facilities for which specific benchmarks and application guidance are not provided in Air Quality Neutral Guidance. Footnote 9 states it is at the discretion of the Local Planning Authority to set the benchmarks, however, LBB were content there was no requirement for a formal Air Quality Neutral assessment. The vast majority of emissions associated with the facilities relate to emissions from the Riverside 1 and Riverside 2 themselves and the Proposed Scheme will not change the emissions of NO_X and PM_{10} from Riverside 1 or Riverside 2. Furthermore, the Proposed Scheme will generate minimal additional daily trips to the Site and there will be no requirements for additional space heating using onsite combustion. Overall, therefore, the Proposed Scheme is inherently Air Quality Neutral and, as agreed with the LBB, there is no requirement for a quantified Air Quality Neutral assessment. As a final note, the Proposed Scheme includes a backup power generator. However, its use will be intermittent and highly infrequent and this does not impact on the above conclusions. An Air Quality Positive Statement for the operation of the Proposed Scheme has been produced and is presented in **Appendix 5-4: Air Quality Positive Statement (Volume 3)**.

Statutory Consultee	Response
Crossness and Rainham Marshes Local Nature Reserves). However, the report does not clearly set out proposed mitigation approaches."	Air quality impacts on ecological sites have been assessed and presented in **Section 5.8**. The significance of effects is set out in **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

5.4. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

5.4.1. The air quality assessment of the Proposed Scheme has been undertaken in line with the legislation, policy and guidance described in **Section 5.2**.

5.4.2. Details of the assessment methodology are provided in **Appendix 5-1: Construction Phase Assessment (Volume 3)** and **Appendix 5-2: Operation Phase Assessment (Volume 3)**. The methodology for assessing impacts comprises a mix of qualitative and quantitative methods, as appropriate. Where a quantitative approach has been adopted, this is based on dispersion modelling using the ADMS suite of models.

POTENTIALLY SIGNIFICANT EFFECTS

5.4.3. As identified in the EIA Scoping Report[33] and PEIR[34], the following effects are considered to be significant and have been considered further in this assessment:

- Construction Phase:
  - impacts from dust, PM_{10} and $PM_{2.5}$;
  - emissions of NO_2, PM_{10} and $PM_{2.5}$ from operational NRMM;
  - road traffic emissions of NO_2, PM_{10} and $PM_{2.5}$; and
  - marine vessel emissions of NO_2, particulate matter (PM_{10} and $PM_{2.5}$) and SO_2.
- Operation Phase:
  - changes to emissions of AQS pollutants and other pollutants arising from the Riverside Campus as a result of the Carbon Capture Facility. This includes:
    - AQS and other pollutants emitted as a result of the incineration process i.e. NO_2, SO_2, PM_{10}, NH_3, acid gases, metals and dioxins, where there is no change to the mass of pollutant emitted but impacts on concentrations arise as a result of changes to the dispersion of the plume (herein referred to as ‘existing pollutants’); and
    - pollutants introduced by the Carbon Capture Facility i.e. solvent-based amines (hereafter referred to as 'amines') and degradation products, and aldehydes (herein referred to as ‘new pollutants’).
  - emissions of NO_2, PM_{10} and $PM_{2.5}$ from new backup power generator (Ancillary Infrastructure);
  - marine vessel emissions of NO_2, particulate matter (PM_{10} and $PM_{2.5}$) and SO_2; and
  - Human Health Risk Assessment.

5.4.4. In addition to the above an Air Quality Positive Statement has been prepared in accordance with Policy S1 1 of the London Plan[3]. This is presented as **Appendix 5-4: Air Quality Positive Statement (Volume 3)**.

5.4.5. The individual elements giving rise to emissions to air during the construction and operation phases have the potential to result in impacts that may, for the same pollutant, overlap geographically to some extent e.g. during operation, impacts from emissions of NO_2 from the Carbon Capture Facility will occur in similar areas to those

from the marine vessels. Therefore, in addition to quantifying the impacts from each aspect of the Proposed Scheme identified alone, the total impact from all the above elements during each phase (construction and operation separately) is quantified. This combined impact is referred to as the 'Full Proposed Scheme Air Quality (AQ) Impact'.

5.4.6. The operation of the proposed new backup power generator has not been included in the Operation Full Proposed Scheme AQ Impact. Further details are provided in **Appendix 5-2: Operational Assessment (Volume 3)**.

5.4.7. The Human Health Risk Assessment is only applicable to the emissions from the Carbon Capture Facility alone. This is because the compounds that are persistent in the environment, such as metals and dioxins, are not emitted by the marine (or road) vessels.

MATTERS SCOPED OUT

5.4.8. The following effects are considered unlikely to be significant, and therefore have not been considered further in this assessment:

- Operation:
  - road traffic emissions of NO_2, PM_{10} and $PM_{2,5}$ from the operation of the Hydrogen Project, as the Hydrogen Project is no longer included in the scope of the Proposed Scheme (as described in **Chapter 1: Introduction (Volume 1)**);
  - emissions of O_3 from the Hydrogen Project, as the Hydrogen Project is no longer included in the scope of the Proposed Scheme; and
  - emissions of toxic/flammable gases from fires, as described **in Chapter 1: Introduction (Volume 1)**, the battery energy storage system is no longer included as part of the Proposed Scheme.

BASELINE DATA COLLECTION

5.4.9. The key sources of information used to determine the baseline air quality conditions are:

- national pollutant concentration mapping for nitrogen oxides and particulate matter, available from the DEFRA website[35];
- national pollutant concentration data for ammonia and sulphur dioxide, and deposition mapping for nitrogen and acid, available from UK Centre for Ecology & Hydrology[33];
- LAQM monitoring and reporting from local authorities including the London Borough of Bexley (LBB)[36], Dartford Borough Council (DBC)[37], the London Borough of Barking and Dagenham (LBBD)[38], the Royal Borough of Greenwich (RBG)[39] and the London Borough of Havering (LBH)[40];
- UK's national monitoring networks, managed by the Environment Agency on behalf of DEFRA and the Devolved Administrations, with data available from DEFRA's UK Air Information Resource Website[41];

- peer reviewed literature focussed on atmospheric chemistry relating to amine reaction schemes;
- The Multi Agency Geographic Information System Mapping (MAGIC)[42]; and
- Proposed Scheme specific air quality monitoring undertaken by the Applicant (as detailed in **Section 5.6**).

ASSESSMENT METHODOLOGY

5.4.10. As set out in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**, two options for the construction programme of the Proposed Scheme are being considered: Option 1 and Option 2. The estimated construction period is approximately 60 months (five years) for Option 1 and approximately 42 months (three and a half years) for Option 2. The choice between Option 1 (two phase) or Option 2 (single phase) construction programmes will not affect the outcome of the assessment of impacts and effects. The required works, for example site clearance, material transport etc, are equivalent and whilst the two phase option may reduce the peak dust emissions, the longer overall programme of the single phase option increases the duration of potential exposure to dust. The IAQM construction dust assessment methodology[22] is not intended to differentiate between such scenarios and the derived dust risk grading is appropriate for both options. Moreover, the construction traffic impacts are based on peak daily traffic generation in the single phase option (Option 2). It will be a conservative representation of peak traffic generation under Option 1.

5.4.11. As set out in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**, two options for the design of the Carbon Capture Facility are being considered. One option is for individual lines to be connected to the exhaust stacks for Riverside 1 and Riverside 2, with two individual Stacks for the Carbon Capture Facility. A second option is for the two lines from Riverside 1 and Riverside 2 to be combined into a single Stack at the Carbon Capture Facility. To produce a conservative assessment, it was assumed that the two Stack(s) option would be taken forward for design noting that the single Stack option would result in lower ground level concentrations than the former option, due to the greater plume buoyancy a single Stack would produce.

5.4.12. As set out in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**, the choice between demolition or retention of the Belvedere Power Station Jetty (disused) is being considered. The choice between demolition or retention of the Belvedere Power Station Jetty (disused) will not change the outcomes of the assessment of impacts and effects reported within this chapter, which assume its removal. Should the Belvedere Power Station Jetty (disused) (with modifications) be retained, instead of demolished as the assessment below assumes, the quantity of construction activities and associated vehicle movements would reduce, therefore reducing the extent of the adverse air quality effects reported in this chapter.

5.4.13. The assessment presented within this chapter considers potential impacts from the construction and operation of the Proposed Scheme alongside Riverside 1 and Riverside 2.

Construction Phase Assessment Methodology

Impacts of Dust and PM_{10} and $PM_{2.5}$

5.4.14. Activities in the construction phase of the Proposed Scheme may result in the generation of fugitive dust emissions which, if transported beyond the Site, can have adverse impacts on local air quality, a qualitative assessment of the risk of impacts from these activities is included in the assessment.

5.4.15. Dust comprises of particles typically sized between 1-75 micrometres (μm) in aerodynamic diameter. Dust is created through the action of crushing and abrasive force on materials. Larger dust particles typically fall out of the atmosphere quickly after the initial release and therefore tend to be deposited in relative proximity to the source of the dust emission. As such, dust is unlikely to cause widespread or long term changes to local air quality, but its deposition on property can cause "soiling". This may result in nuisance complaints through amenity loss or perceived damaged caused, which is usually temporary.

5.4.16. The smaller particles of dust (not exceeding 10μm in aerodynamic diameter) are known as PM_{10} and represent only a small proportion of the total dust released. Within PM_{10} there is a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter not exceeding 2.5μm).

5.4.17. PM_{10} and $PM_{2.5}$ are the smaller end of the size range of dust particles and can remain suspended in the atmosphere for a longer period of time than larger particles and, therefore, can be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during respiration, which can have a potential impact on the health of sensitive members of the public. However, ambient dust emissions from construction activities will be as PM_{10} and predominantly in the coarse fraction ($PM_{2.5-10}$) rather than in the $PM_{2.5}$ fraction[22]. As such, the construction phase dust assessment focuses on levels of PM_{10} with respect to human receptors.

5.4.18. An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken with reference to: the Mayor of London's SPG[23] for the control of dust and emissions during construction and demolition; the available information for this phase of the Proposed Scheme; and professional judgement. The Mayor of London's SPG[23] requires a Dusk Risk Assessment to be undertaken following the methodology published by the IAQM[22].

5.4.19. The IAQM Construction Dust[22] guidance methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources:

- Demolition: any activity involved with the removal of any existing structures.
- Earthworks: the processes of soil-stripping, ground-levelling, excavation and landscaping.
- Construction: any activity involved with the raising of a new structure(s) (including building, road, etc), its modification or refurbishment.

- Track-out: the transport of dust from a site onto the public road network where it may be deposited and subsequently re-suspended by vehicles using the network. Track-out arises when heavy duty vehicles (HGV) leave a site with dusty materials which may then spill onto the road, and/or when HGV transfer dust onto the road network after travelling within a site.

5.4.20. The IAQM Construction Dust[22] guidance methodology takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined.

Emissions of NO_2, PM_{10} and $PM_{2.5}$ from Operation of NRMM

5.4.21. In addition to impacts on local air quality due to onsite construction activities, exhaust emissions from construction plant (non-road mobile machinery) may have an impact on local air quality in the vicinity of the Site itself. A qualitative assessment of this impact on local air quality has been undertaken using professional judgement and by considering the following:

- the number and type of construction plant likely to be required (based on the information on plant type presented in **Chapter 6: Noise and Vibration (Volume 1)**);
- the number and proximity of sensitive receptors to the Site; and
- the likely duration of the construction phase and the nature of the construction activities undertaken (informed by the indicative construction programme (Option 2)[a] and construction activities described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**).

Road Traffic Emissions of NO_2, PM_{10} and $PM_{2.5}$

5.4.22. A quantitative assessment of impacts from NO_X, particulate matter and NH_3 from construction traffic on the local road network has been undertaken. **Chapter 18: Landside Transport (Volume 1)** presents an estimate of peak road traffic movements to/from the Proposed Scheme during the construction phase. This information was used to screen for the requirement for a quantitative assessment of impacts using IAQM/EPUK guidance[21]. As presented in **Appendix 5-1: Construction Phase Assessment (Volume 3)**, the screening exercise indicated that quantitative modelling of emissions from vehicles was warranted due to the volume of both light and heavy duty construction traffic.

[a] The construction assessment presented in this chapter is appropriate for both construction programme options, as set out in **Chapter 2: Site and Proposed Scheme Description (Volume 1).**

5.4.23. The assessment of construction traffic impacts was based on dispersion modelling with the ADMS Roads (version 5.0.0.1)[45]. The model uses detailed information regarding traffic flows on the local road network, the geometry of the road network and local meteorological conditions to predict pollutant concentrations at specific receptor locations within 200m of roads affected by construction traffic.

5.4.24. The modelled road network was determined by construction traffic routing and includes roads exceeding the IAQM screening criteria. This is shown in **Figure 5-3: Construction Emissions Assessment Study Area (Volume 2)**. Outside of the modelled area, construction traffic will further disperse and changes to roadside pollutant concentrations will be imperceptible.

5.4.25. For the assessment of human exposure bespoke receptors were selected to capture the worst case impacts of construction traffic along the modelled road network. **Table 5-10** summarises the receptors used for the assessment of impacts on human receptors.

5.4.26. For the assessment of impacts to ecological sites a transect of receptors was utilised to represent impacts at Crossness LNR. No other sensitive ecological sites were located within 200m of the road network.

5.4.27. Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model were obtained from the observing station at London City Airport for 2022. The airport provides representative data for the Proposed Scheme.

5.4.28. The following traffic scenarios were modelled:

- Baseline 2022 – Baseline Year (also used for model verification);
- Do Minimum 2028 – Future Year Without construction traffic (including traffic growth assumptions set out in **Chapter 18: Landside Transport (Volume 1)**); and
- Do Something 2028 – Future Year With peak construction traffic (including traffic growth assumptions set out in **Chapter 18: Landside Transport (Volume 1)**).

5.4.29. Existing and future baseline traffic data without the Proposed Scheme were provided as Annual Average Daily Traffic (AADT), vehicle speeds (kph) and percentage of Heavy Duty Vehicles (HGV) for the local road network for 2022 and 2028. A diurnal traffic profile was input into the model to mimic the daily changes of traffic flows.

5.4.30. Construction traffic flows were provided as daily flows representing the peak daily flow during construction. These flows were added to the existing and future baseline flows and modelled as if representative of annual mean flows of construction traffic. This is a conservative assumption since, in reality, annual mean construction traffic flows will be considerably lower than the peak flows.

5.4.31. Vehicle emission factors for NO_X, PM_{10} and $PM_{2.5}$ were obtained using DEFRA's Emission Factors Toolkit (EFT) version 11.0[43]. The EFT allows for the calculation of emission factors arising from road traffic for all years between 2018 and 2030. For the predictions of future year emissions, the toolkit takes into account factors such as

anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time.

5.4.32. For emissions of NH_3[b], vehicle emission factors were obtained from the Calculator for Road Emissions of Ammonia (CREAM) V1AI[44].

5.4.33. Background NO_2 concentrations were derived from monitoring undertaken by Dartford Borough Council[c]. Monitoring location DA54 was the closest Urban Background location to the Proposed Scheme (approximately 6.6km) and the monitored concentration was a higher NO_2 concentration than the equivalent grid square from DEFRA's background mapping for 2022[35]. The future year background concentrations were projected from the 2022 monitoring using factors derived from DEFRA's background mapping[35].

5.4.34. In the absence of relevant monitored concentrations, background concentrations of PM_{10} and $PM_{2.5}$ were obtained from DEFRA's Background Mapping for 2022 and 2028[35].

5.4.35. For the assessment of impacts on ecological sites, background concentrations of NO_X, NH_3 and nitrogen deposition were obtained from the Air Pollution Information System (APIS)[45].

5.4.36. The ADMS Roads dispersion model[45] has been widely validated for this type of assessment and is fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the Proposed Scheme and, therefore, to determine the model performance at a local level, a comparison of modelled results with the results of roadside monitoring within the Study Area (detailed in **Section 5.5**) was undertaken. This process of model verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to provide greater confidence in the final results; this has been carried out following the methodology specified in Chapter 7 of LAQM.TG(22)[19]. Details of the verification process are provided in **Appendix 5.1: Construction Phase Assessment (Volume 3)**.

[b] At the PEIR[34] stage, impacts from construction traffic were not quantified and reference simply made to the primary pollutants emitted by vehicles in the context of human health. Since there is the potential for impacts from construction traffic on the Crossness LNR, it is necessary to also include ammonia in the assessment. Ammonia is emitted by vehicles (primarily petrol vehicles) and may affect ecological receptors both directly and indirectly via its contribution to nitrogen deposition.

[c] DEFRA's background mapping provides the broad temporal and spatial trends in concentrations of pollutants. Whilst these are appropriate for use in assessing the likely future total environmental concentrations with the Proposed Scheme, they may not capture the year-and location specific variations in background pollutant concentrations that can occur due, for example, to variations in meteorological conditions between years. These short/small scale variations do not affect the overall trends but can strongly influence the verification of the dispersion modelling of road traffic impacts which relies on identifying the impact from road traffic with reference to the difference between monitored and background concentrations in a specific year. Therefore, to ensure a robust model verification for construction traffic impacts, a local, year specific background concentration was derived from urban background monitoring undertaken by Dartford Borough Council. Dartford Council monitoring was used instead of London Borough of Bexley as the latter do not undertake diffusion tube monitoring on which much of the assessment is based.

5.4.37. The verification factors were applied to modelled road-NO_X outputs prior to conversion to NO_2 concentrations utilising DEFRA's NO_X to NO_2 calculator (version 8.1)[46].

5.4.38. As local roadside monitoring data are not available for PM_{10} or $PM_{2.5}$, the modelled road-PM_{10} and road-$PM_{2.5}$ components were adjusted using the verification factor obtained for NO_X before adding to the appropriate background concentration.

5.4.39. For impacts at ecological sites concentrations of NH_3 have not been verified as no monitoring data were available. This does not present a significant constraint to the assessment since the CREAM emissions model has itself been previously verified against real world monitoring.

5.4.40. Nitrogen deposition was modelled using a deposition velocity approach for road contributions of NO_X (after conversion to NO_2) and NH_3. The deposition velocities applied for NO_2 and NH_3 are habitat specific and follow those set out in Environment Agency (AQTAG) Guidance[25]. The modelled deposition was added to background deposition taken from APIS[45]. The depletion of the plume by deposition of material to surface vegetation has been ignored, which results in a conservative assessment.

5.4.41. The modelled NO_X and NH_3 concentrations and nitrogen deposition at sensitive ecological receptors within 200m of the modelled road network were passed to the Proposed Scheme ecologist for the determination of the significance of any possible effects, as set out in **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

5.4.42. The quantified impacts associated with road traffic emissions were assessed in relation to the following standards:

- statutory ambient air quality standards for both human and ecological receptors (see **Section 5.2**); and
- non-statutory critical levels and critical loads for ecological receptors, taken from the APIS website[45] (see **Table 5-9** below).

5.4.43. The results from the ADMS-Roads dispersion modelling represent annual mean concentrations and deposition. As noted above, the construction traffic data provided for the assessment related not to annual average vehicle flows but to peak construction traffic flows. As such, all modelled annual mean concentrations are highly conservative. Furthermore, there is no significant potential for health and ecological effects resulting from long term exposure to emissions from construction traffic since the construction period, and period of potential impacts, is time limited (approximately 42 or 60 months depending on the construction programme, as described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**). Therefore, the key outputs from the assessment of impacts of construction traffic relate to short term increases in pollutant concentrations during peak construction flows i.e. increases in daily or hourly mean concentrations.

5.4.44. In relation to impacts on human health, the compliance of roadside pollutant concentrations with the statutory air quality objectives for hourly mean NO_2 or daily mean PM_{10} concentrations cannot be robustly modelled directly. Therefore, following Chapter 7 of LLAQM.TG(19)[19], short term roadside concentrations were assessed as follows:

- for hourly mean NO_2 - by reference to the observed relationship between exceedances of the hourly mean air quality objective for NO_2 and annual mean NO_2 concentrations, namely that the hourly mean objective is unlikely to be exceeded where annual mean concentrations are less than 60µg/m^3; and
- for daily mean PM_{10} - by reference to the observed relationship between the number of days with PM_{10} concentrations greater than 50µg/m^3 and the annual mean PM_{10} concentration.

5.4.45. Since the modelled annual mean concentrations are conservative, the assessment of impacts on hourly mean and daily mean concentrations is also conservative.

5.4.46. For ecological receptors, compliance with the daily mean critical level for NO_X, which is based on the worst day of the year, was assessed with direct reference to the maximum modelled daily mean NO_X concentration in the ADMS-Roads modelling.

Marine Vessels Emissions of NO_2, NO_X PM_{10} and $PM_{2.5}$, and SO_2

5.4.47. A quantitative assessment of the impacts from NO_X, particulate matter and SO_2 from construction-related movements of marine vessels on the River Thames has been undertaken. Table 6.2 of EPUK/IAQM's Air Quality Planning Guidance[21] sets out indicative criteria for elements of a development which cause a requirement for an air quality assessment. Point 7 in the table states that an assessment is required where the development will: "*Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. N.B. this includes … shipping*".

5.4.48. The marine vessel movements associated with the Proposed Scheme during the construction phase are set out in **Table 5-4**. They include both construction-related activities and third party passenger vessels that operate for construction staff to access the Proposed Jetty/construction plant.

5.4.49. As such and compliant with the EPUK/IAQM guidance[21], a quantitative assessment of marine vessel emissions has been undertaken using the ADMS model (v6.0) published by Cambridge Environmental Research Consultants (CERC)[47]. The atmospheric dispersion model considers the effects on dispersion of surface parameters together with, in accordance with Environment Agency guidance[24], five years of recent meteorological data (2018 – 2022 inclusive) from London City Airport.

Table 5-4: Indicative Marine Construction Activity during peak construction periods

Vessel	Activity Duration	Peak Visits/day	Notes
Tugs	Assistance to Barges	4	Providing aid to dredging barge, 2 trips per barge movement (in and out), onsite manoeuvring, no hotellingd on site.
Jack-up Barge	Sporadic	-	Constant hotelling, no movements throughout day.
Jack-up Generator	Constant	1	Operational between 0700 to 1800 (11 hours).
Passenger Boat	3 visits per 24hr period	3	3 visits per day taken from existing activity schedule – assumed unaffected by construction.
Dredging Barge	Material delivery and removal	2	During peak periods, 2 barges operational per day.

5.4.50. As for the assessment of road traffic emissions, the information provided in **Table 5-4** for marine vessel movements and activities during the construction phase relates to peak rather than annual mean activities. No detailed information was available on the likely duration of each activity with respect to the construction period or total movements. That is to say that whilst the dredging barge, for example, will have a peak usage of two visits per day to the Site, these visits will be intermittent and only occur during periods of onsite dredging rather than on each day of the construction period (approximately 18 months). Notwithstanding this, since the assessment is relating to peak activities, it is conservative.

5.4.51. The scope of the assessment of construction impacts from marine vessels alone was, therefore, limited to impacts on human and ecological receptors over daily and hourly periods (as per the relevant standards set for each pollutant). Given the nature of the activities set out above and the duration of the construction period, it is unlikely that marine vessel activities during the construction period would result in a significant air quality effect from changes to long term exposure to air pollution (typically assessed as annual mean impacts). In addition, it is noted that any changes to annual mean pollutant concentrations from marine vessels during construction would be temporary (i.e. would occur only for the duration of relevant activities within the construction period) and reversible (i.e. pollutant concentrations would likely return to pre-construction levels following the cessation of works).

[d] Hotelling = berthing of a marine vessel.

5.4.52. In addition to the impacts from marine vessels alone, the Full Proposed Scheme AQ Impacts of construction phase marine vessels, traffic and the operation of Riverside 1 and Riverside 2 (at the time of writing, construction works for Riverside 2 are being undertaken) combustion units were also assessed. This necessitated consideration of annual mean impacts from marine vessels since, as set out above, the road traffic modelling relates primarily to annual mean impacts. Notwithstanding the noted limitations of modelling annual mean impacts based on peak activity levels, the combined impact assessment during the construction phase was based on the worst case daily emissions scenario for marine vessels set out below. This is a conservative assumption.

5.4.53. The assessment of emissions from marine vessels uses the methodology proposed in European Environment Agency (EEA) guidance[28]. The guidance adopts a tiered approach to inventory generation, with increasing sophistication, as follows:

- Tier 1 – uses default emission rates based on fuel consumption;
- Tier 2 – emission rates based on fuel consumption and engine types in the fleet; and
- Tier 3 – emission rates for vessel movements stratified by engine technology either as mass/kWh or mass/hr.

5.4.54. A Tier 3 approach was used for this assessment in which an emission factor, provided in g/kWh, is multiplied by an activity rate e.g. kWh energy use by vessels. In the case of shipping, the energy use is a function of vessel engine power (with main engines and auxiliary engines taken into account, kW), operating load (%) and time in mode (hrs).

5.4.55. Emissions were calculated for the following water-based activities:

- Hotelling – the term used for when a vessel is docked at the Proposed Jetty;
- Manoeuvring – the movement of a vessel casting off or docking; and
- Cruising – the movement of a vessel approaching or leaving the Proposed Jetty.

5.4.56. EEA default values were used for:

- engine fuel usage and emission factors for combustion of marine diesel oil in slow speed diesel engines;
- operating loads as a function of activity;
- times in mode as a function of activity; and
- ratio of auxiliary to main engine power.

5.4.57. SO_2 emissions were also taken from the EEA default values. This equates to a fuel sulphur content of 0.2%, which is conservative since it exceeds the maximum permissible sulphur content of fuel used within the emission control area (ECA) established by the International Maritime Organisation (IMO) for the North Sea area[48] (0.1%).

5.4.58. **Table 5-5**, below summarises the key assumptions made with regards to vessel types, engine size and length of time during each activity for the construction phase.

Table 5-5: Indicative Marine Construction Activity during peak construction periods

Vessel	Engine Power (kW)	Peak Visits/ Day	Time in mode (hours per visit)		
			Cruising	Manoeu-vring	Hotelling
Tugs	2400	4	0.82	1	0
Jack-up Barge	3600	-	0	0	24
Jack-up Generator	900	1	11	0	0
Passenger Boat	236	3	0.82	0.5	0.5
Dredging Barge	540	2	0.82	1	12

5.4.59. Using the above information, emissions were calculated for the following scenarios:

- worst case daily emissions – based on the maximum likely daily emissions of NO_X, SO_2 and PM_{10} taking into account limitations and construction practices (for assessment of daily mean impacts, and, when combined with traffic emissions, as an annual average impacts); and
- worst case hourly emissions – based on the maximum likely construction activities within any hour, for assessment against hourly and sub-hourly NO_2 and SO_2 standards.

5.4.60. For each scenario, the dispersion model was run with constant emissions for each meteorological year and the model used to directly output the relevant statistic for each metric for comparison with the standards e.g. the 99.79th percentile of hourly NO_2 concentrations, 90.41st percentile of daily mean PM_{10} concentrations, 99.73rd percentile of hourly mean SO_2 concentrations. Since activities will not be continuously at their peak levels, this is a conservative assumption. Furthermore, the assessment of impacts is based on the highest modelled concentration over the 5 years of meteorological data tested (2018 - 2022[e] inclusive).

5.4.61. The two shipping modes were represented in the dispersion model using volume sources as follows:

- emissions from hotelling and manoeuvring were represented by volume sources covering the Thames from south to north banks and from approximately 400m upstream and 1000m downstream of the Proposed Jetty. This representation of local movements reflects the fact that the exact routes taken by the vessels will vary according to the specific conditions on the day and the required dredging/docking activities and the pollutant release height will vary according to the specific vessels in use and tidal variations. It accounts for the local mixing of pollutants in air prior to dispersion towards on-land sensitive receptors; and

[e] At the time of writing meteorological data for 2023 was not available.

- emissions from cruising were represented as a volume sources covering the south to north bank of the Thames from just outside the manoeuvring area to approximately 5km upstream and 8km downstream. As for manoeuvring, this representation reflects the fact routine of vessels may vary between days and accounts for the mixing of pollutants in air prior to dispersion towards on-land sensitive receptors.

5.4.62. Background pollutant concentrations were taken from DEFRA's Background Mapping for 2028[35], provided as an annual mean concentration within a 1km x 1km square for the whole of the UK. For the assessment of daily mean concentrations, the annual mean background concentrations were used directly; for hourly mean concentrations, following LLAQM TG19[19], double the annual mean background was used. In both cases, no sector removal was undertaken for the modelled background since impacts of existing movements on the Thames are not modelled explicitly and must be accounted for via their inclusion in the background concentrations.

5.4.63. The quantified impacts associated with marine vessel emissions were assessed in relation to the following standards:

- statutory ambient air quality standards for both human and ecological receptors (see **Section 5.2**); and
- non-statutory critical levels and critical loads for ecological receptors, taken from the APIS website[45] (see **Table 5-9** below).

5.4.64. Emissions of NO_X from marine combustion sources include both nitrogen dioxide NO_2 and nitric oxide (NO), with the majority being in the form of NO. In ambient air, NO is oxidised to form NO_2, and it is NO_2 which has the more significant health impacts. For this assessment, the conversion of NO to NO_2, for compatibility with the modelling of the Stack(s) emissions, was estimated using the standard assumptions set out in the EA guidance[29], namely that:

- for the assessment of long term (annual mean) impacts, at receptors 70% of NO_X is NO_2; and
- for the assessment of short term (hourly mean) impacts, at receptors 35% of NO_X is NO_2.

5.4.65. For the assessment of 15 minute SO_2 concentrations, again following Environment Agency guidance[24], the modelled 99.9th percentile of hourly mean concentrations were scaled by a factor of 1.34 to obtain the 99.9th percentile of 15 minute mean concentrations. This accounts for the fact that within any hour, the peak 15 minute concentration will exceed the hourly mean concentration.

5.4.66. Further details of the methodology are provided in **Appendix 5.1: Construction Phase Assessment (Volume 3)**.

Operation Phase Assessment Methodology

Changes To Emissions of Pollutants (arising from the Riverside Campus as a result of the Carbon Capture Facility)

5.4.67. A quantitative (dispersion modelling) assessment of impacts from introduced pollutants and changes to the existing pollutants from the Riverside 1 and Riverside 2 combustion units has been undertaken. The assessment of emissions from the Proposed Scheme is based on a dispersion modelling exercise undertaken using the ADMS model (v6.0)[47]. The model has been validated against both field studies and wind tunnel studies of dispersion and is widely used for air quality impact assessment in the UK.

5.4.68. The atmospheric dispersion model considers the effects of terrain, roughness length and buildings (as appropriate for the location), together with, in accordance with Environment Agency guidance[24], five years of recent meteorological data (2018 - 2022 inclusive) from London City Airport. The model also has an in-built amine chemistry module that was used in the assessment.

5.4.69. The air pollutants assessed as part of the operation phase air quality assessment comprise:

- Oxides of nitrogen (NO_X);
- Particulate matter (capturing both PM_{10} and $PM_{2.5}$);
- Hydrogen chloride (HCl);
- Hydrogen fluoride (HF);
- Sulphur dioxide (SO_2);
- Ammonia (NH_3);
- Heavy metals;
- Dioxins, furans and dioxin-like polychlorinated biphenyls (PCB)[f]; and
- Pollutants introduced by the carbon capture process:
  - Amine and degradation products; and
  - Aldehydes.

5.4.70. Details of the adopted atmospheric dispersion modelling approach, including the treatment and assessment of amine and nitrosamine emissions, are provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**. However, key information relating to the dispersion modelling methodology is summarised in the subsections below.

[f] The recovery of energy from waste can result in emissions of pollutants that are persistent in the environment, including metals and dioxins/furans etc. As for all existing pollutants, the mass of emissions of these pollutants will not change with the implementation of carbon capture technology but their dispersion will be affected. For completeness, therefore, the impact of these changes on potential exposure to and intake of these pollutants is included within this assessment.

Modelled Scenarios

5.4.71. The air quality assessment for the operation phase of the Proposed Scheme has focussed on the following scenarios:

- Baseline:
  - continuous operation of Riverside 1 and Riverside 2 with the incineration of 850,000 and 805,920 tonnes of waste per annum (tpa) respectively i.e. continued operation at the current maximum permitted operating regime for each unit respectively.
- with Proposed Scheme:
  - continuous operation of Riverside 1 and Riverside 2 as above but including the continuous operation of the Carbon Capture Facility, i.e. operation at the current maximum permitted operating regime/waste throughput for each unit since there is no change to performance as a result of the application of a carbon capture process.

5.4.72. The impact of the Proposed Scheme is taken to be the difference between these scenarios (i.e. Proposed Scheme minus Baseline). The Baseline scenario is also assumed to be occurring during the construction phase of the Proposed Scheme.

Modelled Absorber Stack(s) Parameters

5.4.73. There are two options being considered for the design of the Proposed Scheme:

- Two Absorber Column(s) and Stack(s) where one emits post-capture gas from Riverside 1, and the other from Riverside 2; and
- One Absorber Column(s) and Stack(s) where the two lines from Riverside 1 and Riverside 2 are merged to form a single point of emission.

5.4.74. For the purposes of the air quality assessment, the dispersion modelling was based on the two Absorber Column(s) and Stack(s) design, as this resulted in a more conservative impact than the one Absorber Colum(s) and Stack(s) design due to the increased buoyancy of the merged plumes.

5.4.75. The modelled Stack(s) parameters for the two new Absorber Column(s) Stack(s) are provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**. The flue discharge conditions are based on maximum permitted operations at Riverside 1 and Riverside 2 both with and without the Carbon Capture Facility (as the Carbon Capture Facility does not change them).

5.4.76. For pollutants associated within the incineration of waste (existing emissions), all pollutant emissions were based on current emission limit values as per the existing Environmental Permit conditions for Riverside 1 and Riverside 2. The carbon capture process is assumed to make no difference to the mass emission rates of these pollutants. The impacts of the Proposed Scheme on these pollutants relates to changes to the plume buoyancy and release locations only.

5.4.77. A technology supplier has not yet been selected for the carbon capture process. Consequently, the post carbon capture exhaust gas parameters and pollutant emissions (amines, nitrosamines, aldehydes) are based on indicative parameters derived from information provided by candidate suppliers.

5.4.78. Emissions of amines and nitrosamines associated with the loss of solvents (and their subsequent degradation) from the carbon capture process (the flue gases) were modelled using monoethanolamine (MEA) and dimethylamine (DMA) as indicative emissions of primary and secondary amines respectively. Primary amines do not form stable nitrosamines and, therefore, direct emissions of nitrosamines are modelled as N-nitrosodimethylamine (NDMA), which is the nitrosamine formed by the degradation of DMA.

5.4.79. For the purpose of the comparison of impacts with the associated non-statutory Environmental Assessment Levels (EAL) set by the Environment Agency (**Table 5-8** below), all amine concentrations are assessed (cumulatively) against the EAL for MEA; whilst all nitrosamine and nitramine concentrations are assessed against the EAL for NDMA (again cumulatively). Aldehydes are assessed against the EAL for formaldehyde.

5.4.80. **Appendix 5-2: Operation Phase Assessment (Volume 3)** contains further details on the atmospheric dispersion model input parameters, assumptions and limitations, post-processing of model outputs and associated sensitivity testing that has been completed to inform this chapter.

Model Outputs

5.4.81. The processed model outputs comprise concentration data for each pollutant and the respective short term (e.g. hourly, daily) and long term (annual) averaging periods at all gridded receptor locations (human and ecological). These outputs are provided for each of the modelled five years (2018-2022 inclusive), thereby allowing the maximum value at each receptor to be reported over this period. The relevant averaging periods specific to each assessed pollutant are provided in **Table 5-8** and **Table 5-9** below for human and ecological receptors respectively.

5.4.82. For the assessment of 15 minute SO_2 concentrations, following Environment Agency guidance[24], the hourly mean concentrations are multiplied by a factor of 1.34. This accounts for the fact that within any hour, the peak 15 minute concentration will exceed the hourly mean concentration.

5.4.83. In addition to modelling concentrations of each pollutant, the assessment of nutrient nitrogen deposition and acid deposition at identified sensitive ecological habitats, associated with emissions from each modelled scenario, has adhered to Environment Agency guidance[25]. For nitrogen-containing pollutants not included within this guidance (i.e. amines, nitrosamines, nitramines), a deposition velocity equivalent to that for ammonia was used, which is based on relevant research[49], and is considered to be conservative (see **Appendix 5-3: Detailed Model Pollutant Results (Volume 3)**).

5.4.84. Background pollution and nitrogen/acid deposition levels for each relevant compound, where available, have been obtained from national mapping data provided by DEFRA[35] and APIS[45] for human and ecological receptors respectively, supplemented by available monitoring data from local and national network sites. These are reported in **Section 5.4**.

5.4.85. The quantified impacts associated with the Absorber Column(s) and Stack(s) emissions, termed the Process Contribution (PC) (i.e. the pollutant concentration resulting from the Baseline scenario and the Proposed Scheme) and the Predicted Environmental Concentration (PEC) (i.e. the PC plus background concentration or deposition for each scenario) have been assessed in relation to the following standards:

- statutory ambient air quality standards for both human and ecological receptors (see **Section 5.2**);
- non-statutory EAL set by the Environment Agency (see **Section 5.2**); and
- non-statutory critical levels and critical loads for ecological receptors, taken from the APIS website[45] (see **Table 5-9** below).

5.4.86. This assessment has accounted for the PC and PEC relating to the operation of the Proposed Scheme alone. The impact of the Proposed Scheme represents the change in concentration/deposition between the Baseline scenario PC and Proposed Scheme scenario PC. The assessment of cumulative impacts, whereby the PC from the Proposed Scheme is added to relevant PC from qualifying developments within the Study Area is presented in **Section 5.8**.

Emissions of NO_2 and PM_{10} from New Backup Power Generator (Ancillary Infrastructure)

5.4.87. A quantitative (dispersion modelling, including statistical analysis of outputs) assessment of impacts from backup power generation has been undertaken. The proposed new diesel-powered backup power generator will operate for a maximum of 50 hours per year and is, therefore, exempt from compliance with the MCPD emission limits[50]. Notwithstanding this, the Environmental Permitting Regulations[51] require that all installations use appropriate measures to reduce emissions to air through the application of best available techniques (BAT). Environment Agency recently issued guidance[52] on BAT for emergency backup diesel generators. This stated that backup generators should be emissions optimised (rather than efficiency optimised) and comply with the international build standards '2g TA-Luft' or the US EPA Tier 2. Therefore, emissions from the backup power generator will be required to meet 2000mg/Nm^3 (2g/Nm^3, at 5% O_2, dry) and 80mg/Nm^3 for particulate matter.

5.4.88. Since the backup power generator will operate highly infrequently throughout the year, long term exposure to emissions will not occur and the contribution of the generator to annual mean concentrations will be imperceptible and not requiring assessment. However, when the generator is operating, short term exposure to the exhaust emissions may occur. As such, a screening exercise was undertaken to assess the impacts of the backup power generator in the event of a temporary power outage from the grid and its routine testing.

5.4.89. The exercise involves modelling the impacts of the backup power generator assuming continuous full load (0.2MW) operation, with a statistical analysis of the outputs to determine the likelihood of exceedance of air quality standards based on operation for up to 50 hours of year, potentially including consecutive hours of operation.

5.4.90. The ADMS dispersion model (Version 6.0)[47] was used to model the impacts from generator use across a grid of receptors out to 2km from the Stack(s). As for the main Riverside 1 and 2 units, 5 different years of meteorological data were modelled, from London City Airport for 2018 to 2022 inclusive, and the assessment was based on the highest concentration over all years.

5.4.91. At the time of writing only the power output of the generator and run time (0.2MW at 50 hours per year) were available. Model input parameters were derived on the basis of professional judgement, similar project experience, and the requirement to meet BAT[g].

5.4.92. For metrics with short averaging periods, such as the hourly mean NO_2 objective or the daily mean nitrogen oxides critical level for ecology, it is possible that there is a theoretical risk of exceedance of the objective when impacts are modelled assuming continuous operation of all plant. In these cases, it is necessary to carry out a statistical analysis of the model results to determine the probability of exceedance of the objective when the limited operating hours and likely operating patterns of the plant are taken into account.

5.4.93. Following Environment Agency guidance[29], the statistical analysis for the Proposed Scheme was based on the hypergeometric probability distribution, and took into account the maximum number of hours/days where the concentration of pollutants in ambient air exceeds the standard in any year and the number of operating hours/days per year.

5.4.94. The statistical analysis was undertaken for the following metrics:

- hourly mean impacts of NO_2 and daily mean impacts of PM_{10} at human receptors; and
- daily mean impacts of NO_X at ecological receptors.

5.4.95. Emissions of NO_X from combustion sources include both nitrogen dioxide NO_2 and nitric oxide (NO), with the majority being in the form of NO. In ambient air, NO is oxidised to form NO_2, and it is NO_2 which has the more significant health effects. For this assessment, the conversion of NO to NO_2 was estimated using the standard assumptions set out in the EA guidance[29], namely that:

- for the assessment of long term (annual mean) impacts, at receptors 70% of NO_X is NO_2; and

[g] The following inputs were assumed for the generator: Output of plant 0.2MW, NO_X/PM_{10} emission concentrations 2000/80 mg/Nm3 at reference conditions (5% Oxygen, dry); release height 6m; release diameter 0.5m

- for the assessment of short term (hourly mean) impacts, at receptors 35% of NO_X is NO_2.

5.4.96. The oxidation of NO to NO_2 is not, however, an instantaneous process and, where the maximum impacts occur within a few hundred metres of the Stack(s), the Environment Agency's assumptions are likely to be conservative.

5.4.97. Background concentrations of NO_X and NO_2 were obtained from DEFRA's background mapping[35]. For hourly mean NO_2, it is assumed that the background concentration is double the annual mean concentration, as per Environment Agency guidance[24].

Marine Vessel Emissions of NO_2, NO_X, SO_2 and PM_{10} and $PM_{2.5}$

5.4.98. The marine vessel movements associated within the operation phase of the Proposed Scheme are set out in **Table 5-6**, below.

5.4.99. The methodology for the assessment largely follows that set out in the construction phase methodology above, but with operation phase vessel movements. The main assumption changes between construction and operation were that:

- emissions for the LCO_2 vessels were assumed to meet the latest IMO standards[48] rather than EEA default emission factors;
- hotelling times for LCO_2 vessels were based on loading times rather than EEA default times in mode; and
- hotelling emissions were represented as point sources located on the basis of the latest design for the Proposed Jetty.

Table 5-6: Indicative Marine Operation Activity During Operation of the Proposed Scheme

Vessel	Activity Duration	Average Visits/ Week[a]	Assumption Notes
Tugs	Arrival/Departure Assistance to Vessels	8.1	Providing aid to CO_2 Vessels, two trips per vessel movement (in and out), onsite manoeuvring, no hotelling on site. It is assumed that the operation of the new berth for the tugs will have no impact on the results as there will be minimal change in the movement profile.
LCO_2 Vessel	Sporadic	4.05	Based on 12 hour stops per visit. Vessels are assumed to operate in

Vessel	Activity Duration	Average Visits/ Week[a]	Assumption Notes
			hotelling mode throughout the visit with no movements from docked position. LCO_2 vessels have been assumed to be purpose-built, and therefore will comply with latest International Maritime Organization emissions standards for new vessels[53].

Note:
[a] Vessel movements have been based on 1.5 million tonnes of LCO_2 per annum and a LCO_2 transportation vessel size of 7,500m^3.

5.4.100. Operational dredging vessels have not been included in the assessment as dredging is only likely to occur once annually and is unlikely to contribute as a source of emissions.

5.4.101. Using the above information, operating durations were calculated for the following scenarios:

- annual emissions – based on a recurring weekly profile over the course of a calendar year and the export of 1.5 million tonnes of CO_2, for assessment against annual mean NO_X, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ standards;
- worst case daily emissions – based on maximum likely daily emissions but taking into account operational limitations and likely practices, for assessment against daily average NO_X, SO_2 and PM_{10} standards; and
- worst case hourly emissions – based on maximum likely emissions within an hour, taking into account operational limitations, for assessment against hourly NO_2 and SO_2 standards and 15 minute SO_2 standard.

5.4.102. The three shipping modes were represented in the dispersion model using volume sources and point sources as follows:

- emissions from hotelling were represented by point sources based on Proposed Jetty, at a height representative of the assumed Above Ground Storage Tanks;
- emissions from manoeuvring were represented by volume sources covering the Thames from south to north banks as during operation, reflecting the variety of potential routes that can be taken by vessels and tugs for the Proposed Scheme and also the general mixing of pollutants in air prior to dispersion off the Proposed Jetty; and

- emissions from cruising were represented as a volume source along the standard approach to the Proposed Jetty. This representation reflected uncertainty over the height of emissions from various vessels and the general mixing of pollutants in air prior to dispersion away from the river.

Human Health Risk Assessment

5.4.103. A quantitative risk assessment of effects on human health from changes to the potential intake, via the food-chain, of pollutants that can accumulate in the environment (dioxins, metals etc) has been undertaken.

5.4.104. A human health risk assessment is undertaken to consider the potential direct and, importantly, indirect, exposure to emissions to air from the Proposed Scheme. In this context, direct exposure relates to the inhalation of pollutants and indirect exposure to the ingestion of pollutants via soil and food produce (fruit, vegetables, meat, dairy and eggs) that have themselves been exposed to emissions from the Proposed Scheme.

5.4.105. The methodology uses the USEPA Human Health Risk Assessment Protocol[54] to quantify the potential intake of dioxins and furans, dioxin-like PCB and metals, taking into account their accumulation in the environment over time. The approach adopted is precautionary since it considers the exposure of subsistence farmers and their children, who eat all locally produced (and exposed) food and residents and their children, who eat locally produced vegetables but not animal products. Both scenarios are highly conservative. Further details are provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**.

Air Quality Neutral Assessment and Air Quality Positive Statement

5.4.106. A qualitative consideration of the requirements of London's Air Quality Neutral and Air Quality Positive requirements has been undertaken.

5.4.107. The current methodology for achieving a standard of Air Quality Neutral is based on a series of benchmarks for emissions of NO_X and PM_{10} from buildings (e.g. energy provision) and transport. There are no applicable benchmarks for an industrial development such as the Proposed Scheme, therefore, an Air Quality Neutral Assessment is not required.

5.4.108. Notwithstanding this, the principal source of emissions from the Proposed Scheme are combustion gases from the incineration of waste, as discussed in **Section 5.8**. The Proposed Scheme will not change the emissions of NO_X and PM_{10} from Riverside 1 and Riverside 2 and is therefore inherently Air Quality Neutral.

5.4.109. Regarding Air Quality Positive, the Proposed Scheme has been designed to minimise its impact on local air quality, in particular the design of the two new Absorber Column(s) and Stack(s) has been optimised for air quality. This is set out in **Appendix 5-2: Operation Phase Assessment (Volume 3)**.

5.4.110. A formal statement setting out the evidence base for the design measures incorporated in the Proposed Scheme to satisfy the requirements for Air Quality Positive is provided in **Appendix 5-4: Air Quality Positive Statement (Volume 3)**.

Full Proposed Scheme AQ Impact (All Sources)

5.4.111. For each phase of the Proposed Scheme the impacts from the various modelled sources have been combined to produce a Full Proposed Scheme AQ Impact. Where appropriate, short term and long term impacts have been summed for the following sources of emissions:

- Construction Phase Full Proposed Scheme AQ Impact:
  - Baseline during Construction:
    - Future Baseline traffic flows; and
    - Operation of Riverside 1 and Riverside 2 (no carbon capture);
  - With Proposed Scheme during Construction:
    - Construction-related marine vessel movements;
    - Construction plus Future Baseline traffic movements; and
    - Operation of Riverside 1 and Riverside 2 (no carbon capture process);
- Operation Phase Full Proposed Scheme AQ Impact:
  - Baseline during Operation:
    - Baseline operation of Riverside 1 and Riverside 2 (no carbon capture process).
  - With Proposed Scheme during Operation:
    - Marine vessel movements; and
    - Carbon Capture Facility operation.

5.4.112. The operation of the proposed new backup power generator has not been included in the Operation Full Proposed Scheme AQ Impact since its operation is not planned or even expected in a typical year. Furthermore, as will be demonstrated, impacts during operation of the backup generator are highly localised to the generator and there is no significant potential for combined impacts.

5.4.113. The ‘impact’ of the Full Proposed Scheme is defined as the difference between the With Proposed Development and Baseline Operation scenarios during both the Construction and Operation phase. This implies that for the Construction Phase, the impact is generally identical to the impact of marine vessel alone but that, for the assessment of significance, the total environmental concentration (i.e. modelled sources plus background concentrations) takes account of the Riverside Campus emissions. At the roadside, the construction impacts equate to the marine vessel impacts plus the construction traffic impact.

5.4.114. For the Operation Phase, the impacts take account of the change in impacts from the incinerators themselves, plus the operational marine vessel movements.

5.4.115. The summation of short term impacts from the modelled exhaust stacks (Riverside 1, Riverside 2 and the new Absorber Colum(s) and Stack(s) associated with the Carbon Capture Facility) and marine vessels has been undertaken on a conservative basis, with the maximum short term impacts from each source added without consideration

of whether maximum impacts would, in reality, occur under the same meteorological conditions or at the same time.

5.4.116. During construction, the risk of exceedance of short term objectives at the roadside with the Proposed Scheme is assessed with reference to the annual mean concentrations under the Full Proposed Scheme scenario. This is because, as noted previously, short term impacts from road sources cannot be robustly modelled and cannot therefore be added to maximum hourly or daily concentrations from other sources.

SIGNIFICANCE CRITERIA

Impacts of Dust, PM_{10} and $PM_{2.5}$ from Construction Works

5.4.117. The matrix for determining significant effects for the construction dust assessment is shown in **Chapter 4: EIA Methodology (Volume 1)** and shows the defined descriptors for magnitude of impact (degree of change) and sensitivity of the receptor.

5.4.118. For the purpose of the construction dust assessment, the IAQM dust guidance[22] is not directly comparable given the nature of the Proposed Scheme and so professional judgement has been used to determine the significance of effects for dust soiling, human health and ecological sites.

IAQM/EPUK Significance Criteria

5.4.119. The significance criteria set out below apply to the following potentially significant effects:

- Construction Phase:
  - road traffic emissions of NO_2, PM_{10} and $PM_{2.5}$; and
  - marine vessel emissions of NO_2, SO_2, PM_{10} and $PM_{2.5}$.
- Operation Phase:
  - changes to emissions of existing pollutants (generated in Riverside 1 and Riverside 2 following the application of the carbon capture process) and emissions of new pollutants from the Carbon Capture Facility;
  - emissions of NO_2, PM_{10} and $PM_{2.5}$ from new backup power generator (Ancillary Infrastructure); and
  - marine vessel emissions of NO_2, SO_2, PM_{10} and $PM_{2.5}$.

Human Receptors

5.4.120. For long term (annual mean) pollutant concentrations, the IAQM/EPUK guidance[21] recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant Air Quality Assessment Level (AQAL) and examining this change in the context of the new total concentration and its relationship with the assessment criterion. This is summarised in **Table 5-7**.

5.4.121. The IAQM/EPUK impact descriptors[21] are used as the starting point to make a judgement on significance of effects, since other impacts/effects may be important. The IAQM/EPUK[21] guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including the:

- existing and future air quality in the absence of the Proposed Scheme;
- extent of current and future population exposure to the impacts; and
- influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Table 5-7: Air Quality Impact Descriptors Relating to Individual Receptors (Human)

Long term Average Concentration at Receptors in Assessment Year	% Change in Concentration Relative to AQAL			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% AQAL	Negligible	Slight	Moderate	Moderate
95 – 102 of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes:

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives and non-statutory EALs for human health.

Where the %change in concentrations is <1%, the change is described as 'negligible' regardless of the concentration. For this assessment, this is interpreted as a %change <1.0% (rounded to 1dp) for compatibility with Environment Agency guidance[24].

When defining the concentration as a percentage of the AQAL, 'without scheme' (baseline) concentration should be used where there is a decrease in pollutant concentration and the 'with scheme' (Proposed Scheme) concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

5.4.122. The IAQM/EPUK guidance[21] states that for most road transport related emissions, long term average concentrations are the most useful for evaluating the severity of impacts. For short term (sub-hourly, hourly and daily averages) pollutant concentrations from sources such as the Proposed Scheme Stack(s) ('point' sources), the IAQM/EPUK guidance[21] recommends that the impact is described with reference to the magnitude of the impact from the process without consideration of the background concentrations. This assumes that the background concentrations will be smaller than the peak concentrations caused by a substantial plume. Where the impact is ≤10% of an AQAL, it is negligible; impacts in the range 11-20% are slight, 21-50% are moderate and those ≥51% are substantial.

5.4.123. As a precautionary approach, both long term and short term average concentrations have been considered with respect to judging likely significant effects as part of this assessment, and long term assessments from both the point and other sources (roads and marine vessels) are assessed against the criteria matrix shown in **Table 5-7**.

5.4.124. The AQAL, **Table 5-8** , for the assessment are derived from UK air quality regulations[13] or, where statutory standards do not exist, Environment Agency EAL[24].

5.4.125. It should be noted that throughout the presentation of model results within this chapter and associated appendices, short term pollutant concentrations where there are no permitted exceedances of the standard e.g., NH_3, CO, HF, HCl are reported as the 100th percentile of concentrations at any receptor i.e. the maximum concentration modelled within any meteorological year, assuming continuous emissions from the source. For metrics where there are several permitted exceedances per year, the concentrations are reported as the equivalent percentile of concentrations as follows:

- 99.79th percentile of hourly mean NO_2 concentrations – equivalent to the 18th highest hourly mean concentration;
- 90.41st percentile of daily mean PM_{10} concentrations (35th highest daily mean);
- 99.9th percentile of 15 minute mean SO_2 concentrations (36th highest 15 minute mean);
- 99.73rd percentile of hourly mean SO_2 concentrations (24th highest hourly mean); and
- 99.18th percentile of daily mean SO_2 concentrations (3rd highest daily mean).

Table 5-8: Air Quality Assessment Levels for Human Health

Pollutant	Averaging Period	Concentration (µg/m^3)	Permitted Exceedances per Year	Statutory
NO_2	1hr	200	18	Y
	Annual	40	-	Y
PM_{10}	Daily	50	35	Y
	Annual	40	-	Y

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	Permitted Exceedances per Year	Statutory
SO_2	15min	266	36	Y
	1hr	350	24	Y
	24hr	125	3	Y
$PM_{2.5}$	Annual	20		Y
CO	8hr	10000	-	Y
HF	1hr	160	-	-
HCl	1hr	750	-	-
	Annual	16	-	-
NH_3	1hr	2500	-	-
	Annual	180	-	-
Arsenic	Annual	0.006	-	-
Cadmium	Annual	0.005	-	-
Lead	Annual	0.25	-	Y
Nickel	Annual	0.02	-	Y
Antimony	1hr	150	-	-
	Annual	5	-	-
Chromium III	1hr	150	-	-
	Annual	5	-	-
Chromium VI	Annual	0.00025	-	-
Copper	1hr	200	-	-
	Annual	10	-	-
Manganese	1hr	1500	-	-
	Annual	0.15	-	-
Mercury	1hr	7.5	-	-
	Annual	0.06	-	-
Vanadium	24 hr	1	-	-
MEA	1hr	400	-	-
	24 hr	100	-	-
NDMA	Annual	0.0002	-	-
Formaldehyde	1hr	100	-	-
	Annual	5	-	-

Ecological Receptors

5.4.126. Following Environment Agency guidance[24], impacts on ecological sites will be screened against the following criteria:

- for SPA, SAC, Ramsar site and SSSI designations:
  - the short term PC is less than 10% of the short term environmental standard for the ecological receptor; and
  - the long term PC is less than 1% of the long term environmental standard for the ecological receptor;
- for other designations, including LNR:
  - the short term PC is less than 100% of the short term environmental standard for the ecological receptor; and
  - the long term PC is less than 100% of the long term environmental standard for the ecological receptor.

5.4.127. If the above criteria for SPA, SAC, Ramsar and SSSI designations are not met, additional criteria are applied as follows:

- if the short term PC exceeds the above screening criteria, significant effects cannot be screened out and further assessment is needed; or
- if the long term PC is greater than 1% and the PEC is less than 70% of the long term environmental standard, no significant effects are anticipated, and no further assessment is required; or
- if the PEC is greater than 70% of the long term environmental standard, significant effects cannot be screened out and further assessment is needed.

5.4.128. The significance of effects on ecological receptors is assessed within **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

5.4.129. The assessment standards for ecological receptors are set out in **Table 5-9** below. For SO_2, NH_3 and nitrogen and acid deposition, the assessment standards are habitat, and hence designated site, specific. Standards relating to pollutant concentrations are referred to as critical levels; standards relating to deposition are referred to as critical loads.

Table 5-9: Air Quality Assessment Levels for Ecological Receptors

Designation	Name	NO_X – Annual Mean Critical Level (µg/m³)	NO_X Daily Mean Critical Level (µg/m³)	SO_2 Annual Mean Critical Level (µg/m³)	NH_3 Annual Mean Critical Level (µg/m³) (1)	N-Deposition Annual Mean Critical Load (CL) (kgN/ha/yr) (1)	Acid Deposition (CLmaxN) Annual Mean (keq/ha/yr) (1)
SAC, SSSI	Epping Forest	30	200(2)	10	1	5	1.73
SSSI	Ingrebourne Marshes	30	200 (2)	10	1	15	-
SSSI	Inner Thames Marshes	30	200 (2)	20	3	10	-
SSSI	Oxleas Woodlands	30	200 (2)	10	1	15	2.72
SSSI	West Thurrock Lagoon and Marshes	30	200 (2)	-	3	10	-
LNR	Crossness	30	200 (2)	10	1	10	-
LNR	Lesnes Abbey Woods	30	200 (2)	10	1	10	-
LNR	Rainham Marshes	30	200 (2)	20	3	10	-

Notes:

(1) Data taken from APIS website[45] for sites other than LNR; provided by professional experts for LNR. Data are presented as the lower limit of the critical load range.

(2) 75µg/m³ is the minimum daily mean critical level for habitats; where ozone and sulphur dioxide concentrations are low, the recommended daily mean critical level is 200µg/m³. 200µg/m³ is used in this assessment since both SO_2 and ozone are within their respective critical levels within the Study Area.

Outputs of Statistical Analysis

5.4.130. For human and/or ecological standards, Environment Agency guidance[29] states that where the probability of exceedance of the objective/critical level is:

- 1% or less – exceedances are highly unlikely;
- less than 5% - exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years; or
- more than or equal to 5% - there is potential for exceedances.

5.4.131. In the latter case, the Environment Agency does not state that impacts are unacceptable but rather that the regulator would need to consider whether the risk is acceptable on a case-by-case basis.

Outputs of Human Health Risk Assessment

5.4.132. For pollutants that are potentially carcinogenic, risks are assessed against the US EPA cancer slope factors and unit risk factors for ingestion and inhalation respectively. A Hazard Index (HI) is then calculated as the sum of the carcinogenic risk over all relevant pollutants and exposure pathways (inhalation and ingestion). Where the HI is less than 1%, the risk is described as negligible; where the HI is between 2 and 5%, the risk is described as slight.

5.4.133. For non-carcinogenic effects, the HI is calculated as the sum of hazard quotients (HQ) for each pollutant and exposure routes. Where the hazard quotient is the ratio of the intake of a pollutant to the US EPA reference dose for the ingestion pathway, or the ratio of the pollutant concentration in air to the US EPA reference concentration for the inhalation route. A cumulative HI of less than 1 for non-carcinogenic effects is classed by US EPA as protective.

5.4.134. Details of the US EPA cancer risk factors and reference doses are provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**.

5.4.135. The intake of dioxins, furans and dioxin-like PCB is evaluated against the concept of a tolerable daily intake (TDI). The UK's Committee on Toxicology recommends a TDI of 2 pg ITEQ/kg-bw/day[55]. Median dioxin intakes in the UK were estimated by the Environment Agency[56] to be 0.7 pg ITEQ/kg-bw/day for adults and 1.8pg ITEQ/kg-bw/day for children and decreasing over time. The significance of the effects on the Proposed Scheme on dioxin intake is assessed using the IAQM/EPUK guidance[21] described above.

5.5. STUDY AREA

5.5.1. The overall Study Area for the Proposed Scheme extends 15km from the Carbon Capture Facility (notably the proposed new Absorber Column(s) and Stack(s)). This Study Area aligns with Environment Agency guidance[24] for screening potential impacts on ecological receptors from combustion units over 50MW output. However, there are also impact-specific Study Areas defined below to ensure that the focus of the assessment is on areas with potentially significant effects.

CONSTRUCTION PHASE STUDY AREA

5.5.2. For the assessment of dust impacts during construction, the Study Area (the Construction Dust Study Area) is limited to the zone within 350m of the Site Boundary or within approximately 50m of routes used by construction vehicles up to 500m from the Site Boundary. This conforms to the IAQM dust guidance[22] and the associated LPG[23]. It is also conservative; in that it assumes that construction works could occur anywhere within the Site and captures all potential vehicle routes within approximately 500m of the Site Boundary (not just the Site entrance). A plan of the Construction Phase Study Area is provided in **Figure 5-2: Construction Dust Study Area (Volume 2)**.

5.5.3. The Study Area for construction traffic emissions is a corridor 200m either side of roads potentially affected by construction traffic, as shown on **Figure 5-1: Construction Emissions Assessment Study Area (Volume 2)**.

5.5.4. For marine vessel emissions concentrations have been modelled over a 30km x 30km Study Area, however, emission sources are only included to a distance of 5km upstream and 8km downstream of the Site Boundary as shown in **Figure 5-2: Construction Dust Study Area (Volume 2)**. Therefore, the detailed Study Area for marine emissions extends a minimum of 5km from the Proposed Scheme.

OPERATION PHASE STUDY AREA

5.5.5. The operation phase Study Area for air quality extends approximately 15km in all directions from the Carbon Capture Facility within the Site Boundary (referred to in this chapter as the Operation Study Area). The extent of the Operation Study Area aligns with Environment Agency guidance[24] for larger emitters (i.e. over 50MW output) and is depicted in **Figure 5-4: Operational Study Area (Volume 2)**.

5.5.6. As for the construction phase, the modelled area for marine vessel emissions during operation also covers the 30km x 30km Study Area; however, emission sources are only included to a distance of 5km upstream and 8km downstream of the Site Boundary. Therefore, the detailed Study Area for marine emissions extends a minimum of 5km from the Site Boundary.

5.5.7. The Study Area for the assessment of impacts on human health via the food chain follows that for the Carbon Capture Facility. However, impacts are proportional to modelled concentrations and, as such, impacts are modelled at a series of maximally impacted locations, within 5km of the Site Boundary.

SENSITIVE RECEPTORS

5.5.8. Given the urban setting of the Proposed Scheme, the assessment of impacts is undertaken on the assumption that there is the potential for exposure for members of the public (sensitive receptors) to air pollutants across the entire the Study Area (set out in **Section 5.5**). As such, maximum impacts will be reported for any location within the Study Area. This ensures a conservative assessment, particularly where maximum impacts occur over the River Thames. Notwithstanding this the following key sensitive human receptors have been identified (distances are measured from the Site Boundary):

- residential properties including:
  - Belvedere (Bexley);
    - Clydesdale Way (approximately 50m to the southeast);
    - North Road (approximately 170m to the southeast);
    - Norman Road (approximately 170m to the south);
    - Poppy Close (approximately 275m to the south);
    - Jenningtree Way (approximately 600m to the east);
    - Leatherbottle Green (approximately 1km to the southwest);
  - Thamesmead (Bexley/Greenwich);
    - Cherbury Close (approximately 1.4km to the west);
  - Rainham (Havering);
    - Fairlane Road (approximately 2km to the north);
    - Railway View (approximately 2.5km to the northeast);
  - Dagenham (Barking and Dagenham);
    - Beam Park (approximately 2km to the north); and
    - Riverside (approximately 2.8km to the northwest).
- hospitality facilities including:
  - Travelodge London Belvedere (approximately 30m to the south);
  - Morgan Pub (approximately 20m to the south); and
  - Starbucks Drive Thru (approximately 90m to the southeast).
- places of work including:
  - Riverside 1 and Riverside 2 (within the Site Boundary);
  - Munster Joinery UK Limited (within the Site Boundary);
  - Iron Mountain Records Storage Facility (adjacent east)
  - Asda Belvedere Distribution Centre (approximately 30m east);
  - Asda ASC Recycling Centre (approximately 340m east);
  - Lidl Warehouse/Belvedere Regional Distribution Centre (150m southeast); and
  - Users of the ProW, Crossness LNR and Metropolitan Open Land (within the Site Boundary).

- schools including:
  - Harris Garrard Academy (approximately 0.7km to the southwest);
  - Belvedere Junior and Infant School (approximately 0.7km to the south);
  - Northwood Primary School (approximately 1km to the southwest);
  - Jubilee Primary School (approximately 1.1km to the west)
  - Parkway Primary School (approximately 2.1km to the southwest);
  - Harris Academy Rainham (approximately 2.7km to the north-east); and
  - Riverside School (approximately 2.9km to the north-west).
- hospitals including:
  - Queen Elizabeth Hospital (approximately 7km to the southwest);
  - Queens Hospital (approximately 7.2km to the north);
  - Newham University Hospital (approximately 7.8km to the west); and
  - King George Hospital (approximately 8.5km to the north).

5.5.9. For ecological receptors, Environment Agency guidance[24] screening distances (applied from the Site Boundary) have been applied for the identification of sensitive receptors, which requires that the following sites be identified for the assessment of air quality impacts:

- SAC, SPA, Ramsar, SSSI within 15km of the Site Boundary; and
- Ancient Woodland, Local Wildlife Sites, and National and Local Nature Reserves within 2km of the Site Boundary.

5.5.10. The following internationally designated ecological sites have been identified within 15km of the Proposed Scheme:

- Epping Forest Special Area of Conservation (approximately 11.8km to the north west).

5.5.11. The following nationally designated sites, with features sensitive to air pollution, have been identified within 10km of the Proposed Scheme:

- Inner Thames Marshes SSSI (approximately 0.9km to the east);
- Ingrebourne Marshes SSSI (approximately 2.3km to the northeast);
- Oxleas Woodlands SSSI (approximately 5.9km to the southwest); and
- West Thurrock Lagoon and Marshes SSSI (approximately 8.0km to the southeast).

5.5.12. The following locally designated ecological sites have been identified within 2km of the Proposed Scheme:

- Crossness LNR (within the Site Boundary);
- Rainham Marshes LNR (approximately 900m to the east); and
- Lesnes Abbey Woods LNR and Ancient Woodland (approximately 1.2km to the southwest).

5.5.13. For the assessment of impacts from construction traffic, bespoke receptors have been selected within 200m of the modelled road network (**Figure 5-3: Construction Emissions Assessment Study Area (Volume 2)**). These were selected using professional judgement to capture the maximum traffic-related impacts during the Construction Phase. **Table 5-10** below summarises the receptors modelled.

Table 5-10: Modelled Receptors for the Assessment of Construction Traffic

Receptor	Description	Easting (m)	Northing (m)	Height (m)
DTS1	Diffusion tube – Norman Road	549648	179975	2
DTS5	Diffusion tube – A2016	549794	179866	2
DTS6	Diffusion tube – Picardy Manor Way	549820	179596	2
DTS7	Diffusion tube – Yarnton Way	549337	179441	2
DA36	Diffusion tube – Burnham Road	553284	175291	3
DA83	Diffusion tube – University Way	555617	175330	3
DA96	Diffusion tube – Marsh Street North	555117	175718	2.5
DA104	Diffusion tube – Halcrow Avenue	555278	175619	3
R01	Residential, Yarnton Way	549363	179441	1.5
R02	Residential, Norman Road	549581	179591	1.5
R03	Residential, A2016	549749	179862	1.5
R04	Residential, Picardy Manor Way	549779	179382	1.5
R05	Residential, Picardy Manor Way	549804	179620	1.5
R06	Industrial, Bronze Age Way	549905	179748	1.5
R07	Residential, Bronze Age Way	550669	178654	1.5
R08	Residential, Bronze Age Way	551109	178194	1.5
R09	Residential, Northend Road	551571	176623	1.5
R10	Residential, Queens Road	551573	177605	0

Receptor	Description	Easting (m)	Northing (m)	Height (m)
R11	Residential, South Road	551582	177422	1.5
R12	Residential, Thames Road	552465	175515	1.5
R13	Residential, Burnham Road	553273	175281	1.5
R14	Residential, Bob Dunn Way	555194	175658	1.5
R15	Residential, Bob Dunn Way	555422	175465	1.5
T1_000	Crossness LNR	549549	179857	0
T1_010	Crossness LNR	549546	179867	0
T1_020	Crossness LNR	549543	179876	0
T1_030	Crossness LNR	549539	179886	0
T1_040	Crossness LNR	549536	179895	0
T1_050	Crossness LNR	549533	179905	0
T1_060	Crossness LNR	549530	179914	0
T1_070	Crossness LNR	549526	179924	0
T1_080	Crossness LNR	549523	179933	0
T1_090	Crossness LNR	549520	179943	0
T1_100	Crossness LNR	549517	179952	0
T1_110	Crossness LNR	549513	179961	0
T1_120	Crossness LNR	549510	179971	0
T1_130	Crossness LNR	549507	179980	0
T1_140	Crossness LNR	549503	179990	0
T1_150	Crossness LNR	549500	179999	0

Receptor	Description	Easting (m)	Northing (m)	Height (m)
T1_160	Crossness LNR	549497	180009	0
T1_170	Crossness LNR	549494	180018	0
T1_180	Crossness LNR	549490	180028	0
T1_190	Crossness LNR	549487	180037	0
T1_200	Crossness LNR	549484	180047	0
Note: The ecological transect is only used for assessing impacts from road traffic and does not apply to the operation phase.				

5.5.14. For the assessment of human health impacts from pollutant intake via inhalation and food consumption, a further set of bespoke receptors was selected (**Figure 5-3: Operational Study Area (Volume 2)** and **Table 5-11**). These receptors were selected using professional judgement to reflect the maximum impacts in residential areas and potential farmland surrounding the Proposed Scheme.

Table 5-11: Modelled Receptors for the Assessment of Human Health Impacts during Operation

Receptor	Description	Easting (m)	Northing (m)	Height (m)
HH1	Farmer Worst Case	551400	181300	1.5
HH2	Farmer to East	553300	178000	1.5
HH3	Farmer to North East	552995	181882	1.5
HH4	Resident West	547400	180100	1.5
HH5	Resident North West (1)	547300	183000	1.5
HH6	Resident North West (2)	547700	180700	1.5
HH7	Resident North	550200	183200	1.5
HH8	Resident North East (1)	552500	181700	1.5
HH9	Resident North East (2)	552100	182100	1.5
HH10	Resident North East (3)	551200	182700	1.5

Receptor	Description	Easting (m)	Northing (m)	Height (m)
HH11	Resident North East (4)	553900	180900	1.5
HH12	Resident East	550700	178800	1.5
HH13	Resident South-East (1)	551100	178000	1.5
HH14	Resident South East (2)	550309	179874	1.5
HH15	Resident South (1)	549600	179800	1.5
HH16	Resident South (2)	548600	178200	1.5

5.6. BASELINE CONDITIONS AND FUTURE BASELINE

BASELINE

Local Authority Monitoring

5.6.1. The Proposed Scheme is located within LBB, adjacent to the borders of the LBBD and the LBH. Additional local authorities are also within the overall Study Area, notably, DBC, where sensitive receptors have been identified alongside roads potentially affected by construction-related traffic impacts, and RBG.

5.6.2. In accordance with their duties under the LLAQM.TG(19)[19] and as required under Part IV of the Environmental Act 2021[10], LBB, LBBD, LBH, DBC and RBG undertake air quality monitoring within their respective jurisdictions.

5.6.3. The baseline monitoring datasets in this section have been sourced from the five latest years of data up to and including 2022 monitoring reported in the 2022 and 2023 Annual Status Reports (ASR). It should be noted that data presented for 2020 and 2021 will be impacted by the various social restrictions during the Covid-19 pandemic, with roadside pollutant concentrations likely to have been lower than if the restrictions weren't in place. It is assumed that 2022 represents the latest full year of monitoring largely unaffected by the Covid-19 restrictions and is appropriate for use in this assessment.

5.6.4. LBB, LBBD, LBH and RBG have declared Air Quality Focus Areas (AQFA). These are defined by the Greater London Authority as areas where annual mean NO_2 concentrations exceeded the EU limit (the same standards as the air quality objective for annual mean NO_2 in locations where there is high human exposure). The purpose of the AQFA is to enable targeted measures to reduce NO_2 concentrations to be developed and implemented. London Boroughs are required to have regard to AQFA when developing Air Quality Action Plans to address AQMA declarations.

London Borough of Bexley (LBB)

5.6.5. LAQM information has been taken from the 2023 Air Quality ASR[36].

5.6.6. LBB is covered by a Borough-wide AQMA, declared in 2007 for exceedances of annual and daily mean PM_{10} and annual mean NO_2.

5.6.7. The Borough has declared two AQFA:

- A206 from Erith Queens Road Roundabout to Northend Roundabout, located approximately 2.6km southeast of the Proposed Scheme; and
- A2 East Rochester Way/Falconwood, located approximately 6km southwest of the Proposed Scheme.

5.6.8. Air quality in the Borough has improved between 2016 and 2022.

5.6.9. Monitoring is undertaken using automatic monitors at four sites. Annual mean NO_2 concentrations for monitoring locations within 5km of the Proposed Scheme are shown in **Table 5-12** (as reported in the 2023 ASR[36]).

5.6.10. Since 2018, all sites have recorded annual mean concentrations of NO_2 under the objective value of 40µg/m³, and there have been no exceedances of the hourly mean objective of 200 µg/m³.

5.6.11. Annual Mean PM_{10} and $PM_{2.5}$ concentrations are well within their respective standards of 40µg/m³ and 20µg/m³ respectively. There was a maximum of 11 exceedances of the daily mean PM_{10} standard (50 µg/m³) at BX2 (Belvedere Primary School) in 2019, well within the permitted 35 exceedances per year. However, monitored exceedances of the daily mean standard have reduced since this time and in 2022, none were recorded at BX2 and a maximum of 5 recorded at BX1 (Slade Green) down from 8 in 2019.

Table 5-12: London Borough of Bexley NO_2 Automatic Monitoring[36]

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	NO_2 Concentration (µg/m³)* (Year)				
				2018	2019	2020	2021	2022
BX2	549999	179090	0.8	28	28	18	16	16
BQ7	548465	179469	0.9	21	21	16	17	16
BX1	551864	176379	4.2	23	22	18	19	18

London Borough of Barking and Dagenham (LBBD)

5.6.12. LBBD is covered by a Borough-wide AQMA, declared in 2008 for exceedances of 24 hour mean and annual mean NO_2 and 24 hour mean PM_{10}.

5.6.13. The Borough has declared three AQFA:

- A13 Ripple Road, located approximately 2.6km northwest of the Proposed Scheme;
- Barking Town Centre, located approximately 4.9km northwest of the Proposed Scheme; and
- Whakebone Lane North, located approximately 2.0km northeast of the Proposed Scheme.

5.6.14. LBBD currently undertakes automatic monitoring at two sites and diffusion tube passive monitoring at 30 sites. Monitoring locations within 5km of the Proposed Scheme are shown in **Table 5-13**, together with NO_2 monitoring from the 2023 ASR. The majority of the monitoring sites began operating in 2020 and 2021.

Table 5-13: London Borough of Barking Dagenham Annual Mean NO_2 Monitoring

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	NO_2 Concentration (µg/m³)* (Year)				
				2018	2019	2020	2021	2022
DT11	549832	183208	2.1	-	-	-	31.3	28.1
DT22	549078	183327	2.3	-	-	-	20.6	21.8
DT24	548487	183557	2.6	-	-	-	31.5	32.9
(BG2)	548043	183320	2.6	-	-	-	20.0	21
DT3	547806	183543	3.0	-	-	29.0	30.9	28.6
DT13	547081	183053	3.1	-	-	-	28.7	21.7
DT15	546935	183135	3.3	-	-	-	28.3	21.6
DT12	546501	182713	3.4	-	-	-	26.5	23.4
DT4	549035	184813	3.7	-	-	37.3	41.7	39.6
DT28	546731	183684	3.8	-	-	-	31.9	30.8
DT23	550263	184902	3.8	-	-	-	35.2	32.8
DT18	546415	183717	4.0	-	-	-	39.1	36.8
DT17	545842	183144	4.2	-	-	-	25.6	23.3
DT16	545296	183204	4.7	-	-	-	34.6	34.9
DT2	545032	183193	4.9	-	-	26.7	28.9	24.1
DT5	547789	185792	5.0	-	-	31.1	38.9	35.1

5.6.15. In 2022 and 2021 there were no monitored exceedances of the annual mean NO_2 objective at sites within 5km of the Site Boundary, and no exceedances of the hourly mean standard. PM_{10} concentrations at BG2 were within the objectives for annual and daily mean concentrations in 2022 (and previous years), with an annual mean of 18 µg/m³, and 2 exceedances of the daily mean standard (against 35 permitted per year).

5.6.16. LBBD also monitor concentrations of SO_2 at site BG1, just under 7km north-north-east the Proposed Scheme. There were no monitored exceedances of any SO_2 objective set for the protection of human health (15 minute, 1 hour and daily means) in 2022.

London Borough of Havering (LBH)

5.6.17. LBH is covered by a Borough-wide AQMA, declared in 2006 for exceedances of 24 hour mean PM_{10} and annual mean NO_2.

5.6.18. The Borough has declared two AQFA:

- Rainham Broadway, located approximately 2.0km northeast of the Proposed Scheme; and
- Romford Town Centre, located approximately 6.7km north of the Proposed Scheme.

5.6.19. The 2021 ASR for LBH stated that air quality in the Borough has been steadily improving in recent years.

5.6.20. Air quality in LBH is monitored at two automatic sites and 46 passive diffusion tube locations. Monitoring locations within approximately 5km of the Proposed Scheme are shown in **Table 5-14**, together with results from the 2021 ASR[45] (the latest available).

5.6.21. In 2021, there were exceedances of the annual mean objective for NO_2 at 5 of the 48 monitoring sites, the closest of which was at Rush Green Road (approximately 6.5km from the Site Boundary), but no monitored exceedances of the hourly mean standard.

5.6.22. PM_{10} and $PM_{2.5}$ concentrations at the automatic monitoring stations are well within their respective annual mean objectives. There were no days on which PM_{10} concentrations exceeded 50µg/m^3 in 2021 (against the 35 permitted under the objective).

Table 5-14: London Borough of Havering Annual Mean NO_2 Monitoring[40]

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	NO_2 Concentration (µg/m³) (Year)				
				2018	2019	2020	2021	2022
HAV50	551526	182672	2	39.8	36.6	32.5	30.5	-
HAV49	550722	183294	2.2	34.3	26.6	23.6	22.0	-

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	NO_2 Concentration (µg/m³) (Year)				
				2018	2019	2020	2021	2022
HAV46	552441	182337	2.4	32.2	30.0	27.8	24.4	-
HAV3	551726	183462	2.9	26.5	26.0	29.0	28.0	-
HAV1	553127	182506	3.1	30.0	29.1	23.0	23.0	-
HAV61	553719	180987	3.3	27.5	26.2	22.8	20.9	-
Note: Concentrations that exceed the objective of 40µg/m³ these have been emboldened.								

Dartford Borough Council (DBC)

5.6.23. DBC has three AQMA, as detailed below and in **Figure 5-1: Air Quality Baseline (Volume 2)**:

- Dartford AQMA No. 1 was declared in 2001 for exceedances of the PM_{10} daily mean and the NO_2 annual mean. AQMA No. 1 extends along the A282 Dartford Tunnel Approach Road in a 250m wide corridor;
- Dartford AQMA No. 2 was declared in 2006 for exceedances of the NO_2 annual mean and encompasses London Road; and
- Dartford AQMA No. 3 was declared in 2006 for exceedances of the NO_2 annual mean. AQMA No. 3 encompasses Dartford Town and approach roads.

5.6.24. Air quality monitoring in DBC is carried out by three automatic monitors and 52 passive diffusion tube locations. There are no monitoring locations within 5km of the Site Boundary.

5.6.25. In 2022 there was one exceedance of the annual mean objective for NO_2, on East Hill, approximately 7.7km from the Site Boundary.

Royal Borough of Greenwich (RBG)

5.6.26. The RBG is covered by a Borough-wide AQMA, declared in 2001 for exceedances of 24 hour mean PM_{10} and annual mean NO_2.

5.6.27. The Borough has declared seven AQFA, as detailed below:

- Woolwich and Woolwich Arsenal A205 Woolwich Rd/A206 Plumstead Rd;
- Blackwall Tunnel at Southern Approach Road and Westcombe Park;
- Sun-in-the-Sands junction A102/A2 Shooters Hill and Charlton Rd Roundabout;
- Greenwich Centre;
- Greenwich Trafalgar Road A206;
- Eltham High Street; and
- Westhorne Avenue A205.

5.6.28. Air quality monitoring in RBG is carried out at ten automatic monitors and 42 passive diffusion tube locations. Monitoring locations within approximately 5km of the Proposed Scheme are shown in **Table 5-15** with results from the 2023 ASR.

5.6.29. In 2022, there were no monitored exceedances of the annual mean objective for NO_2, and no exceedances of the hourly mean standard.

5.6.30. PM_{10} and $PM_{2.5}$ concentrations at the automatic monitoring stations are well within their respective annual mean objectives. There were a maximum of 5 days on which PM_{10} concentrations exceeded 50µg/m^3 in 2022, well within the 35 permitted under the objective.

Table 5-15: Royal Borough of Greenwich NO_2 Automatic Monitoring[39]

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	NO_2 Concentration (µg/m^3) Year				
				2018	2019	2020	2021	2022
GW37	546630	178543	2.7	21.0	21.9	18.0	18.0	14.0
GN3	545560	178526	3.9	33.0	34.0	30.0	25.0	25.0
GW34	545490	178543	4.0	33.9	35.3	30.0	28.0	26.0
GW101	544727	178884	4.7	56.5	53.8	44.0	41.0	36.0
Note: Concentrations that exceed the objective of 40µg/m^3 these have been emboldened.								

Background Pollutant Concentrations

5.6.31. Background pollutant concentrations are available from the national maps provided on the DEFRA website[35] where background concentrations of those pollutants included within the Air Quality Strategy these have been mapped at a grid resolution of 1x1km for the whole of the UK. Projected concentrations for NO_X, NO_2 and PM_{10} are available for all years between 2018 and 2030.

5.6.32. The background concentrations for NO_x, NO_2, PM_{10} and other pollutants of relevance to the Proposed Scheme are summarised in **Table 5-16** for the current year (2023). The background pollutants in **Table 5-16** account for the contribution of existing industrial processes in the vicinity of the Proposed Scheme.

5.6.33. Where available, background concentrations for pollutants are within the standards for the protection of human health for all pollutants, although background concentrations of NO_2 in particular are elevated at the roadside.

Table 5-16: DEFRA and APIS Background Annual Mean Pollutant Concentrations Based on 30km x 30km Operation Phase Study Area for 2023 Baseline

Statistic	2023 Annual Mean Background (µg/m^3)						
	NO_x	NO_2	SO_2	PM_{10}	$PM_{2.5}$	HCl	NH_3
Minimum	12.9	9.8	1.4	13.4	8.9	No data	1.2
Maximum	63.6	36.5	5.7	20.3	14.0	No data	2.3
Average	23.8	16.7	2.4	16.2	10.7	No data	1.6
Air Quality Standard/ EAL	30*	40	10 – 20*	40	20	16	180

Notes:
*Critical level for the protection of sensitive habitats.
Data from Defra mapping except data for SO_2 and NH_3 taken from APIS.

5.6.34. Background annual mean concentrations of NO_x, SO_2 and NH_3 at ecological receptors, in addition to annual mean acid and nitrogen (N) deposition rates, were taken from the APIS website[45]. The data are based on a three-year mean (2019-2021), which represent the latest available data at the time of writing. A summary of the baseline background concentrations and deposition levels at the identified ecological receptors is presented in **Table 5-17**. SO_2 and NH_3 concentrations across the study area are presented in **Table 5-16**.

5.6.35. NOx concentrations are elevated where road traffic impacts are significant, including over Epping Forest SAC/SSI where the critical level is exceeded in places. SO_2 concentrations are very low everywhere and are at no risk of exceeding the Site-specific critical level (as such, no spatial variation is included). For sites where the critical level for ammonia is 3µg/m^3, background ammonia concentrations do not exceed the critical level. However, for sites where the critical level is 1µg/m^3, including Epping Forest SAC/SSSI, the critical level is exceeded across the entire site. Background nitrogen deposition exceeds the critical load for all sites and habitats.

5.6.36. Background nitrogen deposition widely exceeds the site-specific minimum critical loads, by a considerable margin for woodland habitats in particular (Epping Forest SAC/SSSI, Oxleas Woodlands SSSI and Lesnes Abbey Woods LNR). The only exception to the exceedances is Ingrebourne Marshes where deposition is just within the critical load.

Table 5-17: Background Annual Mean Range of Pollutant Concentrations and Deposition Levels at Ecological Sites for the Baseline

Designation	Habitat Site	NO_X – Annual Mean ($\mu g/m^3$)	SO_2 Annual Mean ($\mu g/m^3$)	NH_3 Annual Mean ($\mu g/m^3$)	N-Deposition Annual Mean (kgN/ha/yr)
SAC, SSSI	Epping Forest	19.3 – **35.7**	4.1 (maximum in Study Area)	1.55 – 2.05	Heath – **15.3 – 17.9** Woodland – **27.0 – 32.2**
SSSI	Ingrebourne Marshes	18.5 – 24.0		1.42 – 1.5	14.0 – 14.3
SSSI	Inner Thames Marshes	20.5 – 28.3		1.35 – 1.43	**13.6 – 14.4**
SSSI	Oxleas Woodlands	22.3 – 25.6		1.69 – 1.75	**27.7 – 28.3**
SSSI	West Thurrock Lagoon and Marshes	29.9 – **55.0**		1.41	**13.6**
LNR	Crossness	23.3 – 23.3		1.52	**14.6**
LNR	Lesnes Abbey Woods	21.9 – 22.9		1.59 – 1.64	**26.9 – 27.3**
LNR	Rainham Marshes	21.2 – 28.3		1.43	**14.4**
Note: Values shown in bold exceed the Site specific critical load/level.					

Proposed Scheme Specific Air Quality Monitoring

5.6.37. Monitoring of NO_2, using passive diffusion tubes, was carried out at 15 monitoring locations in the vicinity of Riverside 1 and Riverside 2 for three months between April 2023 and June 2023. The locations are shown in **Figure 5-1: Air Quality Baseline (Volume 2)**.

5.6.38. The annualised results of the NO_2 passive monitoring are presented in **Table 5-18**. The data obtained show that roadside NO_2 concentrations were below the Air Quality Strategy objective ($40\mu g/m^3$) at all sites except Location 5. Location 5 (located approximately 0.1km from the Site Boundary) was installed opposite Travelodge Belvedere alongside the A2016, an extremely busy roadway. Additionally, Site 2 (which shows the next highest concentration, located within the Site) was installed on Norman Road, primarily used by heavy duty vehicles travelling to Riverside 1 and adjacent industrial properties.

Table 5-18: Site Specific NO_2 Passive Monitoring

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Approximate Distance from the Site Boundary (km)	Annualised 2022 NO_2 Concentration (µg/m³)
1	549567	179974	Within Site Boundary	26.5
2	549647	180289		30.1
3	549684	180542		25.1
4	549789	179864		20.2
5	549810	179531	0.1	**42.0**
6	549338	179437	0.4	25.8
7	549585	180758	0.4	27.7
8	547919	179656	1.4	21.2
9	547773	178597	2.0	27.9
10	554839	178716	4.9	19.4
11	552038	180763	1.6	15.2
12	551330	180659	0.9	15.4
13	552696	183133	3.1	11.2
14	550200	183353	2.2	14.1
15	553496	184861	5.0	14.1
Note: Concentrations that exceed the objective of 40µg/m³ have been emboldened.				

National Monitoring Network

5.6.39. Environment Agency operate a UK-wide monitoring network for heavy metals in ambient air on behalf of DEFRA[57]. There are three sites within the Study Area and **Table 5-19** shows the annual mean concentrations for 2022 for selected metals at these three sites.

5.6.40. All monitored concentrations are within the relevant long term air quality standards.

Table 5-19: Summary of National Monitoring Network for Metals (2022)

Metal	Annual Mean Air Quality Standard (ng/m³)	Monitoring Site		
		London Marylebone Road (ng/m³)	London Westminster (ng/m³)	Chadwell St Mary (ng/m³)
Arsenic	6	0.83	0.72	0.82

Metal	Annual Mean Air Quality Standard (ng/m^3)	Monitoring Site		
		London Marylebone Road (ng/m^3)	London Westminster (ng/m^3)	Chadwell St Mary (ng/m^3)
Chromium III and compounds	2000 (24hr)	7.16	1.72	1.73
Cadmium	5	0.12	0.09	0.22
Copper	50 (24hr)	35.72	10.18	7.74
Lead	250	5.59	5.15	7.79
Manganese	150	14.09	5.53	5.93
Nickel	20	1.55	0.84	1.72

FUTURE BASELINE

5.6.41. Pollutant concentrations are anticipated to decrease in the future, most noticeably at the roadside, but also at background sites. This is due to the replacement of older, more polluting vehicles with newer, cleaner vehicles as emissions technologies improve and with the introduction of electric vehicles into the fleet. The decreasing trend is expected to be strongest for NO_2 concentrations (for which road transport is the most significant local emissions source) and weakest for particulate matter. This decrease is accounted for in the assessment by taking background data from DEFRA's mapping[35] for 2028 for the construction phase assessment and 2030 for the operation phase assessment.

5.6.42. New processes within the Study Areas, including the operation of Riverside 2, may result in a slowing of the rate of improvement in localised areas. However, these are unlikely to completely offset the impacts of reduced vehicle emissions. The operation of Riverside 2 is included within the assessment presented in this chapter.

5.6.43. SO_2 concentrations are expected to remain low throughout the lifetime of the Proposed Scheme, although the short term trend in NH_3 is uncertain. It is possible that there might be a minor increase in the short term before national policies to reduce ammonia emissions result in declining trends. No trend over time is taken into account in the assessment of background concentrations of SO_2 or NH_3.

5.6.44. Nitrogen deposition is anticipated to decline in the future, driven by the decrease in emissions of nitrogen oxides. This rate of decline may be offset to a degree by increasing NH_3 emissions in the short term, but this is not expected to reverse the overall declining trend. To ensure a conservative assessment, no decrease in background levels of nitrogen deposition is assumed over time in this assessment.

5.7. EMBEDDED DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.7.1. This section sets out the embedded design, mitigation and enhancement measures relevant to the air quality assessment. The **Design Principles and Design Code (Document Reference 5.7)** are commitments which will govern the design of the Proposed Scheme during the detailed design stage. The **Design Principles and Design Code (Document Reference 5.7)** are considered to be embedded mitigation for the purposes of the assessment presented in this chapter.

CONSTRUCTION PHASE

5.7.2. Mitigation measures for construction dust impacts are included within the **Outline CoCP (Document Reference 7.4)** and the **Framework CTMP (Document Reference 7.7)** for the Proposed Scheme. One or more full CoCP and CTMP will be developed in substantial accordance with this outline and framework, as secured by a requirement in the **Draft DCO (Document Reference 3.1)**. The following measures taken from IAQM dust guidance[22] and generally apply to construction sites:

Communications

- display the name and contact details of person(s) accountable for air quality and dust issues on the Site. This may be the environment manager/engineer or the Site Manager;
- display the head or regional office contact information; and
- develop and implement a Dust Management Plan (DMP) as an appendix to the full CoCP(s), which may include measures to control other emissions.

Site Management

- record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- make the complaints log available to the local authority when asked; and
- record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.

Monitoring

- carry out regular site inspections to monitor compliance with the DMP which will be developed prior to construction commencing, record inspection results, and make an inspection log available to the local authority when asked; and
- increase the frequency of site inspections by the person accountable for air quality and dust issues onsite when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Site

- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- site hoarding erected to minimise intrusion (including dust) from construction activities on PRoW;
- erect solid screens or barriers around dusty activities or the Site Boundary that are at least as high as any stockpiles onsite; and
- the Site will be bunded to prevent runoff.

Operating Vehicle/Machinery and Sustainable Travel

- ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable;
- ensure all vehicles switch off engines when stationary – no idling vehicles; and
- minimise the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

Operations

- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips; and
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Waste Management

- no bonfires and burning of waste materials on the Site.

OPERATION PHASE

5.7.3. For the Carbon Capture Facility measures are summarised below. These will be subject to detailed air quality dispersion modelling for the Environmental Permit once the technology provider has been selected.

- Finalised height and diameter parameters will be developed as part of detailed design to ensure that disposition does not cause significant effects which the Applicant will be required to demonstrate to the Environment Agency in order to obtain an Environmental Permit.
- Minimum offset distance between the Absorber Column(s) and Stack(s) and Riverside 1 and Riverside 2 housing units of 100m. This is secured pursuant to the limits of deviation in the **Draft DCO (Document Reference 3.1)**.

- Flue gas from the new Absorber Column(s) and Stack(s) to be continuously monitored via a Continuous Emissions Monitoring System (CEMS) pursuant to the Environmental Permit.
- Exhaust gases post carbon capture are a minimum of 80 degrees Celsius, pursuant to the Environment Permit.
- The LCO_2 transport vessels will meet IMO Tier III[48] requirements for NOx emissions – this is a mandatory requirement.

5.7.4. Pollutant concentration limits for pollutants introduced by the carbon capture process will be set in the Environmental Permit for the Carbon Capture Facility. It is anticipated that the emissions limits will be as per those set in Table 2.2 in **Appendix 5-2: Operation Phase Assessment (Volume 3)**); because these pollutants will be used as the basis for the Environmental Permit limits.

5.8. ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

5.8.1. This section details the assessment of impacts and effects for the Proposed Scheme during both the construction and operation phases considering the embedded design, mitigation and enhancement measures detailed in **Section 5.7**.

CONSTRUCTION PHASE

Impacts from Dust, PM_{10} and $PM_{2.5}$

5.8.2. The likely potential significant effects for air quality associated with the construction phase are set out below.

5.8.3. A qualitative dust assessment has been completed with reference to the relevant IAQM dust guidance[22] to determine the potential for dust impacts at human receptors within the Construction Phase Study Area. **Appendix 5-1: Construction Dust Assessment (Volume 3)** provides details of the construction dust assessment approach and associated findings. A summary of the findings is presented below.

5.8.4. Construction activities that have the potential to generate and/or re-suspend dust, PM_{10} and $PM_{2.5}$ include:

- site clearance and preparation;
- preparation of temporary access/egress to the Site and haulage routes;
- earthworks;
- materials handling, storage, stockpiling, spillage and disposal;
- movement of vehicles and construction traffic within the Site;
- construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- internal and external finishing refurbishment; and
- site landscaping.

5.8.5. Most releases are likely to occur during the working week. However, for some potential release sources (e.g. exposed soil produced from significant earthworks

activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place as the source is present regardless of working hours.

5.8.6. Based on a review of the Construction Phase Study Area, there are human receptors located within approximately 350m of the Site Boundary and/or within approximately 50m of the likely routes to be used by construction vehicles, up to approximately 500m from the Site entrance. As such, the risk of dust impacts from the construction phase cannot be screened out.

5.8.7. The next stage of the assessment requires the potential dust emission magnitude to be determined for dust and PM_{10} sources: demolition, earthworks, construction, and trackout (**Table 5-20**). Overall, the dust emission magnitude from each of these activities is classed as 'large', based on the following:

- Demolition:
  - demolition of the Munster Joinery UK Limited premises and the Belvedere Power Station Jetty (disused) with a total building volume of less than 20,000m^3 and demolition of potentially dusty construction material (concrete).
- Earthworks:
  - the total area within the Site encompasses more than 10,000m^2 and the soil type is potentially dusty clay material. It is assumed that there will be more than 10 earth-moving vehicles onsite during peak earthwork activities, and is it assumed that more than 100,000 tonnes of material will be moved in total.
- Construction:
  - it is assumed that the total volume of all buildings to be constructed will exceed 100,000m^3.
- Trackout:
  - it is assumed that there may be in excess of 50 HGV movements per day during peak construction activity, along with more than 100m of unpaved roads used within the Site.

Table 5-20: Summary Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Large
Earthworks	Large
Construction	Large
Trackout	Large

5.8.8. The next stage of the assessment requires the sensitivity of the area to dust soiling and human health effects, which are based on identifying the number of properties and human receptors located within discrete distance bands from the Site Boundary. As shown in **Figure 5-2: Construction Dust Study Area (Volume 2)** the distance bands are set at:

- 20m, 50m, 100m, 200m and 350m from the Site Boundary for human receptors;
- 50m of routes used by construction vehicles up to 500m from the Site Boundary; and
- 20m and 50m from the Site Boundary for ecological receptors.

5.8.9. Wind roses from the meteorological data used for the dispersion modelling of operation phase impacts are provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**. The wind roses show that the prevailing wind direction is from the southwest. Therefore, receptors located to the northeast of the Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

5.8.10. Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. By conservatively assuming that any construction activities could occur anywhere within the Site, sensitive receptors within approximately 100m of the Site Boundary would include Iron Mountain Records Storage Facility, Lidl Warehouse/Belvedere Regional Distribution Centre, Asda Belvedere Distribution Centre, Snap Fitness Belvedere and Travelodge London Belvedere. Within approximately 350m from the Site Boundary are residential receptors along Norman Road, North Road and Poppy Close.

5.8.11. The closest properties to trackout routes are approximately 20m from the A2016 (35m from the outbound haulage route and not at ground level) along Clydesdale Road. The next nearest residential properties are over 150m from the haulage routes, on North Road, Norman Road and Poppy Close.

5.8.12. The Crossness LNR sits within the Site, but as its status is of local designation it is considered to have low sensitivity to impacts from construction dust as per IAQM dust guidance[22]. There are no other ecological sites within 50m of the Site Boundary.

5.8.13. Taking account of the above, and that the background annual mean PM_{10} concentration is 17.9µg/m^3 within the Construction Phase Study Area, the IAQM dust guidance[22] criteria these have been used to determine that the sensitivity of the area is medium for dust soiling effects and low for human health and ecological (PM_{10}) impacts for all relevant construction activities (**Table 5-21**).

Table 5-21: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Medium	Medium	Medium	Medium
Human health	Low	Low	Low	Low
Ecological	Low	Low	Low	Low

5.8.14. By combining the dust emission magnitude with the sensitivity of the area, the risk of construction dust effects without mitigation applied is shown in **Table 5-22** below. Given that the overall dust risk is High Risk, there is some potential for temporary,

moderate adverse effects. These effects are most likely to occur when earthworks and construction activities are being undertaken in the southern and eastern areas of the Site, where the Site is closer to receptor points.

Table 5-22: Summary Dust Risk Table to Define Site-Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	High Risk	Medium Risk	Medium Risk	Medium Risk
Human health	Medium Risk	Low Risk	Low Risk	Low Risk
Ecological	Medium Risk	Low Risk	Low Risk	Low Risk

5.8.15. The assessed risk rating has been used to determine the appropriate prevention and mitigation measures additional to those discussed in **Section 5.7**, as given by IAQM dust guidance[22], that should be applied via the implementation of a full CoCP(s), an **Outline CoCP (Document Reference 7.4)** is submitted as part of the application for development consent. These measures are presented in **Section 5.9**.

5.8.16. For the assessment of effects on dust soiling the sensitivity of the area is medium. The magnitude of change is low. Therefore, there is likely to be a direct, temporary, short term, **Minor to Moderate Adverse (Not Significant)** effect on nearby places of work.

5.8.17. For the assessment of effects on human health the sensitivity of the area is low. The magnitude of change is low. Therefore, there is likely to be a direct, temporary, short term, **Minor Adverse (Not Significant)** effect on nearby places of work.

5.8.18. For the assessment of effects on ecological sites the sensitivity of the area is low. The magnitude of change is low. Therefore, there is likely to be a direct, temporary, short term, **Minor Adverse (Not Significant)** effect on Crossness LNR.

Emissions of NO_2, PM_{10} and $PM_{2.5}$ from NRMM

5.8.19. The greatest impact on air quality due to emissions from NRMM associated with the construction phase will be in the areas immediately adjacent to the construction works. This area is industrial in character and, therefore, as noted above the sensitivity of the surrounding area for human health is low. Similarly, the sensitivity of the Crossness LNR to impacts during construction is also low.

5.8.20. Final details of the exact plant and equipment likely to be used onsite will be determined by the appointed Contractor(s); but is likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the Site will be variable over the construction period and not all plant will operate simultaneously. The magnitude of impacts, outwith the immediate vicinity of an item of plant during its operation, will be low and intermittent. Furthermore, an offset distance between any potential humans and any NRMM is being pursued in the site design.

5.8.21. Therefore, there is likely to be a direct, temporary, short term, **Minor Adverse (Not Significant)** effect on human health and ecology.

Road Traffic Emissions of NO_2, PM_{10} and $PM_{2.5}$

5.8.22. A summary of the impacts from construction traffic is provided below.

5.8.23. In this section, impacts are considered from road transport, with and without construction traffic, combined with background concentrations.

Potential Effects on Human Health

Annual Mean NO_2 Concentrations

5.8.24. **Table 5-23** below summarises the modelled roadside annual mean NO_2 concentrations during the construction phase of the Proposed Scheme for each receptor.

Table 5-23: Modelled Annual Mean NO_2 Concentrations from Construction Traffic

Receptor	Total NO_2 Conc: Baseline 2022 ($\mu g/m^3$)	Total NO_2 Conc: Without Proposed Scheme Construction Traffic 2028 ($\mu g/m^3$)	Total NO_2 Conc: With Construction of Proposed Scheme 2028 ($\mu g/m^3$)	Impact of Construction Traffic ($\mu g/m^3$)	Descriptor
DTS1	28.5	23.4	23.9	0.5	Negligible
DTS5	**40.7**	29.6	30.0	0.4	Negligible
DTS6	31.2	23.7	23.9	0.2	Imperceptible
DTS7	28.8	22.2	22.3	0.1	Imperceptible
DA36	35.2	26.4	26.5	0.1	Imperceptible
DA83	24.0	19.3	19.3	0.0	Imperceptible
DA96	39.6	29.5	29.6	0.1	Imperceptible
DA104	26.7	20.9	21.0	0.1	Imperceptible
R01	27.9	21.6	21.7	0.1	Imperceptible
R02	25.3	20.1	20.1	0.0	Imperceptible
R03	30.8	23.4	23.6	0.2	Imperceptible
R04	26.5	20.8	20.9	0.1	Imperceptible
R05	25.4	20.1	20.2	0.1	Imperceptible
R06	38.3	28.3	28.5	0.2	Negligible
R07	26.2	20.5	20.5	0.0	Imperceptible
R08	34.2	25.3	25.4	0.1	Imperceptible

Receptor	Total NO_2 Conc: Baseline 2022 ($\mu g/m^3$)	Total NO_2 Conc: Without Proposed Scheme Construction Traffic 2028 ($\mu g/m^3$)	Total NO_2 Conc: With Construction of Proposed Scheme 2028 ($\mu g/m^3$)	Impact of Construction Traffic ($\mu g/m^3$)	Descriptor
R09	36.3	26.7	26.9	0.2	Imperceptible
R10	**42.2**	30.4	30.6	0.2	Imperceptible
R11	38.0	27.8	27.9	0.1	Imperceptible
R12	29.9	22.9	22.9	0.0	Imperceptible
R13	31.0	23.7	23.7	0.0	Imperceptible
R14	30.0	22.9	23.0	0.1	Imperceptible
R15	26.8	20.9	21.0	0.1	Imperceptible
Note: Concentrations that exceed the objective of 40$\mu g/m^3$ have been emboldened.					

5.8.25. The AQS objective for annual mean NO_2 concentrations is 40$\mu g/m^3$. The results of the modelling show that in the 2022 baseline case concentrations were all below the objective except for locations R10 and DTS5. At R10 (alongside the A206, Queens Road), the modelled NO_2 concentration was 42.2$\mu g/m^3$. The next highest predicted concentration was 40.7$\mu g/m^3$ at DTS5 located along the A2016, 180m southeast of the Proposed Scheme. These results are consistent with the project specific monitoring, since an exceedance of the objective was monitored at DTS5 in 2022.

5.8.26. By 2028, the full construction year of the Proposed Scheme, modelled concentrations both with and without the Proposed Scheme have decreased, due to reductions in vehicle emissions as the fleet renews and the proportion of ultra low emission vehicles increases, and are well below the national objective. The highest concentrations were modelled at the same receptor as in the Baseline case (R10) where the concentrations were 30.4$\mu g/m^3$ without construction traffic and 30.6$\mu g/m^3$ with construction traffic. These concentrations are well below the objective, and the impact is negligible.

5.8.27. The greatest impact from the Proposed Scheme (i.e. with Proposed Scheme construction– without Proposed Scheme construction scenarios) occurs at DTS1, at the entrance/exit to the Proposed Scheme (Norman Road). In 2028 construction traffic related to the Proposed Scheme results in an impact of 0.5$\mu g/m^3$. However, absolute concentrations are well below the national objective with 23.4$\mu g/m^3$ modelled 'without development' and 23.9$\mu g/m^3$ predicted 'with development'.

5.8.28. The impacts on concentrations of NO_2 have been compared to the impact descriptor criteria set out in IAQM/EPUK Guidance. At all receptors the impact can be described as negligible and the likely effects of construction traffic on human receptors are **Negligible (Not Significant)**. Furthermore, it is also re-emphasised that the assessment is based on peak construction traffic generation and hence a conservative representation of likely annual mean impacts during construction.

Hourly Mean NO_2 Concentrations

5.8.29. The modelled annual mean NO_2 concentrations are all well below 60µg/m^3 in all modelled scenarios and therefore hourly mean NO_2 concentrations are unlikely to exceed the hourly mean AQS objective. The impact of the Proposed Scheme on roadside hourly mean NO_2 concentrations at existing sensitive receptors will be negligible and, therefore, effects will be **Negligible (Not Significant)**.

Annual Mean PM_{10} Concentrations

5.8.30. The AQS objective for annual mean PM_{10} concentrations is a concentration of 40µg/m^3. The results of the assessment show that, in the 2022 Baseline, concentrations at all receptors are predicted to easily meet the objective. The highest predicted concentration is 25.0µg/m^3 at receptor R10.

5.8.31. Modelled concentrations of PM_{10} are well below the annual mean objective at all receptors in each of the future year scenarios. The highest concentration is predicted at receptor R10, where a concentration of 24.8µg/m^3 is modelled in 2028 with construction traffic. The changes in annual mean PM_{10} concentrations with the construction traffic are all <0.2µg/m^3 (0.5% of the relevant AQS objective). Based on the EPUK/IAQM guidance[21], the impact of construction traffic on annual mean PM_{10} concentrations at the roadside is negligible and the effects are therefore **Negligible (Not Significant)**.

Annual Mean $PM_{2.5}$ Concentrations

5.8.32. Annual mean concentrations of $PM_{2.5}$ are all well below the AQS objective of 25µg/m^3 in all modelled scenarios. The highest modelled concentration is 16.0µg/m^3, at R10 in the Baseline case. All changes in $PM_{2.5}$ as a result of increased traffic associated with the Proposed Scheme are all <0.1µg/m^3 (0.5% of the relevant AQS objective). Based on the EPUK/IAQM guidance [21], the Proposed Scheme has a negligible impact on roadside $PM_{2.5}$ concentrations and any effects are therefore **Negligible (Not Significant)**.

Potential Effects on Ecological Sites

5.8.33. **Table 5-24** below summarises impacts of construction traffic on NO_X concentrations at relevant ecological sites within 200m of the road network affected by construction traffic.

Table 5-24: Modelled Annual Mean NO_X Concentrations from Construction Traffic

Receptor	Critical Level (ug/m^3)	Total NO_X Conc: Max Base-line 2022 (µg/m^3)	Total NO_X Conc: Max Without Proposed Scheme Construction Traffic 2028 (µg/m^3)	Total NO_X Conc: Max With Construction of Proposed Scheme 2028 (µg/m^3)	Max Impact of Construction Traffic (µg/m^3)	Max Impact of Construction Traffic as % of CLe	Distance to <1% of CLe
Crossness LNR	30	86.3	59.3	60.0	0.7	2.1%	15m

5.8.34. **Table 5-25** below summarises the impacts of NH_3 at the modelled ecological sites.

Table 5-25: Modelled Annual Mean NH_3 Concentrations from Construction Traffic

Receptor	Critical Level (ug/m^3)	Total NH_3 Conc: Max Baseline 2022 (µg/m^3)	Total NH_3 Conc: Max Without Proposed Scheme Construction Traffic 2028 (µg/m^3)	Total NH_3 Conc: Max With Construction of Proposed Scheme 2028 (µg/m^3)	Max Impact of Construction Traffic (µg/m^3)	Max Impact of Construction Traffic as % of CLe	Distance to <1% of CLe
Crossness LNR	1.0	2.31	2.47	2.48	0.016	1.6%	15m

5.8.35. Nitrogen deposition at ecological sites has been calculated using road contributions of NO_X and NH_3. **Table 5-26** below summarises the maximum impact of nitrogen deposition at the modelled ecological sites.

Table 5-26: Modelled Nitrogen Deposition from Construction Traffic

Receptor	Vegetation Type	Critical Load (kgN/ha/yr)	Total N-Dep: Max Baseline 2022 (kgN/ha/yr)	Total N-Dep: Max Without Proposed Scheme Construction Traffic 2028 (kgN/ha/yr)	Total N-Dep: With Construction of Proposed Scheme 2028 (kgN/ha/yr)	Max Impact of Construction Traffic (kgN/ha/yr) (as % of CL)	Distance to <1% of CL
Crossness LNR	Grassland	10	22.4	22.0	22.1	0.12 (1.2%)	5m

5.8.36. The results show that maximum modelled concentrations (at the roadside) and deposition are above the relevant critical levels/loads in all scenarios considered, irrespective of whether the Proposed Scheme construction goes ahead. The modelling of Crossness LNR shows impacts greater than 1% of the critical levels/loads for NO_X, NH_3 and nitrogen deposition at the roadside but these reduce rapidly with distance from the road and fall below 1% at a maximum distance of 15m into the Site. Moreover, the impacts are temporary and less than the Environment Agency Screening Criteria[24] of 100% for local nature sites everywhere within the LNR. The effects can, therefore, be described as **Negligible (Not Significant)**. It must also be noted that the modelled impacts are conservative since they are based on peak rather than annual average activity levels during construction.

Marine Vessel Emissions of NO_2, NOx, SO_2, PM_{10} and $PM_{2.5}$

5.8.37. Full results of the dispersion modelling of impacts from marine vessels are presented in **Appendix 5-1: Construction Phase Assessment (Volume 3)** and **Appendix 5-3: Detailed Model Pollutant Results (Volume 3)**, and a summary is provided below. In this section, impacts are considered from the vessels alone and combined with background concentrations.

5.8.38. The contribution of construction-related marine vessels to pollutant concentrations, at all timescales, decreases with distance from the shoreline and with distance from the area of vessel manoeuvring and dredging within the Site. The key receptors for impacts are, therefore, users of the England Coast Path (FP1/NCN1), on the south bank of the River Thames. The north bank of the River Thames adjacent to the Proposed Scheme is used for light industrial purposes, with low potential for exposure of members of the public. The nearest riverside public rights of way are further down the River Thames near Rainham Marshes LNR.

Annual Mean NO_2, NOx, SO_2, PM_{10}, and $PM_{2.5}$ Concentrations

5.8.39. As set out in **Paragraph 5.4.53**, impacts relating to long term exposure from marine activity during construction are not likely to result in any significant contribution to annual mean concentrations. This is due to the limited duration of the construction phase and to the intermittent activity levels during the construction phase. Taking this into account, the likely effect of construction activity from marine vessel emissions on human and ecological receptors can be described as **Negligible (Not Significant)**.

Potential Effects on Human Health

Hourly Mean NO_2 Concentrations

5.8.40. The maximum change in hourly mean NO_2 due to marine emissions associated with the Proposed Scheme during construction is 10.2 µg/m^3, 5% of the relevant AQS objective. This impact occurs within the River Thames, where public exposure at an hourly level during construction works is unlikely.

5.8.41. Total hourly mean concentrations of NO_2 are dominated by contributions from sources other than the marine vessel emissions, and are all well below the AQS objective during construction. The highest modelled total concentration on land is 59.6µg/m^3 (30% of the AQS), which is modelled at the northern bank of the River Thames in West Thurrock, where background concentrations are influenced by industrial processes. At this location, the contribution from marine vessels during construction was negligible (1.6µg/m^3, 0.8% of the AQS).

5.8.42. On land, the maximum change in hourly NO_2 as a result of marine emissions associated with the Proposed Scheme during construction is 8.9 µg/m^3, 4.5% of the relevant AQS objective. This occurs along the southern bank of the Thames, on the England Coast Path (FP3/NCN1), where total concentrations are well below the AQS (<25%). Therefore, based on the EPUK/IAQM guidance [21], marine emissions during construction of the Proposed Scheme have a negligible impact on NO_2 concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Daily Mean PM_{10} Concentrations

5.8.43. During construction, modelled total daily mean concentrations of PM_{10} are all well below the AQS objective everywhere within the Study Area. Furthermore, all changes in daily mean PM_{10} due to marine emissions associated with the Proposed Scheme are <0.5% of the relevant AQS objective (on shore and within the Thames). Therefore, based on the EPUK/IAQM guidance[21], marine emissions during construction of the Proposed Scheme have a negligible impact on PM_{10} concentrations within the Study Area. The effects can, therefore, be described as **Negligible (Not Significant)**.

SO_2 Daily, Hourly, 15 minute Concentrations

5.8.44. The AQS objectives for daily, hourly, and 15 minute mean SO_2 concentrations are 125µg/m^3, 350µg/m^3, 266µg/m^3, respectively. These standards are all set for the protection of human health where exposure is likely to occur over the averaging period of the objective.

5.8.45. During the construction period, all changes in SO_2 due to marine emissions associated with the Proposed Scheme are <0.5% of the relevant AQS objective. Based on the EPUK/IAQM guidance [21], marine emissions from the Proposed Scheme during operation have a negligible impact on SO_2 concentrations everywhere in the Study Area. The effects can, therefore, be described as **Negligible (Not Significant)**.

Potential Effects on Ecological Sites

5.8.46. A summary of the impacts on daily mean NOx concentrations at all ecological sites considered within the assessment is set out in **Table 5-27**, below.

5.8.47. The critical level for daily mean NO_X concentrations (200µg/m^3) is not exceeded at any ecological site during the construction phase, with or without impacts arising due to construction activity.

Table 5-27: Summary of daily mean NOx impacts at designated ecological sites during construction

Ecological Site	Max Daily NOx Impact (100th %ile) from Construction Marine Vessels (µg/m³)	Impact as % of CLe	Maximum Total NOx Concentration inc Background (µg/m³)	Maximum Total NOx Concentration as % of CLe
Epping Forest SAC, SSSI	0.1	0.1%	56.4	28.2%
Ingrebourne Marshes SSSI	0.8	0.4%	42.3	21.1%
Inner Thames Marshes SSSI	1.9	1.0%	50.0	25.0%
Oxleas Woodlands SSSI	0.2	0.1%	42.4	21.2%
West Thurrock Lagoon SSSI	0.6	0.3%	97.5	48.7%
Crossness LNR	4.8	2.4%	52.0	26.0%
Lesnes Abbey Wood LNR (comprising Ancient Woodland)	0.6	0.3%	40.2	20.1%
Rainham Marshes LNR	1.9	1.0%	49.7	24.8%

5.8.48. The highest modelled impact is predicted at Crossness LNR, where the process contribution is 4.8µg/m³ (2.4% of the critical level) in 2028. Over Inner Thames Marshes SSSI, the maximum impact is 1.9µg/m³ (1.0% of the critical level), but the total concentration is 50µg/m³ which is well below the critical level (200µg/m³). The highest total NO_X concentration occurs at West Thurrock Lagoon SSSI and is primarily due to elevated background concentrations. The impact of the Proposed Scheme construction at this site is 0.3% of the critical level. These impacts screen as negligible against Environment Agency screening criteria[24].

5.8.49. Overall marine emissions from the Proposed Scheme during construction have a negligible impact on daily mean NOx concentrations at ecological sites. The effects can, therefore, be described as **Negligible (Not Significant)**.

Full Proposed Scheme AQ Impact – Construction Phase

5.8.50. This section summarises the combined impacts from the following sources:

- construction traffic movements;

- construction marine vessel movements (included as a worst case); and
- baseline operation of Riverside 1 and Riverside 2 (baseline exhaust stack emissions).

5.8.51. Total concentrations and deposition with the Proposed Scheme are influenced by all three sources (traffic, marine and Stack(s)) plus background concentration/deposition. However, since the baseline operation contributes to pollutant concentrations/deposition whether or not construction of the Proposed Scheme proceeds, the Full Proposed Scheme AQ Impact relates to the sum of impacts from construction traffic and marine vessels only.

5.8.52. It must be noted that combined Full Proposed Scheme AQ Impacts for annual mean metrics are only presented at roadside receptors (within the 200m corridor around construction traffic routes). For the construction phase, as noted above, its limited duration means that there is no potential for long term exposure to the pollutant sources. However, at the roadside, short term impacts cannot be modelled directly and are assessed, following guidance, with reference to empirical screening relationships based on the annual mean impacts. For the Full Proposed Scheme AQ Impacts, the assessment is highly conservative since both the construction traffic and marine vessel annual mean impacts are based on peak construction activities rather than annual mean activity levels.

5.8.53. Full results for the Full Proposed Scheme AQ Impacts are provided in **Appendix 5-3: Detailed Model Pollutant Results (Volume 3)**.

Potential Effects on Human Receptors

Receptors at the Roadside

5.8.54. **Table 5-28** below summarises modelled annual mean NO_2 concentrations at roadside receptors from the sources stated above plus background concentrations.

5.8.55. No exceedances of the annual mean objective for NO_2 are modelled at any roadside receptor during the construction phase, even when the combined contribution of all Proposed Scheme-related sources is included. The Full Proposed Scheme AQ Impact is a maximum at DTS1, along Norman Road. This is a result of an increase of 0.5µg/m^3 from construction traffic and 0.2µg/m^3 from marine vessels, giving a combined impact of 0.7µg/m^3. These impacts are negligible, both alone and combined. The resulting effects can, therefore, be described as **Negligible (Not Significant)**.

Table 5-28: Full Proposed Scheme AQ Impact Modelled Annual Mean NO_2, 2028

Receptor	Total NO_2 Conc.: Baseline 2022	Total NO_2 Conc.: Without Proposed Scheme 2028	Total NO_2 Conc.: With Proposed Scheme 2028	Impact of Full Proposed Scheme	Descriptor
DTS1	28.5	23.7	24.4	0.7	Negligible
DTS5	**40.7**	30.0	30.6	0.6	Negligible
DTS6	31.2	24.1	24.4	0.3	Negligible
DTS7	28.8	22.4	22.6	0.2	Imperceptible
DA36	35.2	26.5	26.6	0.1	Imperceptible
DA83	24.0	19.4	19.4	0.0	Imperceptible
DA96	39.6	29.5	29.7	0.2	Imperceptible
DA104	26.7	21.0	21.1	0.1	Imperceptible
R01	27.9	21.8	22.0	0.2	Imperceptible
R02	25.3	20.4	20.5	0.1	Imperceptible
R03	30.8	23.8	24.2	0.4	Negligible
R04	26.5	21.1	21.3	0.2	Negligible
R05	25.4	20.5	20.7	0.2	Negligible
R06	38.3	28.7	29.1	0.4	Negligible
R07	26.2	20.7	20.8	0.1	Imperceptible
R08	34.2	25.4	25.6	0.2	Negligible
R09	36.3	26.9	27.0	0.1	Imperceptible
R10	**42.2**	30.6	30.8	0.2	Negligible
R11	38.0	27.9	28.1	0.2	Negligible
R12	29.9	23.0	23.1	0.1	Imperceptible
R13	31.0	23.8	23.8	0.0	Imperceptible
R14	30.0	23.0	23.1	0.1	Imperceptible
R15	26.8	21.0	21.1	0.1	Imperceptible

Note:
Concentrations that exceed the objective of 40µg/m^3 these have been emboldened.

5.8.56. As noted previously, short term impacts from road traffic cannot be modelled robustly. However, it can be concluded that exceedances of the hourly mean objective for NO_2 are unlikely at roadside receptors, even when accounting for emissions from the Full Proposed Scheme AQ Impact, since combined annual mean concentrations are a maximum of 30.6µg/m^3. This is well below both the annual mean objective and the 60µg/m^3 screening criteria[19] for potential exceedances of the hourly mean objective.

5.8.57. Similar conclusions hold for annual mean PM_{10} and $PM_{2.5}$, and daily mean PM_{10} at the roadside i.e., total concentrations are well within their respective objectives and there will be no exceedance of the daily mean objective for PM_{10}.

Receptors Away from the Roadside

5.8.58. For receptors away from the roadside, to assess the Full Proposed Scheme AQ Impact on pollutants with a short term objective (i.e. NO_2, PM_{10}, SO_2), the outputs of the following modelled sources these have been combined:

- marine construction vessel movements; and
- baseline operation of Riverside 1 and Riverside 2.

5.8.59. The maximum concentration resulting from the future baseline operation of Riverside 1 and Riverside 2 combined with construction marine vessels occurs well to the north of construction traffic routes and outside of the 200m corridor within which the road contribution to concentrations is modelled. The maximum combined impacts away from the roadside are, therefore, unaffected by the contribution of construction traffic and the limitations to modelling short term impacts from road sources do not affect the following conclusions.

5.8.60. **Table 5-29** below summarises the Full Proposed Scheme AQ Impact at receptors away from the roadside across the entire Study Area.

Table 5-29: Maximum Full Proposed Scheme AQ Impacts Across the Modelled Study Area during Construction

Pollutant	Averaging time	Air Quality Standard (µg/m^3)	Max Without Proposed Scheme 2028 (Baseline Stack(s)) (µg/m^3)	Max With Proposed Scheme 2028 (Baseline + Marine Vessels) (µg/m^3)	Max Adverse Impact of Full Proposed Scheme 2028 (µg/m^3)	Max Adverse Impact of Full Proposed Scheme as % of Standard	2028 Background Concentration (µg/m^3)*	At Point of Maximum Impact of Full Proposed Scheme	
								Max Total Conc. With Proposed Scheme 2028 (µg/m^3)	Max Total Conc. as % of Standard
NO_2	1 hour	200	50.8	59.5	10.2	5.1%	33.2	71.4	35.7%
PM_{10}	Daily	50	0.7	0.8	0.1	0.2%	14.4	14.8	29.6%
SO_2	15 minutes	266	103.7	104.6	1.2	0.5%	5.2	62.0	23.3%
	1 hour	350	71.3	71.6	0.8	0.2%	5.2	46.2	13.2%
	Daily	125	6.9	7.0	0.2	0.1%	5.2	8.5	6.8%

Note:
*Following Environment Agency guidance[24], background concentrations for hourly mean NO_2 and all SO_2 metrics are 2 x annual mean background.

5.8.61. The results of combining the impacts associated with the various Proposed Scheme related sources do not change the conclusions of the assessment relating to the short term impact of the Proposed Scheme during construction. All maximum modelled total concentrations are well within the standard for the combined pollutants and there is no exceedance of the standards. The Proposed Scheme has a negligible impact on NO_2 concentrations and effects are therefore **Negligible (Not Significant)**.

Potential Effects on Ecological Receptors

Annual Mean NO_X, NH_3 and nitrogen deposition

5.8.62. **Table 5-30**, **Table 5-31** and **Table 5-32** below summarise impacts on annual mean NO_X,, NH_3 and nitrogen deposition at modelled ecological sites within 200m of the road network (Crossness LNR).

5.8.63. In 2028, total concentrations exceed the critical level for NOx to a distance of approximately 70m from the roadside without the Proposed Scheme and approximately 80m with the Proposed Scheme; NH_3 concentrations and Nitrogen deposition exceed their critical level and critical load respectively at all distances from the road. However, in all cases, total concentrations/deposition are dominated by the background concentrations/deposition.

5.8.64. At the roadside, the maximum impacts on annual mean NOx and NH_3 concentrations and Nitrogen deposition from all sources combined during the construction phase are less than 3% of the relevant critical levels/loads and therefore screen as negligible using the Environment Agency Criteria for local nature sites (100%).

5.8.65. Therefore, the Proposed Scheme has an overall negligible impact on roadside ecological receptors and effects are therefore **Not Significant.**

Table 5-30: Full Proposed Scheme Modelled Annual Mean NO_X (Roadside Receptors)

Receptor	Critical Level (ug/m^3)	Total NOx Conc: Max Baseline 2022 (µg/m^3)	Total NOx Conc: Max Without Proposed Scheme 2028 (µg/m^3)	Total NOx Conc: Max With Full Proposed Scheme Construction 2028 (µg/m^3)	Max Impact of Full Proposed Scheme (µg/m^3) (as % of CLe
Crossness LNR	30	86.3	59.8	60.6	0.8 (2.8%)

Table 5-31: Full Proposed Scheme Modelled Annual Mean NH_3 (Roadside Receptors)

Receptor	Critical Level ($\mu g/m^3$)	Total NH_3 Conc: Max Baseline 2022 ($\mu g/m^3$)	Total NH_3 Conc: Max Without Proposed Scheme 2028 ($\mu g/m^3$)	Total NH_3 Conc: With Full Proposed Scheme Construction 2028 ($\mu g/m^3$)	Max Impact of Full Proposed Scheme ($\mu g/m^3$) (as % of CLe)
Crossness LNR	1.0	2.3	2.51	2.53	0.02 (1.6%)

Table 5-32: Full Proposed Scheme Modelled Annual Mean Nitrogen Deposition (Roadside Receptors)

Receptor	Vegetation Type	Critical Load (kgN/ha/yr)	Total N-Dep: Max Baseline 2022 (kgN/ha/yr)	Total N-Dep: Max Without Proposed Scheme 2028 (kgN/ha/yr)	Total N-Dep: With Full Proposed Scheme Construction 2028 (kgN/ha/yr)	Max Impact of Full Proposed Scheme (kgN/ha/yr) (as % of CL)
Crossness LNR	Grassland	10	22.4	22.3	22.4	0.14 (1.4%)

Daily mean NO_X

5.8.66. Away from the roadside, the only metric relevant for consideration for the Full Proposed Scheme AQ Impact is daily mean NOx **(Table 5-33)**.

Table 5-33: Maximum Full Proposed Scheme AQ Impacts on Daily Mean NO_X at Ecological Receptors during Construction

Receptor	Critical Level (µg/m³)	Max Adverse Impact of Full Proposed Scheme (µg/m³)	Max Adverse Impact of Full Proposed Scheme as % of CL	Max Total Conc: With Full Proposed Scheme 2028 (µg/m³)	Max Total Conc. as % of CL
Epping Forest – SAC, SSSI	200	0.1	0.1%	57.7	28.8%
Ingrebourne Marshes – SSSI	200	0.8	0.4%	48.6	24.3%
Inner Thames Marshes – SSSI	200	1.9	1.0%	60.5	30.3%
Oxleas Woodlands – SSSI	200	0.2	0.1%	45.8	22.9%
West Thurrock Lagoon and Marshes – SSSI	200	0.6	0.3%	99.8	49.9%
Crossness – LNR	200	4.8	2.4%	76.9	38.4%
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)	200	0.6	0.3%	46.8	23.4%
Rainham Marshes – LNR	200	1.9	1.0%	60.0	30.0%

5.8.67. There is no Full Proposed Scheme AQ Impact greater than 1% of the critical level of 200µg/m³ and there are no exceedances of the daily mean critical level. Impacts therefore screen as negligible using Environment Agency Criteria and effects are **Not Significant**.

OPERATION PHASE

Changes to Emissions of Pollutants (arising from the Riverside Campus as a result of the Carbon Capture Facility)

5.8.68. The likely potential significant effects for air quality associated with the operation phase of the Proposed Scheme are summarised below.

5.8.69. The following show the spatial distribution of modelled impacts that do not screen as negligible against the project criteria set out in **Table 5-7**:

- **Figure 5-5: NO_2 Annual Baseline Process Contribution (Volume 2)**
- **Figure 5-6: NO_2 Annual Carbon Capture Process Contribution (Volume 2)**
- **Figure 5-7: NO_2 Annual Impact (Volume 2)**
- **Figure 5-8: NO_2 1 Hour Impact (Volume 2)**
- **Figure 5-9: SO_2 15 Minute Impact (Volume 2)**
- **Figure 5-10: SO_2 1 Hour Impact (Volume 2)**
- **Figure 5-11: SO_2 24 Hour Impact (Volume 2)**
- **Figure 5-12: Total Nitrosamine and Nitramine Annual Impact (Volume 2)**
- **Figure 5-13: Aldehyde Annual Impact (Volume 2)**

5.8.70. It is reiterated that, for pollutants that are not introduced by the Carbon Capture Facility, the impact of the Carbon Capture Facility relates to the difference between the impacts of the Riverside 1 and Riverside 2 emissions with and without the Carbon Capture Facility. The total mass emission rates of these pollutants do not change, but their spatial distribution is changed by a shift in Stack(s) location and variation in plume buoyancy introduced by the cooling and removal of carbon dioxide from the flue gas. A detailed explanation of the spatial distribution of impacts is provided in **Appendix 5-2: Operation Phase Assessment (Volume 3)**, and further model results are provided in **Appendix 5-3: Detailed Model Pollutant Results (Volume 3)**.

5.8.71. For pollutants currently emitted by Riverside 1 and Riverside 2 (including AQS pollutants), the maximum ground level concentrations and Proposed Scheme impacts, anywhere within the receptor grid for any of the five years' worth of meteorological data modelled, are shown for non-metal pollutants in **Table 5-34** and for heavy metals in **Table 5-35**.

5.8.72. Pollutants for which the maximum adverse impact cannot be screened out as being negligible, i.e. with an impact >1% of the long term standard or >10% of the short term standard, are shown in bold. Furthermore, where the predicted maximum adverse impact on ground level receptors cannot be screened out as negligible, the background concentration and total pollutant concentrations (termed PEC) have been reported.

Potential Effects on Human Health

5.8.73. For existing pollutants, maximum adverse impact occurs around 300m to the south-east of the Carbon Capture Facility, over predominantly industrial facilities. For annual mean concentrations, beneficial impacts occur to the north and northwest of the Site.

Maximum beneficial impacts occur around 600m north of the Carbon Capture Facility, within the River Thames. For short term (15min/hourly/daily) concentrations, impacts are predominantly adverse, but there is an area of beneficial impacts within the Site. Overall, non-negligible impacts are concentrated within 2km of the Site Boundary and specifically in areas within this distance of the Site where there are relatively few residential properties.

5.8.74. For annual mean NO_2, maximum adverse impacts where there are residential properties are less than 0.4µg/m^3 (on Jenningtree Way, approximately 610m southeast of the Site Boundary) and 0.3µg/m^3 (on Clydesdale Way, approximately 150m southeast of the Site Boundary). Furthermore, impacts have been modelled at full load operation and with emissions at the permitted limits. This is a conservative assumption since, for NO_x (70% of which is predicted to be converted to NO_2 as an annual mean), between 2020 and 2022, at no time did the actual emissions exceed the permitted daily average limit for Riverside 1[58,59,60].

5.8.75. The maximum modelled hourly mean NO_2 PC at ground level with the operation of the Proposed Scheme is 103.0µg/m^3 over the modelled scenarios and the PEC at this location with the Proposed Scheme is 131.5µg/m^3 which is within the air quality standard (200µg/m^3)[8]. The maximum adverse impact is 81.8µg/m^3, which is 40.9% of the standard and occurs to the southeast within approximately 250m of the Carbon Capture Facility. The maximum beneficial impact is 24.6µg/m^3.

5.8.76. Taking into consideration the modelling of full load operation with emissions at the permitted limits, the maximum hourly mean NO_2 PC is likely to be conservative since for NOx (35% of which is predicted to be NO_2) between 2020 and 2022, monitored emissions from Riverside 1 did not exceed 60% of the 30 minute permitted limit (used to assess hourly mean impacts) at any time.

5.8.77. Overall, whilst the impact of the Proposed Scheme on NO_2 concentrations cannot be screened as negligible, with total PEC being within the standards at the point of maximum impact, no significant effects are likely in relation to changed exposure to NO_2.

5.8.78. For other non-metal and metal pollutants, the impacts for the majority of pollutants are negligible (<1% of the long term standard/<10% of the short term standard).

5.8.79. For those pollutants for which the impacts cannot be screened as negligible (SO_2, Arsenic, Cadmium and Nickel), the predicted maximum ground level concentrations do not exceed the assessment levels and no significant effects are likely.

5.8.80. For 15 minute mean SO_2 the maximum adverse impacts are potentially large (63.1% of the short term standard), and for 1 hour mean SO_2 the maximum adverse impacts are moderate (32.8% of the short term standard). As discussed for NO_2, the impacts of the Proposed Scheme have been modelled conservatively, with emissions of all

[8] The maximum PEC anywhere within the grid is 132.9µg/m^3 but the impact at this location is slightly lower than at the location of maximum impact.

pollutants constantly at their maximum permitted limits and operations at full load. For SO_2, between 2020 and 2022, emissions did not exceed 20% of the permitted limits at any time. Therefore, based on recent emissions, the impacts are likely to be slight for both 15 minute and 1 hour mean SO_2 under normal operations. Notwithstanding this, the maximum PEC for 15 minute mean and 1 hour mean SO_2 did not exceed the relevant AQS objectives when modelled at maximum permitted operation and therefore no health effects are likely.

5.8.81. The maximum adverse impacts on annual mean Arsenic and Nickel are 3.0% and 7.9% of their long term standards respectively and therefore cannot be screened out. However, as noted for other pollutants, these are conservative estimates. For metals, concentrations were modelled at full load operation of the Proposed Scheme and emissions at the Environment Agency worst case screening levels[27]. Between 2020 and 2022, the combined release of Arsenic and Nickel did not exceed 10% of the permitted limits at any time; the combined release is modelled at 49% of the permitted limit, 5% for arsenic and 44% for nickel.

5.8.82. The maximum adverse impact of annual mean Cadmium is 4.8% of the long term standard. As with Arsenic and Nickel, the annual mean adverse impact of Cadmium is likely to be insignificant under normal operations of the Proposed Scheme since, between 2020 and 2022, emissions of Cadmium did not exceed 5% of the permitted limits at any time but has been modelled at 100% of the permitted limit.

5.8.83. $PM_{2.5}$ has been assessed on the assumption that all particulate matter is in the $PM_{2.5}$ size fraction. Further, it has been assessed against the current standard of 20µg/m^3 and found to be negligible. In 2040, the statutory $PM_{2.5}$ target concentration reduces to 10µg/m^3. The maximum impact of the Proposed Scheme is 0.6% of this revised target. Taking into account the conservative assumptions within the assessment i.e. emissions always at maximum permitted operation and all PM being $PM_{2.5}$, no significant effects are likely.

Table 5-34: Maximum Ground Level Concentrations of Non-metal Pollutants Across the Operation Study Area

Pollutant	Averaging time	Baseline Max Mean PC (µg/m³)	With Proposed Scheme Max Mean PC (µg/m³)	Max Adverse Impact (µg/m³)	Max Beneficial Impact (µg/m³)	Air Quality Standard (µg/m³)	Max Adverse as % of Standard	Max Beneficial as % of Standard	At Location of Maximum Impact		
									2030 Background Concentration (µg/m³)	PEC	PEC as % of Standard
NO_2	1 hour	50.8	103.0	81.8	-24.6	200	**40.9%**	-10.9%	29.7	131.5	65.7%
	Annual	3.2	2.4	1.3	-1.8	40	**3.3%**	-3.4%	15.1	16.6	41.6%
PM_{10}	Daily	0.7	0.4	0.3	-0.6	50	0.5%	-1.2%	-	-	-
	Annual	0.2	0.1	0.1	-0.2	40	0.1%	-0.5%	-	-	-
$PM_{2.5}$	Annual	0.2	0.1	0.1	-0.2	20	0.3%	-0.9%	-	-	-
SO_2	15 minutes	103.7	215.0	167.7	-53.7	266	**63.1%**	-20.2%	4.4	219.4	82.5%
	1 hour	71.3	144.7	114.8	-34.1	350	**32.8%**	-9.7%	4.4	144.6	41.3%
	Daily	6.9	10.6	8.2	-5.4	125	6.6%	-4.3%	-	-	-
CO	8 hours	54.0	90.8	76.5	-29.6	10000	0.8%	-0.3%	-	-	-
HF	1 hour	0.4	1.1	1.0	-0.3	160	0.6%	-0.2%	-	-	-
HCl	1 hour	26.6	66.4	58.4	-17.7	750	7.8%	-2.4%	-	-	-
	Annual	0.3	0.2	0.1	-0.2	16	0.6%	-1.4%	-	-	-

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Max Beneficial Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse as % of Standard	Max Beneficial as % of Standard	At Location of Maximum Impact		
									2030 Background Concentration (µg/m^3)	PEC	PEC as % of Standard
NH_3	1 hour	4.2	4.4	3.6	-2.1	2500	0.1%	-0.1%	-	-	-
	Annual	0.5	0.3	0.2	-0.4	180	0.1%	-0.2%	-	-	-

Note:
PEC only shown where the maximum adverse impact cannot be screened as Negligible; background concentrations for short term impacts set at 2 x annual mean background concentration as per Environment Agency guidance[24].

Table 5-35: Maximum Ground Level Concentrations of Metal Pollutants Across the Operation Study Area

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Max Beneficial Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse as % of Standard	Max Beneficial as % of Standard	2030 Background Concentration (µg/m^3)	PEC	PEC as % of Standard
Arsenic	Annual	0.0007	0.0004	0.0002	-0.0006	0.006	**3.0%**	-9.3%	0.0008	0.0012	20.8%
Cadmium	Annual	0.0009	0.0006	0.0002	-0.0007	0.005	**4.8%**	-14.9%	0.0002	0.0008	15.5%
Lead	Annual	0.0014	0.0008	0.0004	-0.0011	0.25	0.1%	-0.5%	-	-	-
Nickel	Annual	0.0061	0.0037	0.0016	-0.0049	0.02	**7.9%**	-24.6%	0.0017	0.0054	26.9%
Antimony	1 hour	0.0031	0.0076	0.0067	-0.0020	150	0.004%	-0.001%	-	-	-
	Annual	0.0003	0.0002	0.0001	-0.0003	5	0.002%	-0.005%	-	-	-
Chromium III	1 hour	0.024	0.061	0.054	-0.016	150	0.04%	-0.01%	-	-	-
	Annual	0.0026	0.0015	0.0007	-0.0021	5	0.01%	-0.04%	-	-	-

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Max Beneficial Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse as % of Standard	Max Beneficial as % of Standard	2030 Background Concentration (µg/m^3)	PEC	PEC as % of Standard
Chromium VI	Annual	0.000004	0.000002	0.000001	-0.000003	0.00025	0.4%	-1.3%	-	-	-
Copper	1 hour	0.008	0.019	0.017	-0.005	200	0.008%	0.00%	-	-	-
	Annual	0.0008	0.0005	0.0002	-0.0006	10	0.002%	-0.01%	-	-	-
Manganese	1 hour	0.016	0.040	0.035	-0.011	1500	0.002%	0.00%	-	-	-
	Annual	0.0017	0.0010	0.0004	-0.0013	0.15	0.3%	-0.9%	-	-	-
Mercury	1 hour	0.009	0.022	0.019	-0.006	7.5	0.3%	-0.1%	-	-	-
	Annual	0.0009	0.0006	0.0002	-0.0007	0.25	0.4%	-1.2%	-	-	-
Vanadium	Daily	0.0012	0.0012	0.0010	-0.0008	1	0.1%	-0.1%	-	-	-

Note:
PEC only shown where the maximum adverse impact cannot be screened as Negligible.

5.8.84. **Table 5-36** shows the maximum ground level concentrations across the Operation Study Area for the compounds introduced by the Proposed Scheme as a result of the carbon capture process.

5.8.85. The maximum annual mean PC with the Proposed Scheme for total nitrosamines and nitramines, and the maximum annual mean PC for aldehyde are >1% of the long term standard and therefore cannot be classed as insignificant. The hourly mean PC with the Proposed Scheme for aldehydes are >10% of the short term standard and therefore cannot be classed as insignificant.

5.8.86. Assessing the combined impacts of total nitramines and nitrosamines against NDMA is conservative, since nitramines are, in general, lower risk than nitrosamines (see **Appendix 5-2: Operation Phase Assessment (Volume 3)**). Furthermore, the maximum Total Nitrosamines and Nitramines impact occurs 1km to the west of the Carbon Capture Facility in the Crossness Sewage Treatment Works and Southmere Park, where there is no realistic long term exposure to these pollutants. At residential properties, the maximum total nitrosamines and nitramines concentration is 0.019µg/m^3 (9.6% of the EAL) (**Figure 5-12: Total Nitrosamine and Nitramine Annual Impact (Volume 2)**).

5.8.87. The maximum impact for annual mean aldehyde occurs 1km to the northeast of the Carbon Capture Facility, in the River Thames. There is no realistic long term exposure to these pollutants in the location of maximum impact. At residential properties, the maximum predicted annual mean aldehyde concentration is 0.058µg/m^3 (1.2% of the EAL) (**Figure 5-13: Aldehyde Annual Impact (Volume 2)**). The maximum impact for hourly mean Aldehyde occurs 200m to the southeast of the Carbon Capture Facility along the Site Boundary. At residential properties the maximum predicted hourly mean aldehyde concentration is 5.67µg/m^3 (5.7% of the EAL) (**Figure 5-13: Aldehyde Hourly Impact (Volume 2)**). Furthermore, aldehydes are assessed against the most stringent available assessment level for this group of chemicals, namely formaldehyde. This adds to the conservatism of the assessment.

5.8.88. Further sensitivity testing of amine and nitrosamine impacts is presented in **Appendix 5-2: Operation Phase Assessment (Volume 3)**.

Table 5-36: Maximum ground level concentrations across the Operation Study Area of New Compounds introduced by the Proposed Scheme

Pollutant	Averaging Time	With Proposed Scheme Maximum Mean PC (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse Impact as % of Standard
Amine 1	1 hour	2.11	400	0.53%
	Daily	0.69	100	0.69%
Amine 2	1 hour	2.14	400	0.53%
	Daily	0.69	100	0.69%

Pollutant	Averaging Time	With Proposed Scheme Maximum Mean PC (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse Impact as % of Standard
Total Amines	1 hour	4.25	400	1.06%
	Daily	1.39	100	1.39%
Nitrosamine	Annual	0.013	0.2	6.52%
Nitramine	Annual	0.015	0.2	7.69%
Total Nitramine + Nitrosamine	Annual	0.025	0.2	12.51%
Aldehyde	1 hour	11.1	100	11.1%
	Annual	0.1	5	2.8%

5.8.89. Taking into account EPUK/IAQM guidance[21] and Environment Agency guidance[24], future pollutant concentrations and the likely magnitude of future emissions, impacts for SO_2, nitrosamines and aldehydes are classed as slight adverse and **Not Significant**. All other pollutants are negligible and **Not Significant**.

Potential Effects within Local Authorities

5.8.90. In this section, the contributions of the Proposed Scheme to air pollution within each local authority discussed in the baseline **(Section 5.6)** are presented as maximum ground level concentrations in **Table 5-37**. Concentrations are presented for both the Baseline and Proposed Scheme scenarios. Pollutants for which the maximum adverse impact cannot be screened out as being negligible (with >1% of the long term standard or >10% of the short term standard) are shown in bold.

5.8.91. The LBB, in which the Proposed Scheme is located, has the highest adverse impact of all the pollutants detailed in **Table 5-37**.

5.8.92. The 1 hour NO_2 mean exceeds 10% of the objective in LBB, and the annual mean NO_2 exceeds 1% of the objective in LBB. Note that these likely maximum concentrations of NO_2 are conservative as the impacts have been modelled at full load operation with emissions at the permitted limits. As stated in **Paragraph 5.8.75**, with typical emission concentrations rather than permitted emission limits, it is likely that the NO_2 impact in LBB would be negligible. Moreover, even with emissions at the maximum permitted limit, the PEC does not exceed the objective and so no significant effects are likely.

5.8.93. The 15 minute mean SO_2 impact exceeds 10% of the objective in LBB and LBH. The 1 hour mean SO_2 impact exceeds 10% of the objective in LBB. As with the NO_2 impact, these maximum SO_2 impacts are conservative estimates. With emissions at maximum permitted limits there is no realistic risk of the PEC exceeding the objective (as shown in **Table 5-37**), and with emissions at typical concentrations impacts from the Proposed Scheme are likely to be negligible in the local authorities.

5.8.94. The annual mean Total Nitrosamine and Nitramine impact exceed 1% of the long term objective in LBB, LBBD, LBH, DBC and the RBG. The annual mean Aldehyde impacts exceed 1% of the long term objective in LBB, LBBD and LBH. The hourly mean Aldehyde impacts exceed 10% of the short term objective in LBB. These pollutant impacts cannot be screened as Negligible.

5.8.95. However, reporting the maximum Total Nitramines and Nitrosamines is conservative, since nitramines are, in general, lower risk than nitrosamines. Furthermore, as noted previously in **Paragraph 5.8.86**, where there is significant potential for long term exposure (residential properties, health/education facilities), impacts from nitrosamines will be considerably lower than those presented as a maximum in LBB.

Table 5-37: Maximum Ground Level Concentrations Across the Operation Study Area in Relevant Local Authorities

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse Impact as % of Standard
London Borough of Bexley						
NO_2	1 hour	50.8	103.0	81.8	200	40.9%
	Annual	3.2	2.3	1.3	40	3.3%
SO_2	15 minutes	103.7	215.0	167.7	266	63.1%
	1 hour	71.3	144.7	114.8	350	32.8%
	Daily	6.9	10.6	8.2	125	6.6%
Total Nitrosamine and Nitramine	Annual	No Emissions	0.03	0.03	0.2	12.5%
Aldehyde	1 hour		11.1	11.1	100	11.1%
	Annual		0.1	0.1	5	2.6%
London Borough of Havering						
NO_2	1 hour	35.5	42.7	10.0	200	5.0%
	Annual	3.2	2.4	0.2	40	0.6%
SO_2	15 minutes	68.7	85.3	36.6	266	13.8%
	1 hour	50.4	60.3	13.8	350	3.9%
	Daily	6.7	6.7	0.8	125	0.6%
Total Nitrosamine and Nitramine	Annual	No emissions	0.02	0.02	0.2	10.8%

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse Impact as % of Standard
Aldehyde	1 hour		5.56	5.6	100	5.6%
	Annual		0.1	0.1	5	2.8%
London Borough of Barking and Dagenham						
NO_2	1 hour	47.3	45.6	7.9	200	3.9%
	Annual	2.1	0.9	0.1	40	0.3%
SO_2	15 minutes	94.4	91.8	17.4	266	6.5%
	1 hour	65.7	63.7	9.9	350	2.8%
	Daily	6.4	4.2	1.0	125	0.8%
Total Nitrosamine and Nitramine	Annual	No emissions	0.01	0.01	0.2	6.3%
Aldehyde	1 hour		4.9	4.9	100	4.9%
	Annual		0.05	0.05	5	1.0%
Royal Borough of Greenwich						
NO_2	1 hour	24.0	29.9	10.9	200	5.43%
	Annual	0.5	0.6	0.1	40	0.37%
SO_2	15 minutes	54.9	74.2	25.3	266	9.50%
	1 hour	32.6	41.1	15.7	350	4.48%
	Daily	1.7	2.0	0.5	125	0.37%

Pollutant	Averaging time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse Impact as % of Standard
Total Nitrosamine and Nitramine	Annual	No emissions	0.02	0.02	0.2	9.3%
Aldehyde	1 hour		3.8	3.8	100	3.8%
	Annual		0.04	0.04	5	0.7%
Dartford Borough Council						
NO_2	1 hour	12.7	13.9	7.1	200	3.6%
	Annual	0.3	0.3	0.0	40	0.1%
SO_2	15 minutes	28.0	32.2	16.5	266	6.2%
	1 hour	16.4	17.9	9.5	350	2.7%
	Daily	1.0	1.0	0.4	125	0.3%
Total Nitrosamine and Nitramine	Annual	No emissions	0.005	0.005	0.2	2.3%
Aldehyde	1 hour		1.8	1.8	100	1.8%
	Annual		0.01	0.01	5	0.3%

Potential Effects within Air Quality Focus Areas

5.8.96. In this section, the contribution of the Proposed Scheme to air pollution within Air Quality Focus Areas within 5km of the Site Boundary are presented as maximum ground level concentrations in **Table 5-38**. Concentrations are presented for both the Baseline and Proposed Scheme scenarios. Pollutants for which the maximum adverse impact cannot be screened out as being negligible (with >1% of the long term standard or >10% of the short term standard) are shown in bold.

5.8.97. The impact of the Proposed Scheme on annual mean NO_2 is <1.0% of the objective in all AQFA (and <10% of the hourly mean). Therefore, at the roadside, where there is potential exposure of the public and elevated concentrations due to traffic emissions, the impact of the Proposed Scheme is likely to be negligible.

5.8.98. The SO_2 impacts within the AQFA can also be screened out as negligible.

5.8.99. The annual mean Total Nitrosamine and Nitramine impacts exceed 1% of the long term objective in all five of the assessed AQFA. The annual mean aldehyde impacts exceed 1% of the long term objective in the Rainham Broadway AQFA. Whilst the pollutant impacts cannot be screened as negligible, increased risk to health is very low when considering the overall conservative nature of the assessment.

Table 5-38: Maximum Ground Level Concentrations Across Receptor Points in Air Quality Focus Areas within 5km of the Site Boundary

Pollutant	Averaging Time	Baseline Max Mean PC (µg/m3)	With Proposed Scheme Max Mean PC (µg/m3)	Max Adverse Impact (µg/m3)	Air Quality Standard (µg/m3)	Max Adverse as % of Objective
London Borough of Bexley – A206 AQFA						
NO_2	1 hour	12.0	20.4	11.0	200	5.5%
	Annual	0.1	0.2	0.1	40	0.2%
SO_2	15 minutes	28.7	45.9	22.7	266	8.5%
	1 hour	15.2	25.5	11.6	350	3.3%
	Daily	0.8	1.2	0.5	125	0.4%
Total Nitrosamine and Nitramine	Annual	0	0.004	0.004	0.2	1.9%
Aldehyde	1 hour	0	2.9	2.9	100	2.9%
	Annual	0	0.01	0.01	5	0.3%
London Borough of Havering – Rainham Broadway AQFA						
NO_2	1 hour	16.9	22.3	7.1	200	3.5%
	Annual	1.0	1.1	0.1	40	0.3%
SO_2	15 minutes	42.7	52.6	14.2	266	5.4%
	1 hour	21.8	28.3	9.0	350	2.6%
	Daily	1.9	2.1	0.3	125	0.2%
Total Nitrosamine and Nitramine	Annual	0	0.01	0.01	0.2	5.5%

Pollutant	Averaging Time	Baseline Max Mean PC (µg/m3)	With Proposed Scheme Max Mean PC (µg/m3)	Max Adverse Impact (µg/m3)	Air Quality Standard (µg/m3)	Max Adverse as % of Objective
Aldehyde	1 hour	0	3.0	3.0	100	3.0%
	Annual	0	0.06	0.06	5	1.2%
London Borough of Barking and Dagenham – A13 Ripple Road AQFA						
NO_2	1 hour	12.9	16.4	6.3	200	3.1%
	Annual	0.1	0.2	0.1	40	0.2%
SO_2	15 minutes	27.4	36.6	13.6	266	5.1%
	1 hour	17.6	22.7	9.1	350	2.6%
	Daily	0.9	1.1	0.3	125	0.3%
Total Nitrosamine and Nitramine	Annual	0	0.004	0.004	0.2	1.8%
Aldehyde	1 hour	0	2.5	2.5	100	2.5%
	Annual	0	0.01	0.01	5	0.2%
London Borough of Barking and Dagenham – Barking Town Centre AQFA						
NO_2	1 hour	8.8	10.4	1.8	200	0.88%
	Annual	0.1	0.1	0.0	40	0.06%
SO_2	15 minutes	21.0	22.2	2.6	266	1.0%
	1 hour	12.3	14.6	2.7	350	0.77%
	Daily	0.5	0.6	0.1	125	0.1%

Pollutant	Averaging Time	Baseline Max Mean PC (µg/m3)	With Proposed Scheme Max Mean PC (µg/m3)	Max Adverse Impact (µg/m3)	Air Quality Standard (µg/m3)	Max Adverse as % of Objective
Total Nitrosamine and Nitramine	Annual	0	0.003	0.003	0.2	1.4%
Aldehyde	1 hour	0	1.5	1.5	100	1.5%
	Annual	0	0.01	0.01	5	0.1%
Royal Borough of Greenwich – A206 Plumstead Road AQFA						
NO_2	1 hour	15.4	18.5	4.4	200	2.2%
	Annual	0.3	0.3	0.0	40	0.1%
SO_2	15 minutes	37.8	44.7	12.6	266	4.7%
	1 hour	20.1	23.9	5.5	350	1.6%
	Daily	1.0	1.2	0.2	125	0.2%
Total Nitrosamine and Nitramine	Annual	0.000	0.000	0.0001	0.2	0.1%
Aldehyde	1 hour	0	2.2	2.2	100	2.2%
	Annual	0	0.02	0.02	5	0.4%

Potential Effects on Ecological Receptors

5.8.100. In this section, the contribution of the Proposed Scheme to air pollution is presented as maximum ground level concentrations and deposition levels at the identified designated sites. The impact of the Proposed Scheme represents the change in concentrations or deposition between the Baseline and the Proposed Scheme.

Ammonia

5.8.101. The impacts of the operation of the Proposed Scheme on concentrations of NH_3 are insignificant (≤1% of the critical level) at Epping Forest SAC, Ingrebourne Marshes SSSI, Oxleas Woodlands SSSI and West Thurrock Lagoon and Marshes SSSI. At Lesnes Abbey Woods LNR, Crossness LNR and Rainham Marshes LNR, the impacts are less than the Environment Agency screening criteria for local sites (≤100% of the critical level) and negligible. Impacts of the Proposed Scheme which cannot be screened out as being insignificant (>1% of the relevant level or load) are shown in bold.

5.8.102. The modelled PEC annual mean concentrations of ammonia at the point of maximum impact of the Proposed Scheme within each designated site, based on five years of meteorological data, are presented in **Table 5-39**. Concentrations are presented for both the Baseline and with Proposed Scheme scenarios.

5.8.103. The air quality impact of the Proposed Scheme on NH_3 at Inner Thames Marshes equates to 1.1% of the critical level. However, the PEC under both the Baseline and Proposed Scheme scenarios is within the Critical Level (3µg/m^3) and the contribution of the Proposed Scheme is minimal compared to the background concentrations.

5.8.104. Notwithstanding the fact that impacts at all sites can be screened as insignificant using Environment Agency criteria or total concentrations are below the critical level, taking into account the potential for long term exposure to pollution, the results of the assessment of significance of any effects are reported within **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

Table 5-39: Modelled Maximum Operation Phase Impacts at Ecological Receptors for Annual Mean NH_3 (CIe = Critical Level)

Receptor	Critical Level (µg/m^3)	Max Impact (µg/m^3)	Impact as % of CLe	At Point of Maximum Impact		
				Max Baseline PEC (µg/m^3)	Max Proposed Scheme PEC (µg/m^3)	Max Proposed Scheme PEC as % of CLe
Epping Forest – SAC, SSSI	1	0.001	0.1%	2.0	2.0	204.4%
Ingrebourne Marshes – SSSI	1	0.009	0.9%	1.6	1.6	160.8%

Receptor	Critical Level (µg/m^3)	Max Impact (µg/m^3)	Impact as % of CLe	At Point of Maximum Impact		
				Max Baseline PEC (µg/m^3)	Max Proposed Scheme PEC (µg/m^3)	Max Proposed Scheme PEC as % of CLe
Inner Thames Marshes – SSSI	3	0.034	**1.1%**	1.6	1.6	53.0%
Oxleas Woodlands – SSSI	1	0.005	0.5%	1.8	1.8	177.9%
West Thurrock Lagoon and Marshes – SSSI	3	0.001	0.04%	1.4	1.4	47.9%
Crossness – LNR	1	0.048	4.8%	1.6	1.6	163.0%
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)	1	0.018	1.8%	1.7	1.7	168.8%
Rainham Marshes – LNR	3	0.034	1.1%	1.6	1.6	52.9%

Nitrogen Oxides and Sulphur Dioxide

5.8.105. The impacts of the operation of the Proposed Scheme on annual mean concentrations of NO_x are ≤1% of the critical level at all but three designated sites (Inner Thames Marshes SSSI, Rainham Marshes LNR and Crossness LNR), although concentrations over Rainham Marshes LNR and Crossness LNR can be screened as not significant against the Environment Agency Screening Criteria[24] for local sites **(Table 5-40)**. Impacts of the Proposed Scheme which cannot be screened out as being insignificant on the basis of the impact alone are shown in bold in the table.

5.8.106. The modelled PEC annual mean concentrations of NO_x and SO_2 at the location of maximum impact within each designated site, based on five years of meteorological

data are presented in **Table 5-40**. Concentrations are presented for both the Baseline and with Proposed Scheme scenarios.

5.8.107. The air quality impact of the Proposed Scheme on NO_x at Crossness LNR, which is located partly within the Site, equates to 1.3% of the critical level. However, the critical Level (30µg/m^3) is not exceeded under either the Baseline or Proposed Scheme scenarios and, as such, the effects at Crossness LNR can be determined to be insignificant.

5.8.108. The air quality impact of the Proposed Scheme on annual mean NO_x at both Inner Thames Marshes SSSI and Rainham Marshes LNR equates to 1.1% of the Critical Level. The Critical Level at these designated sites is 30µg/m^3 but is not exceeded under either the Baseline and Proposed Scheme scenarios. As such, the effects at Inner Thames Marshes SSSI and Rainham Marshes LNR can be determined to be insignificant.

5.8.109. Furthermore, the impacts have been modelled at full load operation and with emissions at the maximum permit levels for Riverside 1 and Riverside 2. Under normal operating conditions, pollutant emission rates (and hence impacts) will be considerably lower, even at high operating load, since typical emission concentrations are well within the maximum permitted levels. Notwithstanding this conclusion, the results of the ecological receptor assessment of significant effects with respect to Inner Thames Marshes SSSI and Rainham Marshes LNR are reported within **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

5.8.110. The impacts of the operation of the Proposed Scheme on annual mean concentrations of SO_2 are insignificant (≤1% of the critical level) at all but one designated site (Crossness LNR). However, the background SO_2 concentrations are low with respect to the Critical Level, and the PEC under both the Baseline and Proposed Scheme scenarios are not exceeded at Crossness LNR where the impact is >1% of the Critical Level but less than the Environment Agency Screening Criteria for local sites (100%). Therefore, the impact of SO_2 at Crossness LNR is negligible and the effects are **Negligible (Not Significant)**.

Table 5-40: Modelled Maximum Operation Phase Impacts at Ecological Receptors for Annual Mean NO_x and SO_2

Receptor	Critical Level (µg/m³)		Max Impact (µg/m³)		Impact as % of CLe		At Point of Maximum Impact					
							Max Baseline PEC (µg/m3)		Max Proposed Scheme PEC (µg/m³)		Max Proposed Scheme PEC as % of CLe	
	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2
Epping Forest – SAC, SSSI	30	10	0.016	0.004	0.05%	0.04%	26.6	2.5	26.6	2.5	88.6%	24.8%
Ingrebourne Marshes – SSSI	30	10	0.112	0.024	0.37%	0.24%	21.0	3.0	21.1	3.0	70.4%	30.2%
Inner Thames Marshes – SSSI	30	20	0.321	0.097	**1.1%**	0.49%	24.3	6.0	24.6	6.1	82.1%	30.7%
Oxleas Woodlands – SSSI	30	10	0.052	0.014	0.17%	0.14%	20.3	2.1	20.3	2.2	67.8%	21.5%
West Thurrock Lagoon and Marshes – SSSI	30	10*	0.015	0.003	0.05%	0.03%	47.4	2.4	47.4	2.4	158.1%	24.0%
Crossness – LNR	30	10	0.393	0.141	1.3%	1.41%	23.7	2.4	24.0	2.5	80.2%	25.4%
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)	30	10	0.176	0.050	0.59%	0.50%	19.3	2.3	19.5	2.4	64.9%	23.9%
Rainham Marshes – LNR	30	20	0.321	0.097	1.1%	0.49%	24.2	6.0	24.5	6.1	81.8%	30.7%

Note:
*No published critical level. 10µg/m³ assumed as a worst case.

Nitrogen and Acid Deposition

5.8.111. **Table 5-41** and **Table 5-42** show the modelled deposition over the ecological sites. Deposition is presented for both the Baseline and Proposed Scheme scenarios, and impacts of the Proposed Scheme which cannot be screened out as being insignificant (>1% of the relevant level or load) are shown in bold. The modelled PEC annual nitrogen deposition rates at the point of maximum impact within each designated site, based on five years of meteorological data, are provided.

5.8.112. Background levels of nitrogen deposition at all designated sites already exceed the lower range of the respective Critical Load with the exception of Ingrebourne Marshes SSSI, as reported in **Table 5-9**. Screening of the designated sites against Environment Agency criteria[24] indicates that all but one of the sites have a negligible impact and effects are therefore **Negligible (Not Significant)** in relation to nitrogen deposition.

5.8.113. Four of the designated sites have a nitrogen deposition impact >1% of the relevant critical load include Inner Thames Marshes SSSI, Rainham Marshes LNR, Lesnes Abbey Woods LNR and Crossness LNR. At each of these sites, the nitrogen deposition impact resulting from operation of the Proposed Scheme are a small portion relative to the PEC under the Baseline scenario. Inner Thames Marshes SSSI is the only site which does not screen as negligible against Environment Agency criteria[24], and here the impact is 2.7% of the critical load and the total deposition is 154% of the critical load. As such, the results of the assessment of significant effects relating to nitrogen deposition is reported within **Chapter 7: Terrestrial Biodiversity (Volume 1)**.

5.8.114. The maximum modelled impact on annual acid deposition rates at each designated site sensitive to acid deposition are presented in **Table 5-42**.

5.8.115. The impacts of the operation of the Proposed Scheme on annual acid deposition rates are insignificant (≤1% of the critical level) at all of the designated sites where Critical Loads for acid deposition are available.

Table 5-41: Modelled Maximum Operation Phase Impacts at Ecological Receptors for Annual Nitrogen Deposition

Receptor	Critical Load (kgN/ha/yr)	Max Impact (kgN/ha/yr)	Impact as % of CL	At Location of Maximum Impact		
				Max Baseline PEC (kgN/ha/yr)	Max Proposed Scheme PEC (kgN/ha/yr)	Max Proposed Scheme PEC as % of CL
Epping Forest – SAC, SSSI	5	0.04	0.7%	32.27	32.30	646.0%
Ingrebourne Marshes – SSSI	15	0.08	0.6%	14.97	15.03	100.2%
Inner Thames Marshes – SSSI	10	0.27	**2.7%**	15.14	15.41	154.1%
Oxleas Woodlands – SSSI	15	0.11	0.7%	28.55	28.66	191.1%
West Thurrock Lagoon and Marshes – SSSI	10	0.03	0.3%	13.68	13.69	136.9%
Crossness – LNR	10	0.32	**3.2%**	15.05	15.37	153.7%
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)	10	0.23	**2.3%**	27.66	27.89	278.9%
Rainham Marshes – LNR	10	0.27	**2.7%**	15.14	15.41	154.1%

Table 5-42: Modelled Maximum Operation Phase Impacts at Ecological Receptors for Annual Acid Deposition

Receptor	Critical Load (keq/ha/yr)	Max Impact (keq/ha/yr)	Impact as % of CL	At Location of Maximum Impact		
				Max Baseline PEC (keq/ha/yr)	Max Proposed Scheme PEC (keq/ha/yr)	Max Proposed Scheme PEC as % of CL
Epping Forest – SAC, SSSI	1.73	0.005	0.3%	2.48	2.48	143.5%
Ingrebourne Marshes – SSSI	Not significant to acid deposition					
Inner Thames Marshes – SSSI						
Oxleas Woodlands – SSSI	2.72	0.016	0.6%	2.18	2.19	80.4%
West Thurrock Lagoon and Marshes – SSSI	Not significant to acid deposition					
Crossness – LNR						
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)						
Rainham Marshes – LNR						

Emissions Of NO_2, PM_{10} and $PM_{2.5}$ From New Backup power Generator (Ancillary Infrastructure)

5.8.116. It is anticipated that the backup generator will not operate for more than 50 hours per year. The assessment of impacts below takes into account the infrequent and intermittent operation of the generator. The assessment considers receptors both within and outside the Site.

Potential Effects on Human Health

5.8.117. To undertake the statistical analysis of the likelihood of exceedance of the air quality objective for hourly mean nitrogen dioxide, the dispersion model ADMS 6.0 was used to determine the maximum possible number of hours (at any single location) that pollutant concentrations potentially exceed the hourly mean nitrogen dioxide standard (200ug/m^3) whilst taking into account background concentrations and assuming continuous operation. Since the maximum ground level concentrations without the diesel generator operating do not exceed the standard, this analysis is limited to the operation of the new backup power generator.

5.8.118. Over all five years of meteorological data, there were no hours in which modelled concentrations exceed the hourly standard of 200ug/m^3 across the receptor grid. This implies that even if operation of the generator coincided with meteorological conditions giving rise to poor dispersion, hourly mean concentrations would still not exceed the standard and the risk of exceedance of the standard is very low.

5.8.119. Similarly, the maximum daily mean PM_{10} impact from the operation of the generator does not result in exceedance of the daily mean standard of 50µg/m^3 and, therefore, there is an insignificant risk of exceedance of the standard with the operation of the generator.

5.8.120. Overall, therefore, the effects of operating backup power generator on human health are **Negligible (Not Significant)**.

Potential Effects on Ecological Sites

5.8.121. To undertake the statistical analysis of the likelihood of exceedance of the critical level for daily mean nitrogen oxides, as for the assessment of risk of exceedance of short term standards for human receptors, the dispersion model ADMS 6.0[47] was used to determine the maximum possible number of days (at any single location within an ecological site) that pollutant concentrations might exceed the daily mean critical level for the protection of vegetation whilst taking into account background concentrations.

5.8.122. The dispersion modelling shows that, over all five years of meteorological data, there is no risk of exceedance of the daily mean critical level for NOx for any designated sites other than Crossness LNR.

5.8.123. The maximum days of possible exceedance of the critical level over Crossness LNR in any given year is seven days for a critical level of 200µg/m^3 assuming operation of the generators 24 hours per day. Assuming 50 hours of possible operation of the diesel generator over a year this amounts to a 4% probability of exceedance of the critical level. Environment Agency guidance is that, with a plant lifetime of around 20 years, exceedance of the critical level is unlikely (as set out in **Section 5.4**). However, there is an insignificant risk of exceedance of the critical level at distances over 25m from the new backup power generator.

5.8.124. Crossness LNR is situated within the Site. However, only a very small part of the ecological site will be impacted by the usage of the new backup power generator as described above. However, some of the Crossness LNR will be enhanced as part of the Proposed Scheme and it is, therefore, recommended that the generator is situated as far as possible from sensitive habitats to further reduce the risk of impacts.

5.8.125. In summary, taking into account the conservatism in the assessment, i.e. consideration of 50 hours of operation, including potential 24 hour operations, it is highly unlikely that there is a significant risk of exceedance of the daily mean critical level over any designated site in the vicinity of the new backup power generator. Therefore, the effects are considered to be **Negligible (Not Significant)**.

Marine Vessel Emissions of NO_2, NOx, SO_2, PM_{10} and $PM_{2.5}$

Potential Effects on Human Health

Annual Mean NO_2 Concentrations

5.8.126. Modelled total annual mean concentrations of NO_2 are largely dominated by contributions from background sources (specifically, roads), and are all below AQS objective during operation.

5.8.127. All changes in annual mean NO_2 as a result of marine emissions associated with the Proposed Scheme are <2% of the relevant AQS objective and decrease with distance from the proposed jetty; on land, where long term exposure is theoretically possible, the maximum impact is <0.6% of the AQS objective. Based on the EPUK/IAQM guidance [21], marine emissions from the Proposed Scheme during operation have a negligible impact on NO_2 concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Hourly Mean NO_2 Concentrations

5.8.128. Modelled hourly mean concentrations of NO_2 are largely dominated by contributions from background sources and are all well below the relevant AQS objective during construction.

5.8.129. The maximum change in hourly NO_2 as a result of marine emissions associated with the Proposed Scheme during operation is 5.1 µg/m^3, 2.5% of the relevant AQS objective. This impact occurs within the River Thames, where public exposure at an hourly level during operation is unlikely given use of the River Thames is likely to be transient.

5.8.130. On land, the maximum change in hourly NO_2 as a result of marine emissions associated with the Proposed Scheme during operation is 3.9µg/m^3, 2.0% of the relevant AQS objective. This occurs along the northern bank of the River Thames, to the northeast of the Proposed Jetty where exposure of the public is unlikely. Total concentrations are well below the AQS (40.5µg/m^3, <25%).

5.8.131. During the operation period, the highest modelled total concentration on land is 58.7µg/m^3 (29% of the AQS), which is modelled at the northern bank of the River Thames 200m southeast of the Queen Elizabeth Bridge, where background concentrations are influenced by industrial processes. At this location, the contribution from marine vessels during operation was 1.9µg/m^3 (1.0% of the AQS). A PRoW exists in proximity to this location, but it is unlikely that members of the public will be present for long periods of time (i.e. more than one hour).

5.8.132. Therefore, based on the EPUK/IAQM guidance [21], marine emissions from the Proposed Scheme during operation have a negligible impact on NO_2 concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Annual Mean PM_{10} and $PM_{2.5}$ Concentrations

5.8.133. In lieu of specific emission rates for marine emissions of $PM_{2.5}$, it has been assumed that all modelled emissions of PM_{10} also fall below the 2.5µm size fraction (i.e. all emissions of PM_{10} are as $PM_{2.5}$). Therefore, the process contribution modelled for PM_{10} has been used alongside DEFRA's annual mean background $PM_{2.5}$ **(Table 5-16)** for this assessment against $PM_{2.5}$ standards **(Table 5-8)**.

5.8.134. Predicted annual mean concentrations of both PM_{10} and $PM_{2.5}$ are largely dominated by contributions from background sources and are all well below the relevant AQS objective during operation.

5.8.135. The maximum modelled contribution from marine vessels was 0.08µg/m^3. This impact occurs within the River Thames, where public exposure at an annual level during operation is highly unlikely. On land, the largest modelled contribution was 0.03µg/m^3, on the northern bank of the River Thames to the northeast of the Proposed Scheme, where exposure of the public is unlikely.

5.8.136. All changes in annual PM_{10} and $PM_{2.5}$ concentrations as a result of marine emissions associated with the Proposed Scheme are <1% of the relevant AQS objectives and therefore, based on the EPUK/IAQM guidance[21], marine emissions from the Proposed Scheme during operation have a negligible impact on PM_{10} concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Daily Mean PM_{10} Concentrations

5.8.137. Modelled daily mean concentrations of PM_{10} are largely dominated by contributions from background sources and are all well below the relevant AQS objective during operation.

5.8.138. All changes in daily PM_{10} as a result of marine emissions associated with the Proposed Scheme are <1% of the relevant AQS objective and therefore, based on the EPUK/IAQM guidance[21], the Proposed Scheme has a negligible Impact on PM_{10} concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

SO_2 Daily, Hourly, 15 minute Concentrations

5.8.139. Modelled total concentrations of SO_2 at all timescales are largely dominated by contributions from emissions sources unrelated to the Proposed Scheme and are all well below the respective AQS objective during operation.

5.8.140. During the operating period, all changes in SO_2 as a result of marine emissions associated with the Proposed Scheme are <1% of the relevant AQS objective. Based on the EPUK/IAQM guidance[21], marine emissions from the Proposed Scheme during operation have a negligible impact on NO_2 concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Potential Effects on Ecological Sites

Annual Mean NO_x Concentrations

5.8.141. A summary of the impacts on annual mean NOx concentrations at all ecological sites considered within the assessment is set out in **Table 5-43**, below.

Table 5-43: Summary of Annual Mean NOx Impacts at Designated Ecological Sites during Construction

Habitat Site	Max NOx Impact (µg/m^3)	Impact as % of CLe
Epping Forest SAC, SSSI	0.00	0.0%
Ingrebourne Marshes SSSI	0.05	0.2%
Inner Thames Marshes SSSI	0.10	0.3%
Oxleas Woodlands SSSI	0.01	0.0%
West Thurrock Lagoon SSSI	0.03	0.1%
Crossness LNR	0.16	0.5%
Lesnes Abbey Wood LNR (comprising Ancient Woodland)	0.03	0.1%
Rainham Marshes LNR	0.10	0.3%

5.8.142. The maximum impact is predicted at Inner Thames Marshes SSSI, where a process contribution of 0.1µg/m^3 is modelled from marine vessels in 2030. This equates to 0.3% of the critical level.

5.8.143. Total concentrations during the operation phase are within the critical level for annual mean NO_x at all sites except West Thurrock Lagoon and Marshes SSSI. Exceedance of the critical level occurs with or without impacts arising due to increased marine activity resulting from the Proposed Scheme. Furthermore, the impact of the Proposed Scheme at this SSSI is just 0.03µg/m^3 (0.1% of the critical level).

5.8.144. All changes in annual NOx as a result of marine emissions associated with the Proposed Scheme are <1% of the relevant AQS objective. Therefore, marine emissions from the Proposed Scheme during operation have a negligible impact on annual mean NOx concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Daily Mean NO_x Concentrations

5.8.145. A summary of the impacts on daily mean NO_x concentrations at all ecological sites considered within the assessment are set out in **Table 5-44**, below.

Table 5-44: Summary of Daily Mean NOx Impacts at Designated Ecological Sites during Construction

Habitat Site	Max Daily Impact (µg/m^3)	Impact as % of CLe
Epping Forest SAC, SSSI	0.07	0.0%
Ingrebourne Marshes SSSI	0.45	0.2%
Inner Thames Marshes SSSI	0.69	0.3%
Oxleas Woodlands SSSI	0.16	0.1%
West Thurrock Lagoon SSSI	0.41	0.2%
Crossness LNR	2.29	1.1%
Lesnes Abbey Wood LNR (comprising Ancient Woodland)	0.35	0.2%
Rainham Marshes LNR	0.69	0.3%

5.8.146. The highest impact is predicted at Crossness LNR, where a process contribution of 2.29µg/m^3 is modelled in 2030 (1.1% of the critical level of 200µg/m^3).

5.8.147. The critical level for daily mean NO_x is not exceeded at any ecological site during the operation phase.

5.8.148. All changes in daily NOx as a result of marine emissions associated with the Proposed Scheme are <1.2% of the relevant AQS objective and are negligible. Therefore, marine emissions from the Proposed Scheme during operation have a

negligible impact on daily mean NOx concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Annual Mean SO_2 Concentrations

5.8.149. The critical levels for annual mean SO_2 vary between sites but are not exceeded at any ecological site during the operation phase **(Table 5-9)**.

5.8.150. The highest impact is modelled at Inner Thames Marshes SSSI, where a process contribution of 0.009µg/m^3 is predicted in 2030 and all changes in annual SO_2 as a result of marine emissions associated with the Proposed Scheme are <0.1% of the relevant critical levels.

5.8.151. Therefore, marine emissions from the Proposed Scheme during operation have a negligible impact on annual mean SO_2 concentrations. The effects can, therefore, be described as **Negligible (Not Significant)**.

Nitrogen and Acid Deposition

5.8.152. The critical loads for nitrogen and acid deposition on the most sensitive habitats vary between sites and are widely exceeded at all ecological sites except Ingrebourne Marshes, whether or not the Proposed Scheme is operational **(Table 5-9)**. The impacts from marine vessels are all <1% of the critical load and are negligible. The effects can, therefore, be described as **Negligible (Not Significant)**.

Human Health Risk Assessment

5.8.153. The human health risk assessment considers the potential effects of changes in exposure to emissions to air of trace metals, dioxins, furans and dioxin-like PCB with the Proposed Scheme.

5.8.154. The assessment covers those pollutants that may accumulate in the environment. Health effects may arise through exposure via direct inhalation of pollutants and via the ingestion of locally grown foodstuffs. The health effects of those pollutants for which the primary risk of health effects of emissions to air arises via direct inhalation, such as NO_2, SO_2, PM_{10}, $PM_{2.5}$, amines and degradation products, are assessed by comparison to the air quality standards set for the protection of human health in UK regulations and/or non-statutory Environment Agency Environmental Assessment Levels.

5.8.155. The assessment considers the potential exposure of local ‘farmers’, who consume all locally grown produce and local ‘residents’, who consume home grown fruit and vegetables. These exposure scenarios are highly conservative and should be considered to be an upper bound on potential risks associated with the operation of the Proposed Scheme. Actual exposure is likely to be considerably lower.

5.8.156. **Table 5-45** sets out a summary of the health risk for the most affected farmer, located on the nearest farmland, approximately 3.6km to the northeast of the Proposed Scheme, and the most affected resident, located in Rainham, approximately 2.9km northeast.

5.8.157. The maximum hazard index for non-carcinogenic risks is 0.097, for the child of a farmer. This is well within the criterion of 1 and represents an increase of 1.2% of the criterion over the baseline. The maximum hazard index for a resident with the Proposed Scheme is 0.056 (for the child receptor).

5.8.158. The maximum lifetime carcinogenic risk with the Proposed Scheme is $6.0x10^{-6}$, which represents a risk per year of 1 in 11.7 million, well below the annual risk of 1 in 1 million that is conventionally considered to be acceptable for industrial process regulation in the UK. For the resident, the maximum lifetime risk is $3.49x10^{-6}$, which is equivalent to an annual risk of 1 in 20 million. The increase with the Proposed Scheme is 1% of the criterion for lifetime risk.

5.8.159. The total intake of dioxins is well within the COT tolerable daily intake[55] (TDI) for all receptors, and the impact of the Proposed Scheme is less than 1% of the TDI. With the estimated median dioxin intake in the UK being 0.7pg/kg-bw/day, the total intake for the most exposed individual (farmer to the northeast of the Site Boundary) is well within the TDI, whether or not the Proposed Scheme is operated.

5.8.160. Overall, taking into account the inherent conservatism built into the risk assessments and with a maximum impact from the Proposed Scheme being 1% of the relevant risk criterion, the effects of the Proposed Scheme on human health are **Negligible (Not Significant)**.

Table 5-45: Maximum Full Proposed Scheme AQ Impacts Across the Modelled Study Area during Operation

Receptor		Baseline	With Proposed Scheme	Impact	Criterion	Impact as % of Criterion
Non-Carcinogenic Effects (Hazard Index)						
Farmer	Adult	0.057	0.065	0.008	1	0.8%
	Child	0.085	0.097	0.012		1.2%
Resident	Adult	0.032	0.038	0.006		0.6%
	Child	0.048	0.056	0.008		0.8%
Carcinogenic Effects (Lifetime Risk)						
Farmer	Adult	$3.89x10^{-6}$	$4.42x10^{-6}$	$5.3x10^{-7}$	$7x10^{-5}$	0.8%
	Child	$5.28x10^{-6}$	$6.00x10^{-6}$	$7.2x10^{-7}$		1.0%
Resident	Adult	$2.17x10^{-6}$	$2.57x10^{-6}$	$4.0x10^{-7}$		0.6%
	Child	$2.96x10^{-6}$	$3.49x10^{-6}$	$5/3x10^{-7}$		0.8%

Receptor		Baseline	With Proposed Scheme	Impact	Criterion	Impact as % of Criterion
Dioxin Intake (Maximum Daily Intake, pg/kg-bw/day)						
Farmer	Adult	0.091	0.102	0.011	2	0.6%
	Child	0.138	0.154	0.016		0.8%
Resident	Adult	0.051	0.059	0.008		0.4%
	Child	0.077	0.090	0.013		0.7%

Full Proposed Scheme AQ Impact - Operation

5.8.161. The impact from the operation of the Carbon Capture Facility has been combined with the impact from marine vessel movements during operation, to generate a Full Proposed Scheme AQ Impact. The impacts from the generator have not been included, as is set out in **Appendix 5-2: Operational Phase Assessment (Volume 3)**.

5.8.162. The following figures show the spatial distribution of modelled impacts that do not screen as negligible against the project criteria set out in **Table 5-7**:

- **Figure 5-14: Full Proposed Scheme AQ Impact: NO_2 Hourly (Volume 2)**
- **Figure 5-15: Full Proposed Scheme AQ Impact: NO_2 Annual (Volume 2)**
- **Figure 5-16: Full Proposed Scheme AQ Impact: SO_2 15 Minute (Volume 2)**
- **Figure 5-17: Full Proposed Scheme AQ Impact: SO_2 Hourly (Volume 2)**

Potential Effects on Human Receptors

5.8.163. **Table 5-46** below summarises the results of the Full Proposed Scheme AQ Impact across the entire Study Area.

5.8.164. Combining the emissions from the Carbon Capture Facility and vessel movements during operation slightly increases the maximum PEC and impacts. However, the impacts and contribution from the Proposed Scheme are dominated by the impacts from the Stack(s) emissions. Maximum concentrations and impacts occur in the same areas as those stated in the results of the Carbon Capture Facility alone, and consideration of the combined impacts of Stack(s) plus marine vessels does not change the conclusions of significance outlined for the Stack(s) alone. The effects can, therefore, be described as **Negligible (Not Significant)** for all pollutants except SO_2, nitrosamines, nitramines and aldehydes for which effects are **Slight Adverse (Not Significant)**.

Potential Effects on Ecological Receptors

5.8.165. **Table 5-47** below summarises the full annual mean impacts of the Proposed Scheme; **Table 5-48** below shows the daily NO_X impacts at each ecological site.

5.8.166. As per the results at human receptors, the Carbon Capture Facility alone dominates the Full Proposed Scheme AQ Impact on ecological sites. Impacts and total pollutant concentrations increase in comparison to the assessment of the Stack(s) emissions alone, but the areas of concern remain as those previously identified and the significance assessment is unchanged.

5.8.167. Similar conclusions hold for nitrogen and acid deposition i.e. that the significance of effects is determined by the Stack(s) emissions assessment. The results of the assessment of significant effects relating to nitrogen deposition is reported within **Chapter 7: Terrestrial Biodiversity (Volume 1)** for Inner Thames Marshes SSSI, Rainham Marshes LNR, Lesnes Abbey Woods LNR and Crossness LNR. The effects of all other designated ecological sites can be described as **Negligible (Not Significant)**.

Table 5-46: Maximum Full Proposed Scheme AQ Impacts Across the Modelled Study Area During Operation

Pollutant	Averaging Time	Baseline Max Mean PC (µg/m^3)	With Proposed Scheme Max Mean PC (µg/m^3)	Max Adverse Impact (µg/m^3)	Max Beneficial Impact (µg/m^3)	Air Quality Standard (µg/m^3)	Max Adverse as % of Standard	Max Beneficial as % of Standard	2030 Background Concentration (µg/m^3)	At Location of Maximum Impact	
										PEC	PEC as % of Standard
NO_2	1 hour	50.8	104.5	83.4	-19.8	200	41.7%	-9.9%	29.7	133.1	66.6%
	Annual	3.2	2.8	1.4	-1.2	40	3.4%	-3.0%	15.1	16.7	41.7%
PM_{10}	Daily	0.7	0.9	0.4	-0.3	50	0.7%	-0.5%	14.7	15.5	31.1%
	Annual	0.2	0.2	0.1	-0.1	40	0.2%	-0.3%	14.9	14.9	37.3%
$PM_{2.5}$	Annual	0.2	0.2	0.1	-0.1	20	0.3%	-0.6%	10.1	10.2	50.8%
SO_2	15 minutes	103.7	215.6	168.3	-45.0	266	63.3%	-16.9%	4.4	220.0	82.7%
	1 hour	71.3	145.1	115.3	-29.1	350	32.9%	-8.3%	4.4	145.0	41.1%
	Daily	6.9	10.7	8.3	-3.9	125	6.6%	-3.1%	4.4	14.0	11.2%

Table 5-47: Maximum Full Proposed Scheme AQ Impacts on Annual Mean Critical Levels at Ecological Receptors During Operation

Receptor	Critical Level (µg/m³)		Max Proposed Scheme PEC (µg/m³)		Max Impact (µg/m³)		Impact as % of CLe		Max Proposed Scheme PEC as % of CLe	
	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2	NO_x	SO_2
Epping Forest – SAC, SSSI	30	10	26.6	2.5	0.0	0.0	0.1%	0.0%	88.7%	24.8%
Ingrebourne Marshes - SSSI	30	10	21.2	3.0	0.2	0.0	0.5%	0.9%	70.5%	30.4%
Inner Thames Marshes - SSSI	30	20	25.3	6.2	0.4	0.1	1.3%	1.7%	84.3%	31.2%
Oxleas Woodlands - SSSI	30	10	20.4	2.1	0.1	0.0	0.2%	0.7%	67.9%	21.4%
West Thurrock Lagoon and Marshes - SSSI	30	10*	47.5	2.4	0.0	0.0	0.1%	0.1%	**158.2%**	24.0%
Crossness - LNR	30	10	24.1	2.5	0.5	0.2	1.6%	7.1%	80.4%	24.9%
Lesnes Abbey Woods – LNR (comprising Ancient Woodland)	30	10	19.5	2.4	0.2	0.1	0.7%	2.5%	65.1%	23.5%
Rainham Marshes - LNR	30	20	25.2	6.2	0.4	0.1	1.3%	2.3%	84.0%	31.2%

Note:
*No published critical level. Assumed 10µg/m³ for conservatism.

Table 5-48: Maximum Full Proposed Scheme Short Term Impacts at Ecological Receptors during Operation

Receptor	Critical Level (µg/m^3)	Max Impact (µg/m^3)	Impact as % of CLe	Max Proposed Scheme PEC (µg/m^3)	Max Proposed Scheme PEC as % of CLe
Epping Forest – SAC, SSSI	200	0.5	0.3%	54.6	27.3%
Ingrebourne Marshes - SSSI	200	1.7	0.8%	47.3	23.6%
Inner Thames Marshes - SSSI	200	2.6	1.3%	57.7	28.9%
Oxleas Woodlands - SSSI	200	0.7	0.3%	44.1	22.0%
West Thurrock Lagoon and Marshes - SSSI	200	0.5	0.3%	97.2	48.6%
Crossness – LNR (comprising Ancient Woodland)	200	14.4	7.2%	73.6	36.8%
Lesnes Abbey Woods - LNR	200	3.5	1.7%	47.9	24.0%
Rainham Marshes - LNR	200	2.6	1.3%	57.4	28.7%

Air Quality Positive Statement

5.8.168. A formal statement setting out the evidence base for the design measures incorporated in the Proposed Scheme to satisfy the requirements for Air Quality Positive has been provided in **Appendix 5-4: Air Quality Positive Statement (Volume 3)**.

5.9. ADDITIONAL DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.9.1. This Section sets out the additional design, mitigation and enhancement measures which are likely to be required to address the significant effects relevant for air quality.

CONSTRUCTION PHASE

5.9.2. A comprehensive list of the potential measures, commensurate to the identified low to medium risk of impacts reported in **Section 5.8**, is set out below. These measures have been included in the **Outline CoCP (Document Reference 7.4)**. The full CoCP(s) will be developed in substantial accordance with this outline, as secured by DCO requirement.

Communications

- develop and implement a Community Engagement Plan to be implemented before work commences onsite.

Site Management

- hold regular liaison meetings with other high risk construction sites within 200m of the Site Boundary (if applicable), to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the offsite transport/deliveries which might be using the same strategic road network routes; and
- the developer and the appointed Contractor(s) are to actively monitor the Site to ensure the control of dust and emissions. Dry and windy conditions increase the likelihood of dust and emissions being produced and dispersed, so extra Site monitoring will take place during these times.

Monitoring

- undertake daily onsite and offsite inspection, where receptors within 100m of Site Boundary (including roads) are nearby, to monitor dust, record inspection results, and make the log available to LBB when asked; and
- agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the LBB. Where possible commence baseline monitoring at least three months before work commences onsite. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction[61].

Preparing and Maintaining the Site

- fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period;
- hoardings, keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being reused onsite. If they are being reused onsite cover as described below;

- cover, seed or fence stockpiles to prevent wind whipping; and
- a change of shoes and clothes by staff and visitors before going offsite is promoted.

Operating Vehicle/Machinery and Sustainable Travel

- impose and signpost a maximum speed limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of LBB, where appropriate); and
- plan construction site layout to locate NRMM as far from potential exposure of members of the public as practicable.

Operations

- ensure equipment is readily available onsite to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods; and
- inform the Environment Agency, London Fire and Emergency Planning Authority (LFEPA) or the UK Health Security Agency (UKHSA) if harmful substances are spilled.

Waste Management

- any excess material will be reused or recycled on or offsite in accordance with appropriate legislation; and
- the appointed Contractor(s) will develop and implement a full SWMP(s) in substantial accordance with the **Outline SWMP (Document Reference 7.10)**.

Measures Specific to Demolition

- soft strip inside buildings before demolition (sheet piling walls and windows in the rest of the building where possible to provide a screen against dust);
- ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

- re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;

- use hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as is practicable. Only remove the cover in small areas during work and not all at once; and
- during dry or windy weather, material stockpiles and exposed surfaces will be dampened down using a water spray to minimise the potential for wind pick-up.

Measures Specific to Construction

- avoid scabbling (roughening of concrete surfaces) if possible;
- ensure aggregates are stored in bunded areas and, where practicable, are not allowed to dry out;
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems; and
- for smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport by re-using existing access points where possible/practicable;
- use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the Site;
- install hard surfaces haul routes which are regularly damped down and cleaned;
- inspect onsite haul routes for integrity and instigate necessary repairs as soon as practicable. Record all haul route inspections and subsequent actions in a logbook;
- implement a wheel-washing system with rumble grids to dislodge accumulated dust and mud prior to leaving the Site. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit;
- avoid dry sweeping of large areas; and
- ensure vehicles covering dusty materials are covered before leaving the Site.

OPERATION PHASE

5.9.3. Based on the results of the statistical analysis for impacts associated with the new backup power generator it is recommended that the generator is positioned as far away from potential exposure of members of the public as practicable. This is secured via the **Design Principles and Design Code (Document Reference 5.7)**. In practice this means locating the generator away from the Site Boundary and/or onsite public right of ways as is practicable. Although there are no modelled impacts to human health, this will limit any impacts to the general population as best as possible. However, some of the Crossness LNR will be impacted and it is, therefore, recommended that the generator is situated as far as possible from sensitive habitats to further reduce the risk of impacts. This is secured via the **Design Principles and Design Code (Document Reference 5.7)**.

5.9.4. The technology used in the Carbon Capture Facility will be designed to minimise, as far as is reasonably practicable, the loss of amines into the plume emitted by the Carbon Capture Facility.

5.9.5. No further additional design, mitigation or enhancement measures are proposed for air quality based on the results presented. However, the Environmental Permit that will be required for the operation of the Proposed Scheme will consider detailed operation processes.

5.10. MONITORING

CONSTRUCTION PHASE

5.10.1. The outcome of the construction dust assessment **(Section 5.8)** indicates that dust monitoring should be undertaken during the construction phase of the Proposed Scheme.

5.10.2. Continuous dust monitoring will be undertaken at locations along the Site due to the potential effects of dust during construction of the Proposed Scheme. Alarms will be set up to alert the LBB when concentrations of dust/PM_{10}/$PM_{2.5}$ reach a certain threshold. IAQM Guidance on Monitoring in the Vicinity of Demolition and Construction Sites[61] will be used when designing the monitoring survey.

OPERATION PHASE

5.10.3. During operation the Proposed Scheme will be subject to continuous Stack(s) emissions monitoring as a requirement of the Environmental Permit.

5.11. RESIDUAL EFFECTS

5.11.1. **Table 5-49** below summarises the residual effects associated with the Proposed Scheme.

Table 5-49: Air Quality - Summary of Residual Effects

Description of the Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measure	Residual Effect
Construction Phase					
Dust, PM_{10} and $PM_{2.5}$	Dust soiling effects during works	Nearby places of work	**Minor to Moderate Adverse (Not Significant)**	Mitigation set out in **Section 5.9**.	**Negligible (Not Significant)**
	Human health effects during works	Nearby places of work	**Minor Adverse (Not Significant)**	Mitigation set out in **Section 5.9**.	**Negligible (Not Significant)**
	Ecological effects works	Crossness LNR	**Minor Adverse (Not Significant)**	Mitigation set out in **Section 5.9**.	**Negligible (Not Significant)**
Emissions of NO_2, PM_{10} and $PM_{2.5}$ from NRMM	Potential effects on human health and ecological sites	Nearby places of work and Crossness LNR	**Minor Adverse (Not Significant)**	Mitigation set out in **Section 5.9.**	**Negligible (Not Significant)**
Road traffic emissions of NO_2, PM_{10} and $PM_{2.5}$	Potential effects on human health	Roadside residential properties	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**
	Potential effects on ecological sites	Crossness LNR	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**
Marine vessel emissions of NO_2,	Potential effects on human health	Anywhere with exposure, but primarily the	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**

Description of the Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measure	Residual Effect
NO_x, SO_2, PM_{10} and $PM_{2.5}$		England Coast Path (FP1/NCN1)			
	Potential effects on ecological sites	All ecological sites, primarily Crossness LNR and Inner Thames Marshes/Rainham Marshes	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**
Full Proposed Scheme AQ Impact (Road + Marine, including Exhaust Stacks for Riverside 1 and Riverside 1)	Potential effects on human health	Anywhere with exposure	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**
	Potential effects on ecological sites	All ecological sites, primarily Crossness LNR and Inner Thames Marshes/Rainham Marshes	**Negligible (Not Significant)**	Not required.	**Negligible (Not Significant)**
Operation Phase					
Changes To Emissions of Pollutants at Riverside Campus as a result of the Carbon Capture Facility	Potential effects on human health (including within local authorities and air quality focus areas)	Any location of relevant exposure	**Negligible (Not Significant)** for all pollutants except SO_2, nitrosamines, nitramines and aldehydes for which effects are **Slight Adverse (Not Significant)**	Not required beyond embedded mitigation measures	**Slight Adverse (Not Significant)**

Description of the Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measure	Residual Effect
	Potential effects on ecological sites	Detailed assessment shown in **Chapter 7: Terrestrial Biodiversity (Volume 1)** for Inner Thames Marshes SSSI, Rainham Marshes LNR, Lesnes Abbey Woods LNR and Crossness LNR.			
	Potential effects on ecological sites	All designated sites except those above	**Negligible (Not Significant)**	N/A	**Negligible (Not Significant)**
Emissions of NO_2, PM_{10} and $PM_{2.5}$ From New Backup power Generators (Ancillary Infrastructure)	Potential effects on human health	Any location of relevant human exposure	**Negligible (Not Significant)**	Generator is positioned as far away from sensitive receptors as is practicable	**Negligible (Not Significant)**
	Potential effects on ecological sites	Crossness LNR	**Negligible (Not Significant)**	Generator is positioned as far away from sensitive receptors as is practicable	**Negligible (Not Significant)**
Marine vessel emissions of NO_2, NO_x, SO_2, PM_{10} and $PM_{2.5}$	Potential effects on human health	Anywhere with exposure, but primarily England Coast Path (FP3/NCN1)	**Negligible (Not Significant)**	Not required	**Negligible (Not Significant)**
	Potential effects on ecological sites	All ecological sites, primarily Crossness LNR and Inner Thames Marshes/Rainham Marshes	**Negligible (Not Significant)**	Not required	**Negligible (Not Significant)**

Description of the Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measure	Residual Effect
Human Health Risk Assessment	Potential effects on human health	Anywhere with long term exposure	**Negligible (Not Significant)**	Not required	**Negligible (Not Significant)**
Full Proposed Scheme AQ Impact	Potential effects on human health (including within local authorities and air quality focus areas)	Any location of relevant exposure	**Negligible (Not Significant)** for all pollutants except SO_2, nitrosamines, nitramines and aldehydes for which effects are **Slight Adverse (Not Significant)**	Not required beyond embedded mitigation measures	**Slight Adverse (Not Significant)**
	Potential effects on ecological sites	Detailed assessment shown in **Chapter 7: Terrestrial Biodiversity (Volume 1)** for Inner Thames Marshes SSSI, Rainham Marshes LNR, Lesnes Abbey Woods LNR and Crossness LNR			
	Potential effects on ecological sites	All designated sites except those above	**Negligible (Not Significant)**	N/A	**Negligible (Not Significant)**
Air Quality Neutral Assessment and Air Quality Positive Statement	The Proposed Scheme complies with the philosophy of Air Quality Neutral, since there is no material change in emissions of nitrogen dioxide and particulate matter during its operation. The Proposed Scheme has been designed to minimise emissions to air and to minimise exposure to emissions and An Air Quality Positive Statement has been prepared to illustrate these impacts. Further detail is provided within **Appendix 5.4: Air Quality Positive Statement (Volume 3)**.			N/A	**N/A**

5.12. LIMITATIONS AND ASSUMPTIONS

5.12.1. The following limitations and assumptions have been identified.

BASELINE CONDITIONS

- the baseline information that has been collated and used in the assessment has been based on the most up to date information currently available;
- where DEFRA or APIS background mapped pollutant data were not available for the Operation Study Area, specifically heavy metals, ambient monitored data were obtained from suitable monitoring sites, operated by DEFRA; and
- the absence of background data for amines and nitrosamines in the UK represents a limitation to the assessment of Operation phase impacts at human receptors.

CONSTRUCTION PHASE ASSESSMENT

- at the time of undertaking this assessment detailed information regarding construction activities and construction plant are not available. It is assumed that dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks will be utilised during construction of the Proposed Scheme;
- given the results of the qualitative construction dust risk assessment, associated mitigation measures, and the review of receptors and baseline air quality conditions within the Construction Phase Study Area, the outcomes of the assessment of likely impacts and significance is unlikely to change once the aforementioned construction activity and traffic data are provided; and
- the results presented for the assessment of construction traffic are worst case. Traffic data provided by the Proposed Scheme Transport Planners represent the peak daily traffic during the construction period and not an average day across a year. For an annual mean assessment, the level of traffic relating to construction will be much lower than the data used in the assessment.

OPERATION PHASE ASSESSMENT

5.12.2. The operation phase air quality assessment has, where possible, adopted a conservative approach by applying the following assumptions to the atmospheric dispersion modelling study:

- Riverside 1 and Riverside 2 (once construction is complete and the facility is fully operational) waste incineration facilities will operate continuously, at full load as defined by their permitted annual tonnes of waste incinerated for all hours of the year;
- the modelling for this assessment has been undertaken on the basis of indicative diameter and height parameters, as set out in Appendix 5-2, to provide a reasonable worst case assessment. These parameters will be confirmed in detailed design to ensure that disposition does not cause significant effects, which the Applicant will be required to demonstrate to the Environment Agency in order to obtain an Environmental Permit;

- emissions of pollutants (except metals) in the exhaust gases that are subject Emission Limit Values were modelled at the associated emission limit for all hours of the year with all operational 'dust' emissions assumed to be in the $PM_{2.5}$ size fraction for particulate matter and therefore included, in total, in both the assessment of PM_{10} and $PM_{2.5}$;
- exhaust gases post carbon capture are a minimum of 80 degrees Celsius;
- metals were assumed to be emitted at the maximum percentages of the ELV advised in Environment Agency guidance[27];
- amine emissions are modelled using reaction rate constants for MEA and DMA. At this stage they are not process specific;
- mass emissions of amines and nitrosamines from the Carbon Capture Facility were modelled at the maximum emission level for all hours of the year, based on indicative data provided by the various candidate technology suppliers;
- a 70%/35% conversion ratio of NO_x to NO_2 in the atmosphere was assumed for long and short term impacts, based on Environment Agency guidance[24];
- deposition of amines, nitrosamines, and nitramines from the atmosphere were modelled using a deposition velocity equivalent to that for ammonia, which based on relevant research[49], is considered to be conservative;
- the maximum impact relating to each assessed designated Site within the Operation Phase Study Area has been reported, regardless of the specific area of the Site represented by the maximum and the presence or otherwise of particular habitats;
- the significance screening of maximum impacts at each designated Site was undertaken against minimum recommended critical levels/critical loads;
- assessment of maximum impacts for both human and ecological receptors has been undertaken across five years of hourly meteorological data;
- all amine concentration outputs from the dispersion model, which are based on non-specific primary and secondary amines (MEA/DMA), these have been treated as MEA for comparison with the respective EALs. Furthermore, the nitrosamine outputs and the sum of all nitramine concentration outputs these have been treated as NDMA for comparison with the relevant EAL;
- the use of the NDMA EAL for the assessment of nitramines in this assessment is conservative given that NDMA is one of the most toxic nitrosamines, with nitramines being considered notably less toxic based on toxicity studies[52]; and
- as detailed in **Appendix 5-2: Operation Phase Assessment (Volume 3)**, there are a number of input variables required to model atmospheric amine chemistry using the ADMS model. The modelling undertaken has utilised reaction rate coefficients for MEA and DMA, along with appropriate regional ambient concentration data for NO_2 and ozone, and published background hydroxyl radical data for the UK. However, as acknowledged by the Environment Agency, there is inherent uncertainty in the amines modelling process.

5.13. REFERENCES

[1] Department for Energy Security and Net Zero. (2024). 'Overarching National Policy Statement for Energy (EN-1)'. Available at: https://assets.publishing.service.gov.uk/media/655dc190d03a8d001207fe33/overarching-nps-for-energy-en1.pdf

[2] Department for Levelling Up, Housing and Communities. (2023). 'National Planning Policy Framework'. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

[3] Greater London Authority. (2021). 'The London Plan'. Available at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

[4] London Borough of Bexley. (2023). 'The Bexley Local Plan 2023'. Available at: https://www.bexley.gov.uk/sites/default/files/2023-07/bexley-local-plan-adopted-26-april-2023.pdf

[5] Greater London Authority. (2018). 'London Environment Strategy'. Available at: https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

[6] Defra. (2007). 'The Air Quality Strategy: framework for local authority delivery'. Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england/air-quality-strategy-framework-for-local-authority-delivery#annex-a-tables-of-pollutants-and-limits

[7] Defra. (2019). 'Clean Air Strategy'. Available at: https://www.gov.uk/government/publications/clean-air-strategy-2019

[8] Defra. (2023). 'Environmental Improvement Plan 2023'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1168372/environmental-improvement-plan-2023.pdf

[9] Department for Environment, Food and Rural Affairs. (2021). 'South East Inshore Marine Plan 2021'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004493/FINAL_South_East_Marine_Plan__1_.pdf

[10] UK Government. (1995). Environment Act. Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents

[11] UK Government. (2021). Environment Act. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

[12] UK Government. (1990). Environmental Protection Act. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents

[13] UK Government. (2000). 'The Air Quality (England) Regulations'. Available at: https://www.legislation.gov.uk/uksi/2000/928/contents/made

[14] UK Government. (2010). 'The Air Quality Standards Regulations'. Available at: https://www.legislation.gov.uk/uksi/2010/1001/contents/made

[15] European Union. (2008). 'Directive 2008/50/EC of the European Parliament and of the Council'. Available at: https://www.legislation.gov.uk/eudr/2008/50/contents

[16] Defra. (2020). 'The Environmental (Miscellaneous Amendments) (EU Exit) Regulations'. Available at:

https://assets.publishing.service.gov.uk/media/5f6b6452d3bf7f723b6c35fb/SI-The-Environment-Miscellaneous-Amendments-EU-Exit-Regulations-2020.pdf

[17] UK Government. (2022). 'The Environmental Targets (Fine Particulate Matter) (England) Regulations 2022'. Available at: https://www.legislation.gov.uk/ukdsi/2022/9780348242959#:~:text=Regulation%204%20sets%20the%20target,metre%20by%2031st%20December%202040.

[18] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government. (2021). 'National Planning Practice Guidance, Healthy and Safe Communities'. Available at: https://www.gov.uk/guidance/health-and-wellbeing

[19] Greater London Authority. (2019). 'London Local Air Quality Management – Technical Guidance'. Available at: https://www.london.gov.uk/sites/default/files/llaqm_technical_guidance_2019.pdf

[20] London Air Pollution Planning and the Local Environment. (2007). 'London Councils Air Quality and Planning Guidance'. Available at: https://www.londoncouncils.gov.uk/our-key-themes/environment/air-quality/london-councils-air-quality-and-planning-guidance

[21] Environmental Protection UK and Institute of Air Quality Management. (2017). 'Land Use Planning & Development Control: Planning for Air Quality'. Available at: [redacted]

[22] Institute of Air Quality Management. (2023). 'Guidance on the Assessment of Dust from Demolition and Construction'. Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf

[23] Greater London Authority. (2011). 'The Control of Dust and Emissions during Construction and Demolition'. Available at: https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance-and-spgs/control-dust-and

[24] Environment Agency. (2021). 'Air emissions risk assessment for your environmental permit'. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[25] Habitats Directive. (2014). 'Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air'. Available at: [redacted]

[26] UK Government. (2017). 'The Conservation of Habitats and Species Regulations'. Available at: https://www.legislation.gov.uk/uksi/2017/1012/introduction/made

[27] Environment Agency. (2016). 'Waste incinerators: guidance on impact assessment for group 3 metals stack'. Available at: https://www.gov.uk/government/publications/waste-incinerators-guidance-on-impact-assessment-for-group-3-metals-stack

[28] European Environment Agency. (2019). 'International maritime navigation, international inland navigation, national navigation (shipping), national fishing, military (shipping) and recreational boats'. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-d-navigation/view

[29] Environment Agency. (2019). 'Specified generators: dispersion modelling assessment'. Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

[30] Greater London Authority. (2021). 'Air Quality Positive'. Available at: https://www.london.gov.uk/sites/default/files/air_quality_positive_lpg_-_consultation_draft_0.pdf

[31] Greater London Authority. (2021). 'Air Quality Neutral'. Available at:

https://www.london.gov.uk/sites/default/files/air_quality_neutral_lpg_-_consultation_draft_0.pdf

[32] Planning Inspectorate. (2023). 'Environmental Impact Assessment Scoping Opinion: Cory Decarbonisation Project.' Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010128/EN010128-000026-EN010128%20-%20Scoping%20Opinion.pdf

[33] Cory Environmental Holdings Limited. (2023). 'Environment Impact Assessment Scoping Report: Cory Decarbonisation Project'. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010128/EN010128-000021-EN010128%20-%20Scoping%20Report.pdf

[34] Cory Environmental Holdings Limited. (2023). 'Preliminary Environmental Information Report: Cory Decarbonisation Project'. Available at: https://corydecarbonisation.co.uk/document-library/

[35] Defra. (2023). 'Background Mapping data for local authorities [online]'. Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018 [Accessed July 2023].

[36] London Borough of Bexley. (2023). 'Annual Status Report'. Available at: https://www.bexley.gov.uk/sites/default/files/2023-08/London-borough-of-bexley-air-quality-annual-status-report-for-2022.pdf

[37] London Borough of Dartford. (2023). 'Annual Status Report'. Available at: https://www.dartford.gov.uk/environmental-services-1/air-quality

[38] London Borough of Barking and Dagenham. (2023). 'Annual Status Report'. Available at: https://www.lbbd.gov.uk/sites/default/files/2023-08/2022%20London%20Borough%20of%20Barking%20and%20Dagenham%20Annual%20Status%20Report.pdf

[39] Royal Borough of Greenwich. (2023). 'Annual Status Report'. Available at: https://www.royalgreenwich.gov.uk/downloads/file/6319/air_quality_annual_status_report_2022

[40] Air Quality Consultants. (2017). 'Calculator for Road Emissions of Ammonia CREAM V1A'. Available at: https://www.aqconsultants.co.uk/resources

[41] Defra UK AIR. (2021). 'UK AIR Data Selector'. Available at: https://uk-air.defra.gov.uk/data/data_selector

[42] Defra. (2023). 'MAGIC Map'. Available at: https://magic.defra.gov.uk/MagicMap.aspx

[43] Defra. (2021). 'Emissions Factor Toolkit'. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/

[44] Air Quality Consultants. (2017). 'Calculator for Road Emissions of Ammonia CREAM V1A'. Available at: https://www.aqconsultants.co.uk/resources

[45] Centre of Ecology and Hydrology. (2023). 'Air Pollution Information System'. Available at: https://www.apis.ac.uk/

[46] Defra. (2020). 'NOX to NO2 Calculator'. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/

[47] Cambridge Environmental Research Consultants. (2023). 'ADMS v6.0'. Available at: https://www.cerc.co.uk/environmental-software/ADMS-model/data.html

[48] International Maritime Organisation. (2005). 'MARPOL - International Convention for the Prevention of Pollution from Ships, Annex VI – Regulations for the Prevision of Air Pollution from Ships'. Available at https://imorules.com/MARPOL_ANNVI.html

[49] Karl. (2011). 'Worst case scenario study to assess the environmental impact of amine emissions from a CO2 capture plant'. Available at: https://www.sciencedirect.com/science/article/abs/pii/S1750583610001581

[50] Environment Agency. (2023). 'Medium combustion plant (MCP): comply with emission limit values'. Available at: https://www.gov.uk/guidance/medium-combustion-plant-mcp-comply-with-emission-limit-values

[51] UK Government. (2016). 'The Environmental Permitting (England and Wales) Regulations'. Available at: https://www.legislation.gov.uk/uksi/2016/1154/contents/made

[52] Environment Agency. (2023). 'Emergency backup diesel engines on installations: best available techniques (BAT)'. Available at: https://www.gov.uk/guidance/emergency-backup-diesel-engines-on-installations-best-available-techniques-bat

[53] International Maritime Organization. (2014). Nitrogen Oxides (NO_X) – Regulation 13'. Available at: https://www.imo.org/en/OurWork/Environment/Pages/Nitrogen-oxides-(NOx)-%E2%80%93-Regulation-13.aspx

[54] United States Environmental Protection Agency. (2023). 'Human Health Risk Assessment'. Available at: https://www.epa.gov/risk/human-health-risk-assessment

[55] Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment. (2001). 'Statement on the Tolerable Daily Intake for Dioxins and Dioxin-like Polychlorinated Biphenyls'. Available at: https://cot.food.gov.uk/sites/default/files/cot/cot-diox-full.pdf

[56] Environment Agency. (2009). 'Soil Guildeline Values for dioxins, furans and dioxin-like PCBs in soil'. Science Report SC050021/Dioxins SGV.

[57] Defra. (2024). 'Heavy Metals Network'. Available at: https://uk-air.defra.gov.uk/networks/network-info?view=metals

[58] Cory Group. (2020). 'Annual Performance Report 2020'. Available at: https://www.corygroup.co.uk/sustainability/emissions/

[59] Cory Group. (2021). 'Annual Performance Report 2021'. Available at: https://www.corygroup.co.uk/application/files/4516/5959/9530/EfW_Annual_Performance_Report_-_RRR_2021.pdf

[60] Cory Group. (2022). 'Annual Performance Report 2022'. Avalidable at: https://www.corygroup.co.uk/application/files/7316/8623/4648/Riverside_Resource_Recovery_Facility_-_2022.pdf

[61] Institute of Air Quality Management. (2018). 'Guidance on Monitoring in the Vicinity of Demolition and Construction Sites'. Available at: http://www.iaqm.co.uk/wp-content/uploads/guidance/monitoring_construction_sites_2012.pdf