Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Volume 1

Chapter 24 - Air Quality

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Glossary of Acronyms

AADT	Annual Average Daily Traffic
APIS	Air Pollution Information System
AQMA	Air Quality Management Area
ASR	Annual Status Report
BC	Breckland Council
BDC	Broadland District Council
CBS	Cement Bound Sand
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIA	Cumulative Impact Assessment
CoCP	Code of Construction Practice
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
DEFRA	Department for the Environment and Rural Affairs
DEP	Dudgeon Extension Project
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DPF	Diesel Particulate Filters
DOW	Dudgeon Offshore Wind Farm
EC	European Commission
EFT	Emission Factor Toolkit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EPUK	Environmental Protection United Kingdom
EQS	Environmental Quality Standards
ES	Environmental Statement
EU	European Union
GIS	Geographical Information System
GYBC	Great Yarmouth Borough Council
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
IPC	Infrastructure Planning Commission
IRZ	Impact Risk Zone

km	Kilometre
KLWNBC	King’s Lynn and West Norfolk Borough Council
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NCC	Norfolk County Council
NNDC	North Norfolk District Council
NorCC	Norwich City Council
NP	National Park
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
RSME	Root Mean Square Error
SEP	Sheringham Shoal Extension Project
SNC	South Norfolk Council
SNS	Southern North Sea
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
TEU	Treaty of the European Union
UK	United Kingdom
UN	United Nations
$\mu g.m^{-3}$	Microgram per metre cubed
WDC	Waveney District Council

Glossary of Terms

Air Quality Management Area (AQMA)	A designation made by a local authority where an assessment of air quality results in the need to devise an action plan to improve the quality of air.
The Applicant	Equinor New Energy Limited
Dudgeon Offshore Wind Farm Extension site	The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary.
The Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable corridor which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point on the coastline at which the offshore export cables are brought onshore and connected to the onshore export cables.
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction..
Onshore Substation sites	Parcels of land within onshore substation zones A and B, identified as the most suitable location for development of the onshore substation. Two sites have been identified for further assessment within the PEIR
Onshore Substation Zone	Parcels of land within the wider onshore substation search area identified as suitable for development of the onshore substation. Two substation zones (A and B) have been identified as having the greatest potential to accommodate the onshore substation.

Study area	Area where potential impacts from the project could occur, as defined for each individual EIA topic.
Sheringham Shoal Offshore Wind Farm Extension site	Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary.
The Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

24 AIR QUALITY

24.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the potential impacts of the proposed Dudgeon Offshore Wind Farm Extension Project (DEP) and Sheringham Shoal Offshore Wind Farm Extension Project (SEP) on local air quality. The chapter provides an overview of the existing environment for the PEIR boundary and study area, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of DEP and SEP.

2. .

3. This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary source are the National Policy Statements (NPS). The terminology and impact assessment methodologies used in this chapter differ from the generic impact assessment terminology presented within **Chapter 6 EIA Methodology**, as air quality guidance documents include specific assessment criteria. Details of these and the methodology used for the EIA and Cumulative Impact Assessment (CIA) are presented in **Section 24.4**.

4. The Planning Inspectorate has agreed, as stated in the Scoping Opinion (the Planning Inspectorate, 2019), to scope out both 'Offshore Air Quality' impacts and 'Operational Impacts' on air quality. Therefore, these elements have been scoped out of the assessment.

5. The assessment should be read in conjunction with following linked chapters:
   - **Chapter 22 Onshore Ecology and Ornithology**;
   - **Chapter 26 Traffic and Transport**; and
   - **Chapter 30 Health**.

6. Additional information to support the air quality assessment includes:
   - **Appendix 24.1 Air Quality Construction Dust and Fine Particulate Matter Assessment Methodology**;
   - **Appendix 24.2 Air Quality Traffic Data**;
   - **Appendix 24.3 Air Quality Background Pollutant Concentrations**; and
   - **Appendix 24.4 Designated Ecological Sites and Critical Load Values**.

24.2 Consultation

7. Consultation with regard to air quality has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements to date have included scoping and initial consultation with the local authorities within the onshore PEIR boundary (i.e. North Norfolk District Council (NNDC), Broadland District Council (BDC) and South Norfolk Council (SNC)). The feedback received has been considered in preparing the PEIR. **Table 24-1** provides a summary of how the consultation responses received to date have influenced the approach that has been taken.

8. This chapter will be updated following consultation on the PEIR in order to produce the final assessment that will be submitted with the DCO application. Full details of the consultation process will also be presented in the Consultation Report alongside the DCO application.

Table 24-1: Consultation responses.

Consultee	Date/ Document	Comment	Project Response
The Planning Inspectorate	November 2019, DEP and SEP Scoping Opinion	Offshore Air Quality: The Scoping Report notes that marine exhaust emissions are limited in line with the provisions of International Convention for the Prevention of Pollution from Ships (MARPOL). It considers that the number of vessels and the associated atmospheric emissions would be small in comparison to the total shipping activity in this region of the North Sea, and that there are no offshore human receptors sensitive to air quality, and marine-based ecological designations are unlikely to be sensitive to air pollution impacts or are dominated by other sources of inputs. On this basis, the Inspectorate agrees that effects are unlikely to be significant and that this aspect can be scoped out of the ES.	Noted. Offshore air quality impacts have been scoped out of the assessment.
		Operational Impacts: The Scoping Report proposes to scope out operational air quality impacts. It states that operation of the proposed built infrastructure would not give rise to any emissions to air and that maintenance activities would not lead to a significant change in vehicle flows within the study area. However, no	Noted. Operational impacts have been scoped out of the assessment.

Consultee	Date/ Document	Comment	Project Response
		vehicle movement figures have been provided in the Scoping Report to support this assertion but the Inspectorate anticipates the numbers of movements are unlikely to lead to significant effects. Nevertheless, the Planning Inspectorate considers that given the nature of the development and as there are no designations for poor air quality within the scoping area (i.e. Air Quality Management Areas), significant effects to onshore operational air quality are unlikely and that this matter can be scoped out of the assessment.	
		Transboundary Impacts: Table 3-17 proposes to scope out transboundary impacts to air quality, although no justification is provided within the aspect chapter. Nevertheless, given the nature of the Proposed Development the Inspectorate agrees that significant transboundary effects are unlikely to occur and therefore this matter can be scoped out of the ES.	Noted. Transboundary impacts have been scoped out of the assessment.
		Study Area: The Scoping Report states that designated ecological sites within 50m of construction works and 200m of the road network may be affected. The Inspectorate considers that a 200m buffer should also be applied to construction works.	Noted. Designated ecological sites within 200m of construction works will be considered in the assessment at the ES stage, see **Section 24.5.4.3.2**. The impact

Consultee	Date/ Document	Comment	Project Response
			assessment for ecological receptors will be provided in the ES.
		Construction Phase Emissions: The Scoping Report addresses the potential for increases in emissions from road vehicles generated during construction. The ES should also assess impacts from construction plant emissions, where significant effects are likely.	Construction plant emissions are considered in **Section 24.6.1.2**.
		No Field Surveys Proposed to Inform Characterisation of Existing Environment: As no site specific air quality monitoring surveys are proposed, the ES should include a justification in support of the existing air quality monitoring data used to inform the assessment and its appropriateness to robustly inform the assessment.	The existing air quality monitoring data coverage is considered to be appropriate. This is presented in **Section 24.4.2**.
		Air Quality Modelling: The ES should provide details of the dispersion modelling used to inform the assessment, including the relevant input parameters.	Details of dispersion modelling used in the assessment are provided in **Section 24.4.3.3**.
		Stakeholder Engagement: The Applicant should make effort to agree the methodology and choice of air quality receptors with relevant consultation bodies including the Environmental Health	The air quality assessment methodology was agreed with the EHOs at NNDC, BDC and SNDC. Further consultation will

Consultee	Date/ Document	Comment	Project Response
		Officers of the local authorities and the EA as appropriate.	be undertaken with the other local authorities within the air quality study area before the ES.
		Statutory Air Quality Limits: The Inspectorate considers that the ES should include an assessment of impacts associated with all relevant pollutants under the EU ambient air quality directive including increases in $PM_{2.5}$ resulting from the Proposed Development where relevant. In determining significance, the assessment should take into account performance against relevant target/limit values.	The construction phase traffic exhaust emissions assessment (see **Section 24.6.1.3**) includes an assessment of NO_2, PM_{10} and $PM_{2.5}$ concentrations. The relevant Objectives and target used in the assessment are provided in **Table 24-5**, these are the EU Limit Values and have been implemented via the Air Quality Standards Regulations (2010).
		Emissions to Air Including Dust: The Health aspect chapter of the Scoping Report has not provided justification to scope out these impacts from the operational phase. However, the Inspectorate has agreed to scope out these operational impacts from the relevant aspect assessments (see Tables 5.1 of this Opinion) and considers that these potential	Noted. Operational phase impacts have been scoped out of the assessment.

Consultee	Date/ Document	Comment	Project Response
		impacts are unlikely to result in significant effects. As such the Inspectorate agrees that their impact on health can also be scoped out of the ES.	
Broadland District Council (BDC)	November 2019, DEP and SEP Scoping Opinion	Requests inclusion of air quality.	This chapter of the PEIR presents the air quality assessment for DEP and SEP.
Cawston Parish Council	November 2019, DEP and SEP Scoping Opinion	Full assessment of cumulative impacts of DEP and SEP with the three other windfarm cable route schemes which affect North Norfolk – inclusive of air quality.	This chapter of the PEIR presents the air quality assessment for DEP and SEP. **Section 24.7** details the air quality CIA.
Natural England	November 2019, DEP and SEP Scoping Opinion	The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk). Further information on air pollution modelling and assessment can be found on the Environment Agency website.	Noted.
		Para 715 states that designated ecological sites within 50m of construction works and 200m of the road network may be affected by changes in air quality. We recommend that construction works within 200m (as	Noted. Designated ecological sites within 200m of construction works were considered in the construction dust

Consultee	Date/ Document	Comment	Project Response
		opposed to 50m) of a designated site is scoped into air quality assessment so the potential impacts of dust and particulate matter to sensitive features are fully considered. This is in line with Natural England's distance criteria (internal guidance).	and particulate matter assessment (see **Section 24.6.1.1**).
Oulton Parish Council	November 2019, DEP and SEP Scoping Opinion	Main concerns – increase in HGVs alone and cumulative.	Noted. This is addressed in **Section 24.6.1.3** and **Section 24.7** respectively.
Public Health England	November 2019, DEP and SEP Scoping Opinion	Although assessing impacts on health beyond direct effects from for example emissions to air or road traffic incidents is complex, there is a need to ensure a proportionate assessment focused on an application's significant effects.	Noted.
		Our position is that pollutants associated with road traffic or combustion, particularly particulate matter and oxides of nitrogen are non-threshold; i.e., an exposed population is likely to be subject to potential harm at any level and that reducing public exposures of non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards will have potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants, address inequalities (in exposure), maximise co-benefits (such as physical exercise). We encourage their consideration during	Noted.

Consultee	Date/ Document	Comment	Project Response
		development design, environmental and health impact assessment, and development consent.	
NNDC, BDC, SNDC	November/ December 2020, Air Quality Method Statement	No comments were received at this stage on the method statement provided to NNDC, BDC and SNDC. The Environmental Health Officer (EHO) at BDC and SNDC agreed with the approach presented in the method statement (as is in this chapter and detailed in **Section 24.4**) in relation to human health and the EHO at NNDC had no objections to the proposed methodology.	The methodology for the assessment is detailed in **Section 24.4**.

24.3 Scope

24.3.1 Study Area

9. The study area for air quality has been defined on the basis of the Planning Inspectorate's Scoping Opinion (the Planning Inspectorate, 2019) and through consultation with the local authorities within the administrative jurisdiction of the onshore study area.

10. The Planning Inspectorate agreed that offshore and operational air quality impacts could be scoped out of the assessment, as they were unlikely to be significant (see **Table 24-1**).

11. During construction, the onshore elements of DEP and SEP may give rise to construction phase dust and fine particulate matter, Non-Road Mobile Machinery (NRMM) emissions and road traffic emissions. These aspects were assessed as presented in this chapter.

12. The onshore PEIR boundary is defined as the landfall area, a typically 200m wide onshore cable corridor and two onshore substation site options, including access requirements. The final onshore cable corridor that will be the subject of the DCO application will be up to 60m wide, increasing to a width of 100m for trenchless crossing zones, along with a single substation option. At PEIR stage, a 60m wide onshore cable corridor route has been assessed, to be located somewhere within the onshore PEIR boundary. The ES will also consider where necessary impacts associated with trenchless crossing zones once these locations have been confirmed. From herein, reference to the PEIR boundary is to the onshore PEIR boundary, as previously stated offshore impacts on air quality have been scoped out of the assessment.

13. The study area for the air quality assessment is defined as follows:

- Construction phase dust and fine particulate matter emissions:
    - Human receptors within 350m of the PEIR boundary and within 50m of routes used by construction vehicles, up to 500m from the PEIR boundary; and
    - Ecological receptors within 200m of the PEIR boundary and within 50m of routes used by construction vehicles, up to 500m from the PEIR boundary.
- Construction phase NRMM emissions:
    - Human and ecological receptors within 200m of construction works where NRMM will be present.
- Construction phase road traffic emissions:
    - Human and ecological receptors within 200m of roads and haulage routes which exceed the screening criteria detailed in **Table 24-10**:. Further information on these route is provided in **Chapter 26 Traffic and Transport**.

14. The air quality study area is shown in **Figure 24.1**.

24.3.2 Realistic Worst Case Scenario

24.3.2.1 General Approach

15. The final design of DEP and SEP will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 6 EIA Methodology**.

16. The realistic worst case scenarios for the air quality assessment are summarised in **Table 24-2**. These are based on DEP and SEP parameters described in **Chapter 5 Project Description**, which provides further details regarding specific activities and their durations.

17. In addition to the design parameters set out in **Table 24-2**, consideration is also given to how DEP and SEP will be built out as described in **Section 24.3.2.2** to **Section 24.3.2.4** below. This accounts for the fact that whilst DEP and SEP are the subject of one DCO application, it is possible that either one or both of DEP and SEP will be developed, and if both are developed, that construction may be undertaken either concurrently or sequentially.

Table 24-2: Realistic Worst Case Scenarios.

Impacts	DEP or SEP in isolation	DEP and SEP concurrently	DEP and SEP sequentially	Notes and Rationale
Construction				
Impacts relating to landfall	Temporary HDD works • HDD temporary works compound area = 5,750m^2 • Transition joint bay size = 10 x 15m. • Total construction space required = 30,000m^2	Temporary HDD works • HDD temporary works compound area = 5,750m^2 • Transition joint bay size = 10 x 15m. • Total construction space required = 30,000m^2	Temporary HDD works • HDD temporary works compound area = 5,750m^2 for each project (overlapping) • Transition joint bay size = 10 x 15m for each project • Total construction space required for each project = 30,000m^2 (overlapping)	HDD and cable pull construction compound considered as one compound installed for duration of construction. The HDD works should not require any prolonged periods of restrictions or closures to the beach for public access, although it is possible that some work activities will be required to be performed on the beach that may require short periods of restricted access.
	Duration • 5 months (site setup, drilling and duct pull-in and demobilization) followed by cable pull	Duration • 5 months (site setup, drilling and duct pull-in and demobilization) followed by cable pull	Duration • 5 months (site setup, drilling and duct pull-in and demobilization) followed by cable pull	

<table>
<tr><th>Impacts</th><th>DEP or SEP in isolation</th><th>DEP and SEP concurrently</th><th>DEP and SEP sequentially</th><th>Notes and Rationale</th></tr>
<tr><td></td><td><u>Temporary access</u>
• Route from the existing road system</td><td><u>Temporary access</u>
• Route from the existing road system</td><td><u>Temporary access</u>
• Route from the existing road system</td><td></td></tr>
<tr><td rowspan="2">Impacts relating to the onshore cable corridor</td><td><u>Temporary access</u>
• Various from public highway (6m wide) to single tracks (3m wide).
• Access haul road number within corridor = 1 (x 60km long x 6m wide)</td><td><u>Temporary access</u>
• Various from public highway (6m wide) to single tracks (3m wide).
• Access haul road number within corridor = 1 (x 60km long x 6m wide)</td><td><u>Temporary access</u>
• Various from public highway (6m wide) to single tracks (3m wide).
• Access haul road number within corridor = 1 for each project (x 60km long x 6m wide)</td><td rowspan="2">The onshore cable duct will be installed in sections of up to 1km at a time, with a typical construction presence of up to four weeks along each 1km section.</td></tr>
<tr><td colspan="3"><u>Construction compounds</u>
• Up to 2 main compounds of 60,000m^2 each
• 8 secondary compounds of 2,500m^2 each
• HDD compounds = 1,500m^2 - 4,500m^2
Secondary compounds (2,500m^2 each) assessed at PEI stage:
• Landfall;
• Bodham;
• South of Oulton on B1149; and
• Hethersett Road.</td></tr>
</table>

Impacts	DEP or SEP in isolation	DEP and SEP concurrently	DEP and SEP sequentially	Notes and Rationale
		• Access haul road number within corridor = 1 (x 60km long x 6m wide)		
	<u>Construction corridor</u> • Total width = 45m • One trench, 1m wide by 1.75m deep. • Minimum cable burial depth at 1.2m	<u>Construction corridor</u> • Total width = 60m • Two trenches, each 1m wide by 1.75m deep. • Minimum cable burial depth at 1.2m	<u>Construction corridor</u> • Total width = 60m • Two trenches, each 1m wide by 1.75m deep. • Minimum cable burial depth at 1.2m	
	<u>Duration</u> • 24 months in total	<u>Duration</u> • 24 months in total	<u>Duration</u> • 24 months in total for each project	
Impacts relating to the onshore substation	<u>Substation footprint</u> • Permanent area = 3.25ha. • Temporary construction area = 1ha • Total construction area = 4.25ha	<u>Substation footprint</u> • Permanent area = 6.0ha • Additional construction area = 1ha • Total construction area = 7.0ha.	<u>Substation footprint</u> • Permanent area = 6.25ha • Additional construction area = 1ha • Total construction area = 7.25ha.	It has been assumed that the substation construction compound will be adjacent to either of the two substation site options.
	<u>Duration</u> • 36 months in total	<u>Duration</u> • 36 months in total	<u>Duration</u> • 36 months in total for each project	

Impacts	DEP or SEP in isolation	DEP and SEP concurrently	DEP and SEP sequentially	Notes and Rationale
Impacts relating to construction traffic	DEP/SEP together concurrently (Scenario 2) construction traffic as a worst-case scenario, as detailed in **Chapter 26 Traffic and Transport** and presented in **Appendix 24.2**.			
Operation				
Operational phase air quality impacts have been scoped out as detailed in the Scoping Report (Equinor, 2019) and Scoping Opinion (the Planning Inspectorate, 2019).				
Decommissioning				
No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable corridor and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused or recycled where possible, with the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that, for the purposes of a worst-case scenario, the impacts will be no greater than those identified for the construction phase.				

24.3.2.2 Construction Scenarios

18. The following principles set out the framework for how DEP and SEP may be constructed:
    - DEP and SEP may be constructed at the same time, or at different times;
    - If built at the same time both Projects could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times the first Project would require a four-year period of construction including a three year onshore construction period. The second Project would require a three-year period of construction;
    - If built at different times, the duration of the gap between end of onshore construction of the first Project, and the start of onshore construction of the second Project may vary from 0 to 1 year;
    - Assuming maximum construction periods, and taking the above into account, the maximum period over which the construction of both Projects could take place is 7 years; and
    - The earliest construction start date is 2024 and the latest is 2028.
19. The three onshore construction scenarios taken into consideration for the air quality assessment are therefore:
    - Scenario 1: Build DEP or build SEP in isolation;
    - Scenario 2: Build DEP and SEP concurrently – reflecting the maximum peak effects; and
    - Scenario 3: Build one project followed by the other with a gap of up to one year (sequential) – reflecting the maximum duration of effects.
20. Any differences between DEP and SEP, or differences that could result from the manner in which the first and the second projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in the impact assessment section of this chapter (**Section 24.6**). For each potential impact only the worst case construction scenario for DEP and SEP is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in **Section 24.6**.
21. DEP and SEP construction generated road traffic flows were determined for the worst-case DEP/SEP together concurrently scenario (see **Chapter 26 Traffic and Transport**), therefore, the construction road traffic emissions assessment only considers Scenario 2 (i.e. DEP/SEP together concurrently). It is anticipated that the magnitude of impacts of the single project (i.e. Scenario 1) would be no greater, or less (as it is anticipated that DEP and SEP-generated construction traffic flows would be lower), than DEP and SEP together (i.e. Scenario 2). Depending on the outcome of the assessment of the worst case scenario, consideration of the other scenarios may be included at the ES stage.

24.3.2.3 Operation Scenarios

22. Operational phase air quality impacts have been scoped out as detailed in the Scoping Report (Equinor, 2019) and Scoping Opinion (the Planning Inspectorate, 2019).

24.3.2.4 Decommissioning Scenarios

23. Decommissioning scenarios are described in detail in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a Decommissioning Plan prior to construction; however, for the purpose of this assessment it is assumed that decommissioning of DEP and SEP could be conducted separately, or at the same time.

24.3.3 Summary of Mitigation Embedded in the Design

24. This section outlines the embedded mitigation relevant to the air quality assessment, which has been incorporated into the design of DEP and SEP (**Table 24-3**). Where other mitigation measures are proposed, these are detailed in the impact assessment (**Section 24.6**).

Table 24-3: Embedded Mitigation Measures

Parameter	Mitigation Measures Embedded into the Design of DEP and SEP
General	
Site selection	DEP and SEP has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules (for explanation see **Chapter 4 Site Selection and Alternatives**) for the onshore substation and associated infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts. Key principles that have informed the onshore cable corridor route include: • Preference for the shortest onshore cable corridor to minimise the overall footprint and the number of receptors that will be affected. • Avoid key constraints, where possible; and • Avoid populated areas, where possible. Consideration has been taken into account for the following constraints: • Sites designated for nature conservation; • Residential properties; and • Other infrastructure (e.g. buried cables, railways, roads). This corridor will be further refined throughout the DCO application taking into account the location of air quality sensitive receptors.

24.4 Impact Assessment Methodology

24.4.1 Policy, Legislation and Guidance

24.4.1.1 National Policy Statements

25. The assessment of potential impacts upon air quality has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to DEP and SEP are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

26. The specific assessment requirements for air quality, as detailed in the NPS, are summarised in **Table 24-4** together with an indication of the section of the PEIR chapter where each is addressed.

Table 24-4: NPS Assessment Requirements

NPS Requirement	NPS Reference	Section Reference
EN-1 NPS for Energy (EN-1)		
Any ES on air emissions will include an assessment of Carbon Dioxide (CO_2) emissions, but the policies set out in Section 2 [of EN-1], including the EU ETS, apply to these emissions. The IPC (now Planning Inspectorate) does not, therefore need to assess individual applications in terms of carbon emissions against carbon budgets.	Paragraph 5.2.2	Not applicable to assessment.
The ES should describe: Any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project; The predicted absolute emission levels of the proposed project, after mitigation methods have been applied; Existing air quality levels and the relative change in air quality from existing levels; and Any potential eutrophication impacts.	Paragraph 5.2.7	Please refer to **Section 24.6**

NPS Requirement	NPS Reference	Section Reference
Other matters that the IPC may consider important and relevant to its decision-making may include Development Plan Documents or other documents in the Local Development Framework. In the event of a conflict between these or any other documents and an NPS, the NPS prevails for the purposes of IPC decision making given the national significance of the infrastructure.	Paragraph 4.1.5	Please refer to **Section 24.4.1.2**

27. EN-3 and EN-5 do not specifically include details on the assessment of air quality.

24.4.1.2 Other

28. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of air quality.

29. Legislation of relevance to the air quality assessment include:

- European Union (EU) Directives:
    - Air pollution can have adverse effects on the health of humans and ecosystems. EU legislation forms the basis for UK air quality policy. The EU Air Quality Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management entered into force in 1996 (European Parliament, 1996). Directive 96/62/EC and the first three Daughter Directives were combined to form the new EU Directive 2008/50/EC (European Parliament, 2008) on Ambient Air Quality and Cleaner Air for Europe, which came into force in June 2008.
- United Kingdom Air Quality Strategy:
    - The 1995 Environment Act required the preparation of a national Air Quality Strategy which sets air quality standards for specified pollutants. The Act also outlined measures to be taken by local authorities in relation to meeting these standards and Objectives, which became the Local Air Quality Management (LAQM) system.
    - The UK Air Quality Strategy was originally adopted in 1997 (Department of Environment, 1997) and has been reviewed and updated to take account of the evolving EU legislation, technical and policy developments and the latest information on health effects of air pollution. The strategy was revised and reissued in 2000 as the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Department of the Environment, Transport and the Regions (DETR), 2000). This was subsequently amended in 2003 (DETR, 2003) and was last updated in July 2007 (Defra, 2007).

   - The Government published its Clean Air Strategy in January 2019 (Defra, 2019), which reset the focus for the first time since the 2007 Air Quality Strategy revision. The Clean Air Strategy identifies a series of 'new' air quality issues, including biomass combustion, shipping emissions and releases from agricultural activities. There is a recognition that the effects of pollutant deposition on sensitive ecosystems and habitats needs greater focus. The concept of an overall exposure reduction approach is raised, in recognition that numerical standards are not safe dividing lines between a risk and a safe exposure, within a population with a varying age and health profile.
- Local Air Quality Management:
   - The standards and Objectives relevant to the LAQM framework have been prescribed through the Air Quality (England) Regulations (2000) (HMSO, 2000), and the Air Quality (England) (Amendment) Regulations (2002) (HMSO, 2002). The EU Limit Values have been implemented via the Air Quality Standards Regulations (2010), which set out the combined Daughter Directive limit values and interim targets for Member State compliance (HMSO, 2010).
   - The current air quality standards and Objectives of relevance to this assessment are presented in **Table 24-5**. Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health. Pollutant Objectives, however, incorporate target dates and averaging periods which take into account economic considerations, practicability and technical feasibility.
   - Where an air quality Objective is unlikely to be met by the relevant deadline, local authorities must designate those areas as Air Quality Management Areas (AQMAs) and take action to work towards meeting the Objectives. Following the designation of an AQMA, local authorities are required to develop an Air Quality Action Plan (AQAP) to work towards meeting the Objectives and to improve air quality locally.
   - Possible exceedances of Air Quality Objectives are usually assessed in relation to those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the Objective.

Table 24-5: Air Quality Strategy Objectives (England) for the purposes of LAQM

Pollutant	Air Quality Objective		To be achieved by
	Concentration	Measured as*	
Nitrogen Dioxide (NO_2)	200µg.m^{-3}	1-hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg.m^{-3}	Annual mean	31/12/2005

Pollutant	Air Quality Objective		To be achieved by
	Concentration	Measured as*	
Particles (PM_{10})	50µg.m^{-3}	24-hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg.m^{-3}	Annual mean	31/12/2004
Particles ($PM_{2.5}$)	25µg.m^{-3}	Annual mean (target)	2020
	15% cut in annual mean (urban background exposure)	Annual mean	2010-2020
*the way the Objectives are to be measured is set out in the UK Air Quality (England) Regulations			

30. National air quality Objectives also apply for the protection of vegetation and ecosystems, which are termed Critical Levels. Critical Levels apply irrespective of habitat type and are based on the concentration of the relevant pollutants in air. Institute of Air Quality Management (IAQM) guidance (IAQM, 2020) recommends that only the annual mean Critical Level is used in assessments due to the comparative importance of annual effects to impacts upon vegetation, except where specifically required by the regulator where high short-term emissions may occur, such as from an industrial stack emission source. As such, given the consistent traffic exhaust emission source along road links, only annual mean Critical Levels were considered.

31. The Critical Levels of relevance to this assessment are detailed in **Table 24-6**.

Table 24-6: Critical Levels

Pollutant	Critical Level	
	Concentration	Measured as
Oxides of nitrogen (NOx)	30µg.m^{-3}	Annual Mean
Ammonia (NH_3)	3µg.m^{-3}	Annual Mean

32. Critical Loads for habitat sites in the UK are published on the APIS website (CEH, 2020). These are the maximum levels of nutrient nitrogen and acid deposition that can be tolerated without harm to the most sensitive features of these habitat sites. Guidance provided by the Environment Agency (EA, 2020) states that where the contribution of a project leads to nutrient nitrogen and acid deposition values below 1% of the Critical Load, impacts can be considered to be not significant. Therefore, any project-generated nutrient nitrogen deposition values above 1% of the Critical Load will require additional assessment by an ecologist to determine whether any impacts may be experienced at the affected habitats.

33. The PEIR boundary falls within the area of jurisdiction of three local authorities':

- North Norfolk District Council (NNDC);
- Broadland District Council (BDC); and
- South Norfolk Council (SNC).

34. The PEIR boundary also falls wholly within the jurisdiction of Norfolk County Council (NCC).

35. In addition, construction vehicle access routes (as identified in **Chapter 26 Traffic and Transport**) would pass through the following local authority boundaries:
    - King's Lynn and West Norfolk Borough Council (KLWNBC);
    - Breckland Council (BC);
    - Great Yarmouth Borough Council (GYBC); and
    - Waveney District Council (WDC).

36. Local planning policy documents and policies of relevance to the air quality assessment include:
    - NNDC Core Strategy (NNDC, 2008):
        - 'Policy EN13 Pollution and Hazard Prevention and Minimisation' states that *"Proposals will only be permitted where, individually or cumulatively, there are no unacceptable impacts on… air quality".*
    - North Norfolk Local Plan 2016 – 2036 – First Draft Local Plan (Part 1) (NNDC, 2019a):
        - NNDC is currently preparing a new Local Plan and has undertaken consultation on its emerging First Draft Local Plan. The following policies of relevance to air quality were identified in the first draft of the Local Plan: 'Policy SD 13 Pollution & Hazard Prevention and Minimisation' states that *"Proposals will only be permitted where, individually or cumulatively, there are no unacceptable impacts on… air quality"*. 'Policy ENV 10 Protection of Amenity' states that *"in assessing the impact of development on the living conditions of occupants, regard will be had to the North Norfolk Design Guide and the following considerations… other forms of pollution (including, but not limited to: contaminated land, dust, air and light pollution)."*
    - BDC Development Management DPD (BDC, 2015):
        - 'Policy EN4 – Pollution' states that *"where a proposed development would result in airborne pollutants exceeding statutory objectives, it will not be permitted unless appropriate mitigation measures are agreed. Development which may give rise to airborne emissions of potentially harmful substances, including smoke, grit and dust, will be required to provide a risk assessment of the likelihood of demonstrable harm to human health or to the environment."*
    - South Norfolk Local Plan: Development Management Policies Document (SNDC, 2015):

- ‘Policy DM 3.13 Amenity, noise and quality of life’ states that *“development should ensure a reasonable standard of amenity reflecting the character of the local area. In all cases particular regard will be paid to avoiding… introduction of incompatible neighbouring uses in terms of… air, dust”*. ‘Policy DM 3.14 Pollution, health and safety’ states that *“when assessed individually or cumulatively, development proposals should ensure that there will be no unacceptable impacts on… air quality… Developments which may impact on air quality will not be permitted where they have an unacceptable impact on human health, sensitive designated species or habitats, and general amenity, unless adequate mitigation can be ensured. Development will not be granted in locations where it is likely to result in an Air Quality Management Area being designated or the worsening of air quality in an existing Air Quality Management Area.*”

- KLWNBC Site Allocations and Development Management Policies Plan (KLWNBC, 2016):
  - ‘Policy DM15-Environment, Design and Amenity’ states that *“development must protect and enhance the amenity of the wider environment including its heritage and cultural value. Proposals will be assessed against their impact on neighbouring uses and their occupants as well as the amenity of any future occupiers of the proposed development. Proposals will be assessed against a number of factors including: Air quality.”*
  - ‘Policy DM20-Renewable Energy’ states that *“proposals for renewable energy (other than proposals for wind energy development) and associated infrastructure, including the landward infrastructure for offshore renewable schemes, will be assessed to determine whether or not the benefits they bring in terms of the energy generated are outweighed by the impacts, either individually or cumulatively, upon: Amenity (in terms of noise, overbearing relationship, air quality and light pollution).”*
- KLWNBC Local Plan Review 2019 (KLWNBC, 2019):
  - In the new emerging Local Plan for KLWNBC, Policy DM15 is to be replaced by LP18 and Policy DM20 is to be replaced by LP21, but the polices have not changed.
- Breckland Local Plan (BC, 2019):
  - ‘Policy COM 01 – Design’ states that *“development should be designed to reduce the impact on local air quality, particularly from road traffic, especially in those areas in or likely to impact on, areas identified as ‘at risk’ of exceeding air quality objectives.”*
  - ‘Policy COM 03 Protection of Amenity’ states that *“in assessing the impact of development on the living conditions of occupants, regard will be had to the following amenity considerations: … other forms of pollution (including contaminated land, dust, air pollution, for example the emission of particulates etc).”*

- GYBC Local Plan Core Strategy (GYBC, 2015):
  - 'Policy CS9-Encourage well-designed, distinctive places' *"seek to protect the amenity of existing and future residents, or people working in, or nearby, a proposed development, from factors such as noise, light and air pollution and ensure that new development does not unduly impact upon public safety."*
  - 'Policy CS11-Enhancing the natural environment' states to ensure *"that all new development takes measures to avoid or reduce adverse impacts on existing biodiversity and geodiversity assets. Where adverse impacts are unavoidable, suitable measures will be required to mitigate any adverse impacts. Where mitigation is not possible, the Council will require that full compensatory provision be made."*
- Waveney Local Plan (East Suffolk Council, 2019):
  - No reference is made to air quality in the policies of the Waveney Local Plan, however reference is included to the following: *"where vehicle movements are likely to significantly increase in these* [European protected habitats, particularly the Broads SAC] *locations, further assessment on air quality and impact on habitats will be required to inform project level Habitat Regulations Assessments."*

37. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

24.4.2 Data and Information Sources

24.4.2.1 Data sources

38. Data sources that have been used to inform the assessment are listed in **Table 24-7**.

Table 24-7: Data sources

Data set	Spatial coverage	Year	Notes
NNDC Air Quality Annual Status Report (ASR) 2019	NNDC boundary	2014-2018	Local monitoring locations and baseline information
BDC and SNDC Air Quality ASR 2019	BDC and SNDC boundary	2014-2018	Local monitoring locations and baseline information
NDC and SNDC diffusion tube monitoring results for 2019	BDC and SNDC boundary	2019	Provided during consultation with the EHO* at BDC and SNDC in November 2020.
KLWNBC Air Quality ASR 2020	KLWNBC boundary	2015-2019	Local monitoring locations and baseline information
BC Air Quality ASR 2020	BC boundary	2015-2019	Local monitoring locations and baseline information

Data set	Spatial coverage	Year	Notes
GYBC Air Quality ASR 2019	GYBC boundary	2014-2018	Local monitoring locations and baseline information
WDC Air Quality ASR 2020	WDC boundary	2015-2019	Local monitoring locations and baseline information
Defra LAQM Technical Guidance (TG16) (Defra, 2016)	UK	2016	Assessment Methodology
Defra's LAQM Support Portal	Study area	Assessment years	2018-based 1km x 1km grid pollutant background maps
Centre for Ecology and Hydrology (CEH)	UK	2021	Details of Critical Loads for ecological habitats
Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK)	UK	2017	Assessment methodology
IAQM	UK	2016	Guidance on the assessment of impacts from construction dust and particulate matter
IAQM	UK	2020	Guidance on the assessment of air quality impacts on designated nature conservation areas
Highways England	UK	2019	Design Manual for Roads and Bridges (DMRB) assessment methodology
Natural England	UK	2018	Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations
*email received containing 2019 monitoring data for BDC and SNDC on 26th November 2020.			

24.4.3 Impact Assessment Methodology

39. **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied to DEP and SEP. The following sections confirm the methodology used to assess the potential impacts on local air quality.

24.4.3.1 Construction Phase Dust and Fine Particulate Matter

40. Assessment of potential impacts associated with construction phase dust and fine particulate matter emissions was undertaken in accordance with the latest Institute of IAQM guidance (IAQM, 2016). The terminology differs from the generic impact assessment terminology presented within **Chapter 6 EIA Methodology**.

41. A summary of the assessment process is provided below.

24.4.3.1.1 Construction Phase Assessment Steps

1. Screen the need for a more detailed assessment;
2. Assessment conducted separately for demolition, earthworks, construction and trackout:
   a) Determine potential dust emission magnitude;
   b) Determine sensitivity of the area; and
   c) Establish the risk of dust impacts.
3. Determine site specific mitigation; and
4. Examine the residual effects to determine if additional mitigation is required.

42. It should be noted that trackout is defined as the transport of dust and dirt from the construction site onto the public road network. Full details of the assessment methodology are provided in **Appendix 24.1**.

24.4.3.1.2 Sensitivity

43. Definitions of the different sensitivity levels for human and ecological receptors to dust (IAQM, 2016) are given in **Table 24-8**.

Table 24-8: Definitions of the different sensitivity levels for receptors to construction dust

Sensitivity	Sensitivity of people and property to dust soiling	Sensitivity of people to the health effects of PM_{10}	Sensitivity of ecological receptors
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.	Residential properties, hospitals, schools and residential care homes.	International or national designation and features affected by dust soiling or locations with dust-sensitive species.
Medium		Office and shop workers not	Locations with important plant species or national

Sensitivity	Sensitivity of people and property to dust soiling	Sensitivity of people to the health effects of PM_{10}	Sensitivity of ecological receptors
	Parks, places of work.	occupationally exposed to PM_{10}.	designation with features affected by dust soiling.
Low	Playing fields, farmland, footpaths, short-term car parks and roads.	Public footpaths, playing fields, parks and shopping streets.	Local designation where features may be affected by dust deposition.

24.4.3.1.3 Magnitude

44. The magnitude of construction phase dust emissions should be defined for each type of activity. These are broken down into four categories: demolition, earthworks, construction and trackout. The dust emission magnitudes can either be small, medium or large and are dependent on the methods of work undertaken and the scale of the activity. It is anticipated that there will be no dust-generating demolition required as part of the construction phase of DEP and SEP; therefore, this was not considered as part of the assessment.

45. The dust emission magnitudes for each activity are detailed in **Table 24-9**.

Table 24-9: Definitions of the different magnitudes of construction phase dust emissions

Activity	Criteria used to Determine Dust Emission Magnitude		
	Small	Medium	Large
Earthworks	Total site area <2,500m^2. Potentially dusty soil type (e.g. clay).	Total site area 2,500 – 10,000m^2. Moderately dusty soil type (e.g. silt).	Total site area >10,000m^2. Soil type with large grain size (e.g. sand).
Construction	Total building volume <25,000m^3.	Total building volume 25,000 – 100,000m^3.	Total building volume >100,000m^3.
Trackout	<10 outward Heavy Duty Vehicle (HDV) trips in any one day. Unpaved road length <50m.	10-50 outward HDV trips in any one day. Unpaved road length 50-100m.	>50 outward HDV trips in any one day. Unpaved road length >100m.

46. As detailed in **Table 24-9**, the IAQM guidance provides broad ranges of the area of a site, the total building volume and the number of outward vehicle trips which are used to determine the dust emission magnitude.

24.4.3.1.4 Significance

47. The dust emission magnitude should be combined with the sensitivity of the area to determine the risk of impacts prior to mitigation. This is shown in more detail in **Appendix 24.1**. This assessment deviates slightly from the methodology set out in **Chapter 6 EIA Methodology**, as the IAQM guidance does not assign a significance before applying mitigation measures. Once appropriate mitigation measures have been identified as required, the significance of construction phase impacts can be determined. The aim is to prevent significant effects at receptors due to the implementation of effective mitigation. A matrix is therefore not provided in the guidance to determine significance.

24.4.3.2 Construction Phase Non-Road Mobile Machinery (NRMM) Emissions

48. The Scoping Opinion requested that *"impacts from construction plant emissions"* be assessed where significant effects are likely. Defra technical guidance (Defra, 2018) states that emissions from NRMM used on construction sites are unlikely to have a significant impact on local air quality where relevant control and management measures are employed. A qualitative assessment of Project-generated NRMM used during construction of the onshore cable corridor and/or onshore substation, where impacts on receptors may occur, has been undertaken.

49. This assessment will take into account:

- The number and type of plant to be used;
- The working hours to be employed and the duration of works;
- Distances from NRMM to the nearest receptors;
- Existing air quality conditions in the area (based on either local monitoring (where available) and/or Defra background pollutant concentration maps (Defra, 2020a)); and
- Prevailing meteorological conditions.

24.4.3.3 Construction Road Vehicle Exhaust Emissions

24.4.3.3.1 Screening Criteria and Assessed Road Links/Haulage Routes

50. The requirement for a detailed assessment of construction vehicle exhaust emissions at human and ecological receptors has been considered using screening criteria provided by IAQM and EPUK (2017), Highways England (2019) and Natural England (2018). The assessment criteria are detailed in **Table 24-10**:.

Table 24-10: IAQM and EPUK, Highways England and IAQM road traffic assessment screening criteria

Guidance Document	Receptor	Screening Criteria	
IAQM and EPUK (2017)	Human receptors	Light Duty Vehicles (LDVs)	A change in annual average daily traffic (AADT) of more than 100 within or adjacent to an AQMA, or more than 500 elsewhere.
		Heavy Duty Vehicles (HDVs)	An increase in HDV movements of more than 25 per day within or adjacent to an AQMA, or more than 100 elsewhere.
Highways England (2019) and Natural England (2018)	Ecological receptors	LDVs	Increase of 1,000 AADT or more.
		HDVs	An increase in HDV movements of more than 200 per day.

51. The screening criteria above for ecological receptors are considered by Natural England to equate to a 1% change in the Critical Load or Level (Natural England, 2018) which is regarded as a threshold of being not significant. A change of this magnitude is likely to be within the natural range of fluctuation in deposition and is unlikely to be perceptible. Ecological receptors are screened inclusive of in-combination traffic growth from the base year to the future base year. Reasoning for this is provided in further detail in **Section 24.4.3.3.14**.

52. The increases in traffic flows on the road network associated with the construction phase of DEP and SEP were screened using the criteria detailed in **Table 24-10**:, and as mentioned previously (**Section 24.3.2.2**), this was undertaken for the anticipated worst case scenario (i.e. Scenario 2 – DEP/SEP together concurrently, see **Chapter 5 Project Description** for further detail on the different construction scenarios). Road links which are anticipated to experience increases in traffic flows greater than the screening criteria were considered in the assessment. As such, sensitive receptor locations were identified on the affected road links only.

53. Construction activities associated with Scenario 2 (DEP/SEP together concurrently) are predicted to generate the most vehicle movements (i.e., worst case scenario) of all potential scenarios. Therefore, more road links exceed the IAQM and EPUK screening criteria for a detailed assessment, resulting in a larger road network being considered in the assessment.

54. The road links which were predicted to experience increases in vehicles numbers and HDVs in exceedance of the criteria are detailed in **Table 24-11**: for Scenario 2 (DEP/SEP together concurrently) and are shown in **Figure 24.1**.

55. More information on the derivation of the traffic flows is provided in **Chapter 26 Traffic and Transport** and the traffic data used in the assessment is provided in **Appendix 24.2**.

56. Traffic flows on the temporary haulage routes to be used for DEP and SEP during construction will also be screened against the criteria detailed in **Table 24-10**: at the ES stage once further details on these traffic numbers and routes are known.

Table 24-11: Affected road links under Scenario 2 (boxes in red show traffic flows that exceed criteria)

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
1	A1078 Low Road / A148 Grimston Road	Both	825	630	2,841	731
2	A148 from A149 to A1065	Both	427	231	1,409	306
3	A148 from A1065 to A1067	Both	420	231	2,262	342
4	A148 from A1067 to B1149	Both	387	176	1,468	233
5	A148 from B1149 to Hamstead Road	Ecological	273	76	1,891	132
6	A148 from Hemstead Road to Bridge Road	Ecological	251	57	1,870	113
13	A148 from Gypsie's Lane to B1436	Ecological	272	73	1,985	217
14	B1436 - Felbrigg	Ecological	214	62	1,041	137

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
15	A140 - Roughton	Ecological	259	62	1,559	202
16	A149 - North Walsham	Ecological	118	62	1,167	104
17	A149 from B1145 to B1150	Ecological	118	62	1,591	128
18	A149 from B1150 to Kidas Way	Ecological	118	62	1,591	128
20	A149 from B1159 to Station Road	Ecological	118	62	1,213	123
21	A149 from Station Road to A1064	Ecological	118	62	1,429	117
22	A149 from A1064 to Yarmouth Road	Ecological	118	62	3,101	142
23	A149 from Yarmouth Road to B1141	Ecological	118	62	2,501	132

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
24	A149 from B1141 to A47	Both	508	457	4,616	581
25	A12 from A47 to Williams Adams Way	Both	434	236	4,679	370
26	A12 from Williams Adams Way to B1385	Both	420	239	3,507	343
27	A12 from B1385 to A1117	Both	239	239	2,392	296
28	A12 from A1117 to Mill Road	Both	239	239	1,386	315
29	A12 from Mill Road to B1384 / A1145 from B1384 to A146	Both	221	221	1,555	272
30	A146 from A47 to A1145	Both	469	221	2,731	320
31	A47 from A146 to A1042	Both	472	221	6,791	507

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
32	A47 from A1042 to Cucumber Lane	Both	612	395	5,876	635
33	A47 from Cucumber Lane to A1064	Both	601	395	5,866	635
34	A47 from A1064 to A12	Both	593	395	3,227	558
35	A1270 from A1151 to A47	Both	410	174	1,756	261
37	A149 from A1151 to B1159	Ecological	85	62	1,753	216
38	A149 from The Street to A1151	Ecological	85	62	1,754	445
39	A149 from Honing Road to The Street	Ecological	85	62	1,754	445
40	A1270 from B1150 to A1151	Both	424	174	3,116	347

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
41	A1270 from A140 to B1150	Both	405	174	3,097	347
42	A140 from B1149 to A1042	Ecological	304	0	2,518	88
43	A140 from Cawston Road to A1270	Both	333	118	2,055	189
44	A140 from B1145 to Cawston Road	Both	308	104	2,186	272
45	A140 from B1145 to Aylsham Road	Ecological	206	0	1,595	47
46	A140 from Thorpe Market Road to Aylsham Road	Ecological	207	0	1,595	47
47	A1270 from Drayton Lane to A140	Both	388	160	1,734	246

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
48	Brewery Lane / B1149 from Brewrey Lane to Shorthorn Road	Ecological	227	0	1,026	34
49	B1149 from Buxton Road to Shorthorn Road	Ecological	231	0	1,030	34
51	B1149 from B1145 to Buxton Road	Ecological	249	16	1,229	89
52	B1145 from B1149 to A140	Human	171	104	-	-
54	B1149 from Spink's Lane to B1145	Human	396	158	-	-
56	B1149 from B1354 to Spink's Lane	Human	368	132	-	-
57	B1354 east of B1149	Ecological	200	16	1,549	-2

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
72	A1270 from Reepham Road to Brewrey Lane	Ecological	248	57	1,594	143
73	A1270 from Fir Covert Road to Reepham Road	Ecological	239	50	1,585	136
76	A1067 from Beech Avenue to A140	Ecological	209	0	1,769	45
78	A1270 from A1067 to Fir Covert Road	Ecological	242	50	1,588	136
79	A1067 from Marl Hill Road to A1270	Ecological	277	80	1,617	166
80	A1067 from A148 to Marl Hill Road	Ecological	251	55	1,166	110
86	A47 from A1065 to Berrys Lane	Both	623	399	2,538	587
87	A47 from A10 to A1065	Both	610	399	2,314	579

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
88	A149 from A148 to A47	Both	449	399	3,504	620
89	A47 from Wood Lane to Taverham Road	Both	625	387	3,698	650
94	A47 from Blind Lane to Dereham Road	Both	620	384	3,692	647
95	A47 from Dereham Road to A1074	Both	615	375	6,750	744
96	A1074 from A47 to A140	Ecological	188	0	1,941	102
97	A47 from A1074 to B1108	Both	618	375	6,753	744
100	A148 from Bridge Road to Gypsie's Lane	Ecological	242	47	1,860	104
105	A47 from B1108 to A11	Both	614	371	6,749	740

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
106	B1172 from Ketteringham Lane to A47	Ecological	236	52	2,074	156
107	B1172 from New Road to Ketteringham Lane	Ecological	227	52	2,065	156
111	B1135 from Melton Road to Norwich Common	Ecological	17	0	2,683	66
112	B1172 from B1135 to New Road	Ecological	211	27	2,969	78
113	B1135 from B1172 to A11	Ecological	232	48	4,970	135
114	A11 from B1135 to A47	Ecological	261	48	6,378	475
121	A11 from A47 to A140	Ecological	192	0	2,662	154
122	A47 from A11 to A140	Both	592	336	8,150	748
123	B1113 south of the A47	Ecological	215	31	1,271	104

Link ID	Road	Screened in (for Human or Ecological Receptors)	Scenario 2 – 2025 Worst Case Assumption			
			Number of vehicles generated by the construction phase of DEP and SEP		Number of vehicles generated by the construction phase of DEP and SEP + incombination growth (2018 to 2025) – Ecological receptors only	
			Total AADT	HDVs (per day)	Total AADT	HDVs (per day)
124	B1113 from A47 to A140	Ecological	215	31	1,227	97
125	A140 from A146 to A47	Ecological	323	31	3,047	151
126	Aylsham Road	Human	332	124	929	158
127	A140 south of the A47	Both	821	350	3,465	693
128	Mangreen/Mangreen Lane	Both	818	350	856	352
129	A47 from A140 to A146	Both	512	221	1,627	311
141	A1082 Holway Road	Ecological	41	19	1,102	41

57. As can be seen from **Table 24-11**:, the majority of links that have been screened in for exceeding ecological criteria (i.e. 1,000 AADT or 200 HDVs) are as a result of in-combination growth in traffic flows from 2018 to 2025 on links and not as a result of construction traffic from DEP and SEP.

24.4.3.3.2 Dispersion Model

58. The potential impact of exhaust emissions from construction road vehicles accessing the onshore project area was assessed using the Atmospheric Dispersion Modelling System for Roads (ADMS-Roads) v5.0.0.1. The main pollutants of concern for human health as a result of vehicle emissions are annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, and annual mean concentrations of NOx and deposition of NO_2 at designated ecological sites. Concentrations of these pollutants were therefore the focus of the ADMS-Roads assessment.

24.4.3.3.3 Assessment Scenarios

59. The air quality assessment considered the assessment year which represents the maximum DEP and SEP generated traffic and highest base traffic flows within the construction of Scenario 2, as a worst case scenario.

60. The worst-case scenario is that peak onshore construction works would occur over a two year period (as detailed in **Table 24-2**), from 2025 to 2026.To provide a conservative assessment, the maximum proposed DEP generated traffic across the two year peak construction period was combined with the earliest year of construction, where pollutant emission rates and background concentrations would be higher than in later years of construction. The assessment has therefore considered the following scenarios:

- Verification / Base year (2018);
- Scenario 1 – Worst-Case Construction Year (2025) 'without DEP and SEP'; and
- Scenario 2 – Worst-Case Construction Year (2025) 'with DEP and SEP'.

61. A base year of 2018 was used as this was the most recent year for which monitoring data were available to verify the dispersion model.

24.4.3.3.4 Traffic Data

62. 24-hour AADT flows and HDV percentages were derived for the worst case construction year. The traffic data for the assessment is detailed in **Appendix 24.2**.

63. Traffic speeds were included in the air dispersion model as follows:

- Roundabouts and queues at junctions were modelled at 20km/h; and
- Speed data for free-flowing traffic conditions were obtained from average speeds recorded during the traffic count surveys (discussed in **Chapter 26 Traffic and Transport**) where applicable, or national speed limits. Where speeds vary across a road link, the lowest speed was used to provide a conservative assessment. For the purposes of model verification, the recorded road speed adjacent to the monitoring location was used to more adequately represent monitored conditions.

24.4.3.3.5 Emission Factors

64. Emission factors were obtained from the Emission Factor Toolkit (EFT) v10.1 provided by Defra (Defra, 2020b). 2018 emission factors were used in the verification/base year assessment and emission factors for 2025 were used in the future year 'without DEP and SEP' and 'with DEP and SEP' scenarios. There has been uncertainty in the future vehicle emissions projections in versions previous to v9.0 of the EFT. However, evidence has been published to suggest that v10.1 of the EFT, as used in the assessment, provides a reasonable prediction of vehicle emissions into the future and a sensitivity test is not required (Air Quality Consultants, 2020). Given this evidence, the use of 2025 emission factors in the assessment is considered to be appropriate.

65. The use of future year emission factors was agreed with the EHOs at NNDC, BDC and SNDC during consultation.

24.4.3.3.6 Meteorological Data

66. Norwich International Airport recording station meteorological data from 2018 was used in the ADMS-Roads model. There is also a station at Weybourne, which is located within the PEIR boundary on the coastline. However, the majority of the roads affected by DEP and SEP are likely to be located further inland, and therefore data from the Norwich station is considered to be more representative of the overall study area.

67. The use of the Norwich recording station data was agreed with the EHOs at NNDC, BDC and SNDC during consultation.

24.4.3.3.7 Model Verification

68. Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data. In this assessment, model uncertainty was minimised following Defra (2018) and IAQM and EPUK (2017) guidance.

69. Monitoring locations within the study area were reviewed to establish the suitability for use in model verification. Locations were considered where the assessed road links provided sufficient representation of road traffic sources that would affect monitored concentrations at that point. Monitoring locations that were situated in proximity to several road links which were not considered in the assessment were discounted on the basis that modelled concentrations would be underestimated.

70. A review of the monitoring data identified nine NO_2 diffusion tubes located on the considered road network with available data for 2018 and 2019. These diffusion tubes are:

- NNDC location 7;
- BDC location BN1;
- SNDC locations DT1, DT13 and DT27;
- GYBC locations DT1; and
- WDC locations CCL 1, LOW 1 and LOW 6a,b,c.

71. Locations DT1 and DT13, operated by SNDC, are both classed as suburban sites and it is recommended that only roadside sites are used in verification (Defra, 2018). Therefore, these sites were discounted from the verification process. Location DT27, also operated by SNDC, is located at the junction of Lord Nelson Drive (a link for which traffic data is not provided in the assessment) and A1074 Dereham Road (Link 96 in the assessment), according to the 2019 SNDC ASR (BDC and SNDC, 2019). The coordinates included in the SNDC 2019 ASR show DT27 to be located in Turnpike Belts along Link 96 (i.e., not on Lord Nelson Drive) and the diffusion tube could not be accurately located using Google Maps Street View, therefore this location was discounted from the verification process.

72. Location DT1, operated by GYBC, had a data capture of less than 75% in 2018, and therefore was discounted from the verification process in accordance with Defra guidance (Defra, 2018). Monitoring data were not available for this location in 2019 at the time of writing.

73. Location CCL 1, operated by WDC, has a data capture of less than 75% in 2018, and therefore was discounted from the verification process in accordance with Defra guidance (Defra, 2018). Monitoring data were not provided for this location in 2019 in the East Suffolk 2020 ASR (East Suffolk Council, 2020).

74. Monitoring data for 2019 were not available for location 7, operated by NNDC, at the time of writing, therefore a verification year of 2018 and the following locations were used for the verification process:

- NNDC location 7 (located on Link 4 – A148 from A1067 to B1149);
- BDC location BN1 (located on Link 33 – A47 from Cucumber Lane to A1064); and
- WDC locations LOW 1 and LOW 6a,b,c (both located on Link 28 – A12 from A1117 to Mill Road).

75. The first round of verification showed that the difference between modelled and monitored concentrations was greater than 25% at location 7 operated by NNDC. The model was under predicting concentrations in this area by approximately 1/3rd, therefore, to provide a conservative assessment, a different, higher adjustment factor was applied to receptors results in NNDC (see **Table 24-12**).

76. The first round of verification also showed that modelled road concentrations at LOW 1, operated by WDC, were over predicting monitored road concentrations; therefore, to provide a conservative assessment, this location was removed from the model verification and the resulting adjustment factor calculated using BDC location BN1 and WDC location LOW 6a,b,c was applied to remainder of receptor results in the study area (i.e. excluding NNDC receptor results) (see **Table 24-13**).

77. Details of the model verification process for NNDC and the rest of the study area are provided in **Table 24-12** and **Table 24-13**.

Table 24-12: Model verification for NNDC

Model Verification	**NO_2 diffusion tube monitoring location**
	NNDC Location 7
2018 Monitored Total NO_2 (µg.m^{-3})	19.9
2018 Background NO_2 (µg.m^{-3})	8.6
Monitored Road Contribution NOx (total - background) (µg.m^{-3})	21.3
Modelled Road Contribution NOx (excludes background) (µg.m^{-3})	7.8
Ratio of Monitored Road Contribution NOx / Modelled Road Contribution NOx	2.72
Adjustment Factor for Modelled Road Contribution	**2.718**
Adjusted Modelled Road Contribution NOx (µg.m^{-3})	21.3
Modelled Total NO_2 (based on empirical NOx / NO_2 relationship) (µg.m^{-3})	19.9
Monitored Total NO_2 (µg.m^{-3})	19.1
% Difference [(modelled - monitored) / monitored] x 100	0%

Table 24-13: Model verification for study area (excluding NNDC)

Model Verification	**NO_2 diffusion tube monitoring location**	
	BN1 (BDC)	**LOW 6a,b,c (WDC)**
2018 Monitored Total NO_2 (µg.m^{-3})	26.3	34.7
2018 Background NO_2 (µg.m^{-3})	10.2	25.0
Monitored Road Contribution NOx (total - background) (µg.m^{-3})	31.1	19.4
Modelled Road Contribution NOx (excludes background) (µg.m^{-3})	29.4	12.2
Ratio of Monitored Road Contribution NOx / Modelled Road Contribution NOx	1.06	1.60
Adjustment Factor for Modelled Road Contribution	**1.135**	
Adjusted Modelled Road Contribution NOx (µg.m^{-3})	33.4	13.8

Model Verification	NO_2 diffusion tube monitoring location	
	BN1 (BDC)	LOW 6a,b,c (WDC)
Modelled Total NO_2 (based on empirical NOx / NO_2 relationship) (µg.m^{-3})	27.4	32.0
Monitored Total NO_2 (µg.m^{-3})	26.3	34.7
% Difference [(modelled - monitored) / monitored] x 100	4%	-8%

78. As shown in **Table 24-12** and **Table 24-13**, the verification process highlighted that model performance varied at the monitoring locations considered, which reflects the uncertainties in each of a range of factors which will influence this relationship (including the representation of road traffic flow data, vehicle speeds, and individual vehicle emissions compared to emission factors, as well as model performance in representing dispersion). The average ratio between the modelled and monitored nitrogen oxides (NOx) road contribution across the two sites detailed in **Table 24-13** was used to determine the adjustment factors applied to receptor results (excluding NNDC).

79. For the verification shown in **Table 24-13**, the Root Mean Square Error (RMSE) of the model was 2µg.m^{-3}. The RMSE is used to determine the average error or uncertainty of the model. Defra technical guidance (Defra, 2018) states that this would ideally be within 4µg.m^{-3} (10% of the annual mean NO_2 Objective of 40µg.m^{-3}) but should be less than ± 25% of the Objective (i.e. 10µg.m^{-3}). If the RMSE value is higher than ± 25% of the Objective, Defra guidance recommends that model inputs and verification should be revisited. Model performance in this assessment was therefore considered to be suitable, as the RMSE was within ± 25% of the Objective. Without adjustment, an RMSE of 3µg.m^{-3} was predicted; therefore, model performance is improved by the application of the adjustment factor.

80. There is no monitoring of PM_{10} and $PM_{2.5}$ carried out along the links included in the air quality assessment. Therefore, the derived NOx adjustment factors were applied to the modelled PM_{10} and $PM_{2.5}$ concentrations to provide a conservative assessment (in accordance with guidance in LAQM TG(16) (Defra, 2018)).

24.4.3.3.8 NOx to NO_2 Conversion

81. NOx concentrations were predicted using the ADMS-Roads model. The modelled road contribution of NOx at the identified receptor locations was then converted to NO_2 using the NOx to NO_2 calculator (v7.1) (Defra, 2020c), in accordance with Defra guidance (Defra, 2018).

24.4.3.3.9 Background Pollutant Concentrations

82. The ADMS-Roads assessment requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which contributions from the assessed roads are added. Background NO_2, PM_{10} and $PM_{2.5}$ concentrations were therefore obtained from Defra mapping (Defra, 2020a) for the 1km x 1km grid squares covering the study area and receptor locations for the 2018 and 2025 assessment years.

24.4.3.3.10 Calculation of Short-term Pollutant Concentrations

83. Defra guidance (Defra, 2018) sets out the method for the calculation of the number of days, in which the PM_{10} 24-hour Objective is exceeded, based on a relationship with the predicted PM_{10} annual mean concentration. The relevant calculation utilised in the prediction of short-term PM_{10} concentrations was:

$$\text{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

84. Research projects completed on behalf of Defra and the Devolved Administrations (Laxen and Marner, 2003; AEAT, 2008) concluded that the hourly mean NO_2 Objective is unlikely to be exceeded if annual mean concentrations are predicted to be less than 60µg.m^{-3}. This value was therefore used as an annual mean equivalent threshold to evaluate likely exceedance of the hourly mean NO_2 Objective.

24.4.3.3.11 Sensitivity – Human Receptors

85. The sensitivity of a human receptor is not considered in the assessment of air quality impacts; the Air Quality Objectives in **Table 24-5**, which are health-based, only apply at locations where there is relevant public exposure as detailed in **Table 24-14**.

Table 24-14: Examples of where the Air Quality Objectives should/should not apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes, etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-Hour Mean and 8-Hour Mean	All locations where the annual mean Objective would apply, together with hotels and	Kerbside sites (as opposed to locations at the building façade), or any other location where

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
	gardens of residential properties.	public exposure is expected to be short term.
1-Hour Mean	All locations where the annual mean and 24 and 8-hour mean Objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

86. Sensitive receptor locations that experience pollutant concentrations close to, or in exceedance of the Objectives experience a larger impact magnitude with a smaller change in pollutant concentrations, as detailed below.

24.4.3.3.12 Magnitude and Significance – Human Receptors

87. Guidance is provided by the IAQM and EPUK (IAQM and EPUK, 2017) on determining the magnitude and significance of a project's impact on local air quality. The guidance was developed specifically for use in planning and assessing air quality impacts associated with mixed-use and residential developments. However, due to the nature of DEP and SEP, the criteria detailed below were utilised in the assessment to provide consideration of the impacts associated with DEP and SEP.

88. The impact descriptors that take account of the magnitude of changes in pollutant concentrations, and the concentration in relation to the Air Quality Objectives, are detailed in **Table 24-15**.

Table 24-15: Impact descriptors for individual receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to the air quality Objective			
	1	2-5	6-10	>11
75% or less of Objective	Negligible	Negligible	Slight	Moderate
76 - 94% of Objective	Negligible	Slight	Moderate	Moderate

Long term average concentration at receptor in assessment year	% Change in concentration relative to the air quality Objective			
	1	2-5	6-10	>11
95 - 102% of Objective	Slight	Moderate	Moderate	Substantial
103 - 109 of Objective	Moderate	Moderate	Substantial	Substantial
110% or more of Objective	Moderate	Substantial	Substantial	Substantial
Note: Figures are to be rounded up to the nearest round number. Any value less than 1% after rounding (effectively less than 0.5%) will be described as "Negligible".				

89. Further to the determination of the impact at individual receptors, the guidance recommends that assessment is made of the overall significance of the impact from a development on local air quality. The overall significance will need to take into account the following factors:

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

90. The guidance also states that a judgement of the significance should be made by a competent professional who is suitably qualified. This air quality assessment and determination of the significance of DEP and SEP on local air quality was undertaken by members of the IAQM.

91. For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

24.4.3.3.13 Sensitivity – Ecological Receptors

92. Whilst Critical Levels (see **Table 24-6**) apply regardless of habitat type, Critical Loads for habitat sites in the UK are published on the Air Pollution Information System (APIS) website (CEH, 2021). These are the maximum levels of nutrient nitrogen and acid deposition that can be tolerated without harm to the most sensitive features of these habitat sites (see **Appendix 24.4**).

24.4.3.3.14 Magnitude and Significance – Ecological Receptors

93. Guidance provided by the Environment Agency (Environment Agency, 2016) states that where the contribution of a project leads to values below 1% of the Critical Load or Level, impacts can be considered to be not significant. Whilst this guidance is intended for use with permitted industrial installations, the use of the 1% criterion, or for traffic-related impacts a 1,000 AADT or 200 HDV increase in traffic flows, is also considered by Natural England (Natural England, 2018) and IAQM (IAQM, 2020) to be a reasonable determination of the level at which impacts of a project or plan are not significant. A change of this magnitude is likely to be within the natural range of fluctuations in deposition and is unlikely to be perceptible.

94. A project or plan in isolation may not lead to significant effects, however the 2017 EIA Regulations require the consideration of impacts associated with a project or plan both in isolation, and in addition to other plans or projects which may affect the same designated site (an 'in-combination' assessment). The outcome of recent court judgements (notably the Wealden Judgement 2017) has led to the requirement for the 1% criterion to be applied to the in-combination impact to determine whether impacts remain insignificant, or whether further ecological investigation is required.

95. The road links which pass alongside the designated sites considered in the assessment (as detailed in **Table 24-11**:) will experience background traffic growth between the base year (2018) and the year of peak construction (2025) of the worst case scenario (i.e. Scenario 2 – DEP/SEP together concurrently), which may increase nutrient nitrogen/acid deposition or NOx at the designated sites. The 1,000 AADT threshold was therefore applied to the 'in-combination' traffic flows (DEP and SEP-generated traffic flows plus background growth) to determine whether a detailed assessment was required.

96. In addition, any consented agricultural or industrial projects in the vicinity of designated sites which may be affected by traffic generated by DEP and SEP may also contribute to nutrient nitrogen/acid deposition and NOx concentrations. Natural England developed Site of Specific Scientific Interest (SSSI) Impact Risk Zones (IRZs) which specify the types of projects which may impact on SSSIs based on the distance from the site

97. Where the 'in-combination' traffic flows exceeded 1,000 AADT, a search will be carried out at the ES stage for projects within the relevant distances which meet the criteria in each of the SSSI IRZs. Additional contributions of nutrient nitrogen from these sources (from both NO_2 and ammonia) and airborne NOx will be included in the 'in-combination' assessment, where there was sufficient information included within the application to quantify these emissions.

98. This approach to the assessment is also in accordance with the requirements of IAQM Guidance on the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM, 2020).

99. Any development-generated or in-combination values above 1% of the Critical Load or Level would require additional assessment by an ecologist to determine whether any significant impacts may be experienced at the affected habitats. The determination of the significance of impacts associated with nutrient nitrogen/acid deposition and airborne NOx concentrations will be provided at the ES stage.

24.4.4 Cumulative Impact Assessment Methodology

100. The cumulative impact assessment (CIA) considers other plans, projects and activities that may impact cumulatively with DEP and SEP. As part of this process, the assessment considers which of the residual impacts assessed for DEP and/or SEP on their own have the potential to contribute to a cumulative impact, the data and information available to inform the cumulative assessment and the resulting confidence in any assessment that is undertaken. **Chapter 6 EIA Methodology** provides further details of the general framework and approach to the CIA.

101. For air quality, the CIA utilised the same methodology as detailed above in **Section 24.4.3**. The results of the CIA are presented in **Section 24.7**.

24.4.5 Transboundary Impact Assessment Methodology

102. As detailed in **Table 24-1**, the Planning Inspectorate has agreed that transboundary air quality effects are unlikely to occur and that this topic can be scoped out of the assessment.

24.4.6 Assumptions and Limitations

103. Traffic data was utilised in the prediction of impacts at sensitive human and ecological receptor locations. Any assumptions made in the derivation of the traffic data are therefore applicable to the air quality assessment. For further details please refer to **Chapter 26 Traffic and Transport**.

24.5 Existing Environment

104. A desk based review was undertaken to determine the air quality baseline within the study area. Monitoring data were obtained from the following local authority websites for use in the PEIR:

- NNDC;
- BDC;
- SNDC;
- KLWNBC.
- BC;
- GYBC; and
- WDC.

105. The characterisation of the existing environment was undertaken using data sources listed in **Table 24-7**. The baseline data sources are sufficient to provide an assessment of potential air quality impacts arising from DEP and SEP and were agree with the local authorities within the PEIR boundary (i.e. NNDC, BDC and SNDC) during consultation via email in November and December 2020.

24.5.1 Local Air Quality Management

106. A review of the annual air quality review and assessment reports for the seven identified local authorities identified that the onshore cable corridor and associated affected road network do not pass through or close to any statutory designated AQMAs.

107. The statutory designated AQMA in Swaffham, declared in 2017 for exceedances of the NO_2 annual mean, is located approximately 1km south of the A47, which forms part of the affected road network. However, as DEP and SEP-generated traffic would not pass through the AQMA itself, it is not anticipated that, given the distance, there would be any significant increases in pollutant concentrations within the AQMA as a result of DEP and SEP.

108. The statutory designated Railway Road and Gaywood Clock AQMAs in King's Lynn, declared in 2003 and 2009 respectively for exceedances of the NO_2 annual mean, are located approximately 400m and 1.6km south respectively of the A1078 Edward Benefer Way, which also forms part of the affected road network. However, DEP and SEP-generated traffic would not pass through the AQMAs themselves as traffic commences/terminates at King's Lynn Docks, therefore there would not be any significant increases in pollutant concentrations within these AQMAs as a result of DEP and SEP.

24.5.2 Air Quality Monitoring Data

24.5.2.1 North Norfolk District Council

109. There were six NO_2 diffusion tube locations in the vicinity of the onshore cable corridor or associated affected road network considered. The results were obtained from the latest available 2019 ASR (NNDC, 2019b) and are presented in **Table 24-16**.

Table 24-16: Annual Mean NO_2 Monitoring undertaken by NNDC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
			2014	2015	2016	2017	2018
7	Norwich Holt Road	Roadside	-	-	-	17.7	19.9
9	Queens Rd, Fakenham	Roadside	-	-	21.6	21.7	19.9
10	Barons Hall Rd, Fakenham	Roadside	-	-	7.5	10.0	8.9
12	High Street, Holt	Roadside	-	-	19.3	21.9	21.2
15	Trinity Rd, Fakenham	Roadside	-	-	-	12.5	14.6
16	Rudham Stile Lane	Roadside	-	-	-	10.3	9.3

110. As detailed in **Table 24-16**, annual mean NO_2 concentrations were well below (i.e. less than 75% of) the annual mean Objective of $40\mu g.m^{-3}$ at all monitoring locations in the NNDC study area.

24.5.2.2 Broadland District Council

111. There were three NO_2 diffusion tube locations in the vicinity of the onshore cable corridor or associated affected road network considered. The results were obtained from the latest available 2019 ASR (BDC & SNDC, 2019) and 2019 monitoring data (provided by the BDC and SNDC EHO during consultation) and are presented in **Table 24-17**.

Table 24-17: Annual Mean NO_2 Monitoring undertaken by BDC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
BN1	A47 Nth Burlingham	Roadside	28.4	30.6	24	26.3	24.5
BN2	Norwich Road Acle	Kerbside	18.3	19.3	16.6	-	-
BN20	The Street Acle	Kerbside	-	-	-	22.5	21.1

112. As detailed in **Table 24-17**, recent annual mean NO_2 concentrations were well below the annual mean Objective of 40µg.m^{-3} at all monitoring locations in the BDC study area.

24.5.2.3 South Norfolk Council

113. There were ten NO_2 diffusion tube locations in the vicinity of the onshore cable corridor or associated affected road network considered. The results were obtained from the latest available 2019 ASR (BDC & SNC, 2019) and 2019 monitoring data (provided by the BDC and SNC EHO during consultation) and are presented in **Table 24-18**:.

Table 24-18: Annual Mean NO_2 Monitoring undertaken by SNC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
DT1	46a Newmarket Rd Cringleford	Suburban	17.1	20.2	21.2	19.7	19.9
DT2	131 Longwater Ln Costessey	Suburban	18.1	21.2	21.6	20.1	19.1
DT9	Kirby Bedon Rd Bixley	Suburban	21.4	25.4	24.9	23.2	23.9
DT10	209 Norwich Rd Wymondham	Suburban	12.0	18.0	16.5	15.3	15.7
DT11	2 Thickthorn Cottages	Rural	12.8	15.8	14.9	13.9	15.0
DT13	233 Norwich Rd Wymondham	Suburban	11.9	15.9	16.1	15.0	14.2
DT23	3 Norwich Rd Costessey	Suburban	13.0	16.7	15.6	14.5	15.2
DT27	Lord Nelson Drive Costessey	Roadside	23.1	28.4	25.4	23.6	16.2
DT28	Riverside Court Costessey	Suburban	16.3	14.1	13.9	12.9	12.3

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
DT29	25 Broad St Harleston	Suburban	31.5	27.8	24.2	22.5	35.1

114. As detailed in **Table 24-18**:, annual mean NO_2 concentrations were well below the annual mean Objective of 40µg.m^{-3} at all monitoring locations (with the exception of DT29 in 2019, which was still below the Objective) in the SNC study area. There was a large change in concentrations at location DT29 between 2018 and 2019; no information was included with the 2019 data provided; however, this may be due to a change in location or introduction of a new pollution source in the vicinity of the diffusion tube.

24.5.2.4 King's Lynn and West Norfolk Borough Council

115. KLWNBC undertakes automatic and diffusion tube monitoring within its area of jurisdiction. Monitoring is undertaken predominantly within King's Lynn, including at several locations within the Railway Road and Gaywood Clock AQMAs. Recent NO_2 monitoring data were obtained from the 2020 ASR (KLWNBC, 2020) and are detailed in **Table 24-19**. Exceedances of the annual mean Objective are shown in **bold** text.

Table 24-19: Annual Mean NO_2 Monitoring undertaken by KLWNBC (CM = continuous monitor sites)

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
CM1	Southgate Park, King's Lynn	Roadside	21.0	25.0	25.0	23.9	21.0
CM2	Gaywood, King's Lynn	Roadside	**42.0**	**45.0**	38.0	34.5	37.0
1	Railway Road 1	Roadside	36.6	35.5	35.9	33.8	36.3
2	Railway Road 2	Roadside	**46.6**	**44.6**	**45.5**	**43.2**	**42.4**
3	Railway Road 5	Roadside	36.9	38.6	38.5	37.4	37.5
6,7,8	Southgate Monitoring Station	Roadside	25.2	24.6	24.6	23.9	24.3
9	Mill Fleet	Roadside	20.3	20.8	19.5	19.9	20.5
10	London Road 1	Roadside	37.8	36.3	37.2	36.2	35.5
11	London Road 2	Roadside	28.5	27.9	27.7	28.1	28.4
12	London Road 3	Roadside	33.1	32	33.5	29.8	31.4
13	London Road 4	Roadside	30.3	31	29.9	28.8	29
14	London Road 5	Roadside	33.1	33.1	33.6	33.6	33.2

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
15	Southgates	Roadside	37.2	35.4	34.9	35.3	36.7
18	Hardwick Rd	Roadside	25.8	24.5	25.9	24.1	25.1
19	Vancover Avenue	Roadside	23.7	23	24	21.9	23.9
20	London Road 10	Roadside	30.8	30.6	28.2	30	28.2
22	London Road 6	Roadside	31.4	32.6	30.1	34	31
23	London Road 7	Roadside	31.6	32.5	29.6	32.6	31.2
24	London Road 8	Roadside	28.7	28.9	26.4	30.5	29.7
25	The Walks	Roadside	15	14.4	15.3	15.9	15.3
26	Railway Road 7	Roadside	33.8	31.5	31.4	32.9	31.5
27	St John's Terrace	Roadside	27.5	28.5	27.8	28.5	27.6
28	St. John's Terrace/ Blackfriar's	Roadside	30.2	30	30.5	28.9	29.8
29	Waterloo St	Kerbside	18.6	18.3	18.7	19	18.9
30	Portland St	Kerbside	21.4	20.4	19.7	19.4	20.5
31	Railway Road 2	Roadside	30.4	28.2	28.3	30.2	29.1
32	Railway Road 3	Roadside	27.7	29	28.3	28.8	27.8
33	Wellesley Street	Roadside	27.4	26.1	27.8	27.4	28.5
34	Blackfriars 2	Roadside	30.1	28.7	28.9	31.1	28.8
35	Blackfriars 1	Roadside	28.5	27.2	28.2	27.7	27.6
37	Blackfriars 3	Roadside	27.3	26.5	26.5	30.6	29.7
38	Littleport Street	Roadside	32.5	31.5	33.2	34	34.2
39	Gaywood Road 2	Roadside	24.3	24.1	24.3	24.5	24.5
40	The Swan (1) Gayton Road	Roadside	31.2	30.2	31.2	31.3	32
41	Wootton Road 2	Roadside	31.2	32.2	32.1	36.7	34.9
42	Wootton Road 1	Roadside	29.8	29.3	30.5	30	29.7
43	Lynn Road 1	Roadside	28.7	30	29.2	30.9	29.4
44	Lynn Road 2	Roadside	31.8	32.8	32.4	36	34.6

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
			2015	2016	2017	2018	2019
45	Gaywood Road 3	Roadside	26	27	25.2	28.8	26.8
46	Gaywood Road 1	Roadside	23.8	24	22.5	24.6	24.1
47	Austin Street 1	Roadside	29.6	30.3	29.3	30.6	29.7
48	Austin Street 2	Roadside	28.4	26.8	27.8	27.7	27.2
51	Wootton Road 3	Roadside	17.3	18.3	19	18.8	18.6
52	Lynn Road 3	Roadside	27.2	27.3	28.7	30.1	28.4
58	NORR	Roadside	26.7	28.2	24.7	28.2	27.4
66	Gaywood Road	Urban Background	20.9	20.4	18.5	20.6	22.1
67	Greyfriars, London Road	Urban Background	16.4	15.7	17.2	16.4	16.8
68	Nursery, London Road	Urban Background	18.8	19	19.5	20.5	19.1
69	Whitefriars 1, Whitefriars Road	Urban Background	12.8	12.7	12.5	13.7	13.3
70	Whitefriars 2, Whitefriars Road	Urban Background	12.4	12.3	12.7	12.7	13.5
75	The Swan (2) Gayton Road	Roadside	33	32.2	31.6	34.1	35.8
79	Tennyson Ave	Roadside	34	34.6	32.8	32.7	33.2
87	Albion Street	Roadside	28.7	30.5	29.3	32	30
88	Tennyson Avenue (2)	Roadside	18.9	18.3	17.8	18.2	18.9
89	Whitefriars Terrace	Roadside	13.3	13	13.2	13.2	13.5
90	Spenser Road	Roadside	-	14	15	15.9	16.1
91	Reid Way	Roadside	-	13.6	13.7	14.4	14.5
92	Garden Court	Roadside	-	12.9	12.6	12.9	13
93	Front Way	Roadside	-	13.1	11.9	13.3	12.7

116. As detailed in **Table 24-19**, annual mean NO_2 concentrations were in exceedance of the Objective (40µg.m^{-3}) at two roadside locations (CM2 in 2015 and 2016; Site 2 from 2015 to 2019) within the Gaywood Clock and Railway Road AQMAs respectively; however, concentrations at these locations have been decreasing since 2016. Monitoring at all other locations were below the annual mean Objective across the five year period.

117. Particulate matter continuous analyser monitoring was also undertaken in King's Lynn between 2015 and 2019, and these results are presented in **Table 24-20**.

Table 24-20: Annual Mean PM_{10} Monitoring undertaken by KLWNBC

Site ID	Location	Site Type	Monitored Annual Mean Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
			PM_{10}				
CM3	North Lynn, King's Lynn	Roadside	18.0	18.0	19.0	-	-
OS1	Page Stair Lane, King's Lynn	Roadside	19	21	18	16.4	11
OS3	Estuary Road, King's Lynn	Roadside	20	15	13	14.6	13
			$PM_{2.5}$				
OS1	Page Stair Lane, King's Lynn	Roadside	-	6	6	7	5
OS3	Estuary Road, King's Lynn	Roadside	-	4	6	6.9	7

118. As detailed in **Table 24-20**, annual mean PM_{10} and $PM_{2.5}$ concentrations were well below the annual mean Objective of 40µg.m^{-3} and target of 25µg.m^{-3} respectively at the monitoring locations in King's Lynn.

24.5.2.5 Breckland Council

119. Breckland Council undertakes automatic and diffusion tube monitoring within its area of jurisdiction. Monitoring is undertaken at three diffusion tube locations in Dereham and at several locations within the Swaffham AQMA. Recent monitoring data were obtained from the 2020 ASR (BC, 2020) and are detailed in **Table 24-21**:. Exceedances of the annual mean Objective are shown in **bold** text.

Table 24-21: Annual Mean NO_2 Monitoring undertaken by BC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
D1	High Street Dereham	Urban Centre	33.9	34.3	30.9	27.3	29.3

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
			2015	2016	2017	2018	2019
D2	Station Rd Dereham	Urban Background	27.8	28.6	25	22.5	22.6
D3	Wellington St Dereham	Urban Centre	-	11.2	13.7	20	22.4
S1	Butchers Swaffham	Urban Centre	22.6	24.2	20.2	20	20
S2	Ceres Books Swaffham	Urban Centre	37.3	38.4	33.5	28.6	28.7
S3	London Street	Roadside	29.1	30.5	25.8	25.7	26.2
S3a	London Street	Roadside	29.1	30.5	25.8	25.7	26.2
S3b	London Street	Roadside	29.1	30.5	25.8	25.7	26.2
S4	Bridewell Place Swaffham	Roadside	25.2	26.9	20.9	21.4	22.4
S5	London Street Zebra Crossing	Roadside	25.9	25.7	22.7	21.8	24.1
S6	London Street N Roundabout	Roadside	31.1	33.2	29.1	26.9	29.6
S7	Station Road Swaffham	Roadside	34.8	38.4	29.7	30.2	30.2
S8	Station Road Swaffham	Roadside	37.7	**41**	34.3	30.5	31.6
S9	Anglia Computer Solutions Swaffham	Roadside	26.4	26.7	21.9	21.8	23
S10	Kev's Tackle Swaffham	Roadside	24.7	24.9	22.7	20.3	21.6
S11	13 Station Road Swaffham	Roadside	34	37	30.6	30.9	26.6
S12	Glazedale Lamp post Swaffham	Roadside	31.4	32	29.2	31.5	38
S13	33 Station Road Swaffham	Roadside	25	26.4	21.7	14.9	25.2
S14	Corner Whitecross	Roadside	22.9	24.2	21.2	17.2	21.3

120. As detailed in **Table 24-21**:, annual mean NO_2 concentrations were in exceedance of the Objective (40µg.m^{-3}) at one roadside location (S8 in 2016) within the Swaffham AQMA; however, concentrations at this location have been decreasing since 2016. Monitoring locations in Dereham were below the annual mean Objective across the five year period. There was a large change in concentrations at location S12, S13 and S14 between 2018 and 2019. Site S12 only monitored eight months (66.7%) in 2019 and therefore annualised, which increased the raw data measurement from 29.7 to 40µg.m^{-3}, which may be responsible for the large change between 2018 and 2019. There is no information available in the annual report about S13 and S14, however this may be due to a change in location or introduction of a new pollution source in the vicinity of the diffusion tubes.

24.5.2.6 Great Yarmouth Borough Council

121. GYBC undertakes automatic and diffusion tube monitoring within its area of jurisdiction. GYBC operates one continuous analyser, which monitors NO_2 and PM, at a background site. This analyser was relocated from Maltings House to Fenner Road in 2018. Monitoring data were obtained from the 2019 ASR (GYBC, 2019) and are presented in **Table 24-22**.

Table 24-22: Continuous Analyser Monitoring undertaken by GYBC

Site ID	Location	Site Type	Monitored Annual Mean Concentration (µg.m^{-3})				
			2014	2015	2016	2017	2018
NO_2							
CM1	Maltings House, Gorleston	Urban Background	17.1	16.8	14.5	-	-
CM1	Fenner Road	Urban Background	-	-	-	-	15.0
PM_{10}							
CM1	Maltings House, Gorleston	Urban Background	16.6	16.8	15.5	-	-
CM1	Fenner Road	Urban Background	-	-	-	-	20.0
$PM_{2.5}$							
CM1	Fenner Road	Urban Background	-	-	-	-	12.0

122. As detailed in **Table 24-22**, continuous analyser annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were below the annual mean Objective at both continuous analyser monitoring locations in the GYBC study area.

123. There are also 12 NO_2 diffusion tubes located in the vicinity of the affected road network that are operated by GYBC. The triplicate site at DT8 was relocated in 2019 to Fenner Road. Monitoring data were obtained from the 2019 ASR (GYBC, 2019) and are presented in **Table 24-23**.

Table 24-23: Annual Mean NO_2 Monitoring undertaken by GYBC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2014	2015	2016	2017	2018
DT1	12 Bridge Road	Roadside	22	21.9	21.1	25.6	22.5
DT2	44 North Quay	Roadside	24.1	22.5	21.2	20.9	19.4
DT3	60 North Quay (upper)	Roadside	26.9	25.4	24.4	21.8	22.2
DT4	Southtown Road Junction	Roadside	37.8	37.4	33.2	36.7	30.3
DT5	110 South Quay	Roadside	23.5	23.8	22.9	21.7	18.9
DT6	9 Southgates Road	Roadside	25.6	24.4	22.2	22.3	19.8
DT7	41 Southgates Road	Roadside	22.9	20.9	20.3	19	18.1
DT8 (Triplicate site)	Maltings House, Gorleston	Urban Background	17.8	16	17.7	16.7	-
			16.9	16.3	17.7	16.2	-
			15.4	15.7	17.1	16.3	-
DT8 (Triplicate site)	Fenner Rd	Urban Background	-	-	-	-	14
			-	-	-	-	14
			-	-	-	-	13.6
DT9	81 North Quay	Roadside	18.7	19.9	18.5	18.8	17
DT10	1 South Quay	Roadside	30.6	32.8	33.7	33.2	29.8
DT11	25 South Quay	Roadside	-	31.6	27.4	27.9	21.6
DT12	Pasteur Road	Roadside	-	-	24.9	23.3	21

124. As detailed in **Table 24-23**, annual mean NO_2 concentrations were below the annual mean Objective of 40µg.m^{-3} at the monitoring location in the GYBC study area.

24.5.2.7 Waveney District Council

125. There are eight NO_2 diffusion tube located in the vicinity of the affected road network that are operated by WDC. Monitoring data were obtained from the 2020 ASR (East Suffolk Council, 2020) and are presented in **Table 24-24**:.

Table 24-24: Annual Mean NO_2 Monitoring undertaken by WDC

Site ID	Location	Site Type	Monitored Annual Mean NO_2 Concentration (µg.m^{-3})				
			2015	2016	2017	2018	2019
CCL 1 (DT1)	Castleton Ave, Carlton Colville	Roadside	20	21	19	20	-
LOW 1 (DT9)	Belvedere Rd 1, Lowestoft	Roadside	31	29	34	27	28
LOW 3 (DT7)	Mill Rd, Lowestoft	Kerbside	20	21	24	23	20
LOW 6a,b,c (PT4a,b,c)	Pier Terrace, Lowestoft	Roadside	-	38	36	35	33
LOW 7 (DT11)	Pier Terrace 1, Lowestoft	Roadside	28	31	30	29	30
LOW 8	Levington Court, Lowestoft	Roadside	-	-	-	-	21
LOW 10	42 Waveney Drive	Roadside	-	-	-	-	23
LOW 11	241 Stradbroke Rd/Bloodmoor Rd	Roadside	-	-	-	-	26

126. As detailed in **Table 24-24**:, annual mean NO_2 concentrations were below the annual mean Objective of 40µg.m^{-3} at the monitoring location in the WDC study area. Location LOW 6a, b, c had the highest NO_2 concentrations of all the monitoring locations, however these have been decreasing since 2017.

24.5.3 Background Pollutant Concentrations

127. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ were obtained from the air pollutant concentration maps provided by Defra for the grid squares covering the air quality study area (Defra, 2020a). 2018 background concentrations were used for the base year assessment. Background concentrations for 2025 were used for the future year scenario. The highest and lowest background concentrations within each local authority boundary covering the study area are detailed in **Table 24-25**:. The full table of background concentrations used in the assessment is provided in **Appendix 24.3**.

Table 24-25: Background pollutant concentrations

Local Authority	Annual Mean Background Concentration ($\mu g.m^{-3}$)					
	NO_2		PM_{10}		$PM_{2.5}$	
	Min.	Max.	Min.	Max.	Min.	Max.
2018						
NNDC	7.3	9.3	15.2	16.6	9.0	9.5
BDC	7.5	11.0	14.3	16.8	9.0	9.8
SNC	8.7	14.9	15.2	17.6	9.4	10.3
KLWNBC	7.3	13.3	15.2	17.1	9.3	10.5
BC	7.7	9.1	16.0	16.9	9.5	9.7
GYBC	11.4	17.2	13.5	15.0	8.9	10.4
WDC	9.4	25.0	14.0	15.9	9.1	10.3
2025						
NNDC	5.7	7.3	13.8	15.2	7.9	8.4
BDC	5.9	8.6	12.9	15.4	7.9	8.6
SNC	6.8	11.8	13.7	15.5	8.2	9.1
KLWNBC	5.7	10.6	13.8	15.7	8.1	9.3
BC	5.8	6.9	14.6	15.4	8.3	8.6
GYBC	8.9	13.6	12.1	13.5	7.8	9.2
WDC	7.4	20.0	12.5	14.5	8.0	9.1

128. As detailed in **Table 24-25**:, background pollutant concentrations were 'well below' (e.g. less than 75% of) and no greater than 50% of the relevant Air quality Objectives/target. This is to be expected in areas that are largely rural in nature.

24.5.4 Identification of Receptors

24.5.4.1 Construction Phase Dust and Fine Particulate Matter

129. IAQM guidance (IAQM, 2016) states that a Detailed Assessment is required where there are human receptors within 350m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Internal guidance from Natural England recommends that ecological receptors within 200m of a site should be considered in a construction dust and particulate matter assessment, as opposed to only those ecological sites within 50m of the site (as stated in IAQM guidance).

130. The onshore cable corridor from landfall at Weybourne to the two onshore substation site options near the existing Norwich Main substation was assessed (see **Figure 24.2**). This represents a worst case scenario as the onshore cable corridor and onshore substation locations will be further refined ahead of the DCO application (i.e., the eventual location(s) may well be further away from receptors).

131. Receptor locations were identified in the areas closest to the anticipated maximum impacts due to construction (as defined in **Table 24-2**) within the study area, taking into account the following:

- There are human receptors within 350m of the PEIR boundary and within 50m of the planned construction vehicle route up to 500m from the PEIR boundary; and
- There are designated ecological receptors within 200m of construction activity within the PEIR boundary, and/or within 50m of the planned construction vehicle routes, up to 500m from the PEIR boundary.

132. A Detailed Assessment is therefore required to assess the impact of dust during the construction phase at human and ecological receptors.

133. The current proposed locations for the construction compounds are as follows:

- Landfall;
- Bodham;
- South of Oulton on the B1149;
- Hethersett Road; and
- Onshore substation.

134. If further construction compounds are required for the construction of DEP and SEP, these will be identified post-PEIR and will be assessed as part of the ES, where required.

24.5.4.1.1 Human Receptors

135. As the PEIR boundary currently stands, human receptors within 350m of the onshore works are located in Weybourne, Bodham, Little Barningham, Oulton, Cawston, Swannington, Attlebridge, Weston Longville, Barford, Ketteringham and Swardeston. This represents a worst case scenario as the onshore cable corridor and onshore substation locations will be further refined prior to the DCO application (i.e. identifying where within the PEIR boundary that works footprints will be located).

136. As detailed in **Appendix 24.1**, the number of receptors potentially exposed to dust impacts is a factor that determines the receptor sensitivity. For DEP and SEP, the areas with the most human receptors within 350m of the PEIR boundary are Weybourne, Bodham, Attlebridge and Swardeston. Currently, the proposed construction compounds are located nearest to human receptors at landfall (near Weybourne), Bodham and the onshore substation (near Swardeston). Therefore, these areas have been the focus of the construction dust assessment for human receptors, to provide a conservative assessment, as the combined sources of dust from both the compound location and cable trenching is considered to represent the worst case in terms of dust impact magnitude.

137. There are other areas along the onshore cable corridor where a greater number of human receptors are present within 350m of the PEIR boundary (e.g. Attlebridge); however these receptors would either be further away from construction works relating to the worst case scenario mentioned above, or closer to a reduced level of construction works (i.e. close to cable trenching but away from a construction compound). It is therefore anticipated that the sensitivity of these receptors would be equal to, or less than, those located at landfall, Bodham and the onshore substation site options (**Table 24.1.3** and **Table 24.1.4** of **Appendix 24.1** provides further details on how the sensitivity of human receptors to dust soiling and human health impacts are determined).

138. Further refinement of the onshore cable corridor will be undertaken post-PEIR (from a typically 200m wide corridor presented here to a typically 60m wide corridor for the DCO application). Additional construction compounds will also be identified as well as identifying the location of all trenchless crossings (i.e. HDD works). With this more defined set of information, the worst affected human receptors will be reviewed and used to update the assessment for the ES. It should be noted that the mitigation measures identified to suppress dust emissions (see **Section 24.6.1.1.5**) will be applied across the onshore works, and are not only applicable as mitigation for those receptors included within the assessment.

24.5.4.1.2 Ecological Receptors

139. Designated ecological receptors that may be sensitive to dust impacts within 200m of the onshore works (as the PEIR boundary currently stands) are identified in **Table 24-26**:, as well as the distance each ecological site is from the PEIR boundary.

Table 24-26: Designated sites within 200m of PEIR boundary

Local Authority	Designated Ecological Site	Distance from PEIR boundary (m)
NNDC	Greater Wash Special Protection Area (SPA)	Within 0m of the landfall PEIR boundary*
	Weybourne Cliffs SSSI	Small portion within landfall PEIR boundary*
	The Wash and North Norfolk Coast SAC	130m of landfall PEIR boundary

Local Authority	Designated Ecological Site	Distance from PEIR boundary (m)
	North Norfolk Coast Ramsar, SPA, SAC and SSSI	130m of landfall PEIR boundary
BDC	Cawston Wood ancient woodland	60m from PEIR boundary
	Alderford Common SSSI	80m from PEIR boundary
	River Wensum SSSI	Within PEIR boundary
	Harmans Grove ancient woodland	160m from PEIR boundary
SNC	Colton Wood ancient woodland	0m from PEIR boundary
	Ancient woodland (near Ketteringham)	110m from PEIR boundary
	Smeeth Wood ancient woodland	140m from PEIR boundary
* While the Greater Wash SPA and Weybourne Cliffs SSSI are within the PEIR boundary at landfall, the offshore export cables will be installed at the landfall using HDD techniques, which is not considered a dusty construction activity. A temporary landfall compound will be required to accommodate the drilling rigs, ducting and welfare facilities and this will be set back 100-150m from the cliff edge (approximately 80-130m from the SSSI boundary).		

140. Colton Wood ancient woodland was chosen as the worst case ecological receptor location for dust from earthwork and construction activities, as it is 0m from the PEIR boundary and may be sensitive to dust. Alderford Common SSSI was chosen as the worst case ecological receptor with respect to dust from trackout activity as it is adjacent to two links which DEP and SEP-generated construction traffic will travel and represents a worst case location for this activity.

141. As previously stated, the onshore cable corridor will be further refined prior to DCO application and the ecological sites within 200m of the onshore works may change following that refinement, especially between landfall and Lower Bodham, as a wider area currently is included in the PEIR boundary to give flexibility to determine the best route in this area.

142. The construction dust and particulate matter assessment was undertaken using a worst case scenario whereby the maximum amount of works (e.g., cable trenching, a construction compound, jointing bay and link box construction) are undertaken in proximity to the greatest number of human and ecological receptors. Recommended mitigation measures for these worst case locations would then be applied to all onshore construction works, to provide a conservative assessment.

24.5.4.2 Construction Phase NRMM Emissions Assessment

143. The exact locations of the construction compounds, onshore cable corridor, trenchless crossings, substation civils, etc. have not been determined. Therefore, to provide a conservative assessment, the potential effects of NRMM on air quality have been conservatively assessed using realistic worst-case scenarios. The onshore cable corridor will be further refined post-PEIR for the ES submission from a 200m wide corridor to an approximately 60m wide corridor (for the DEP and SEP together scenarios) and therefore the number of sensitive receptors will likely change and any potential effects of NRMM during construction on air quality will be updated.

24.5.4.2.1 Landfall

144. The closest human receptors to proposed NRMM works at landfall are the residential properties on Beach Lane. The closest ecological receptors are the Greater Wash SPA, Weybourne Cliffs SSSI, The Wash and North Norfolk Coast SAC and North Norfolk Coast Ramsar, SPA, SAC and SSSI.

24.5.4.2.2 Onshore Cable Corridor

145. The closest human receptors to the works along the onshore cable corridor include Weybourne, Bodham, Little Barningham, Oulton, Cawston, Swannington, Attlebridge, Weston Longville, Barford, Ketteringham and Swardeston. As stated previously, the proposed locations for the construction compounds along the cable corridor include at landfall; Bodham; south of Oulton on the B1149; Hethersett Road; and at the onshore substation site options. The closest ecological receptors to works which may require NRMM are listed in **Table 24-26**:.

24.5.4.2.3 Onshore Substation

146. The two onshore substation options are located in arable land south of the existing Norwich Main substation. Site 1 is located approximately 250m south of Norwich Main, immediately west of the Norwich to Ipswich rail line, and approximately 600m north of the nearest village (Swainsthorpe). Site 2 is located approximately 150m south west of Norwich Main and approximately 1km east of the nearest village (Swardeston). It has been assumed that the construction compound at the onshore substation will be located adjacent to either of these substation options. The nearest human receptor to the worst case location for the substation construction compound for Site 1 would be off the A140 Ipswich Road (to the east) and for Site 2 would be off Gowthorpe Lane (to the west and south). The nearest ecological receptor is the Dunston Common Local Nature Reserve (LNR), approximately 650m north-east of the closest onshore substation construction compound (worst case location for Site 1).

24.5.4.3 Construction Phase Road Traffic Emissions Assessment

24.5.4.3.1 Human Receptors

147. Existing sensitive receptor locations were identified within the air quality study area for consideration in the assessment. Predicted changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of project-generated traffic were calculated at these locations.

148. The sensitive receptor locations were selected based on their proximity to road links affected by DEP and SEP and exceeding the screening criteria detailed in **Table 24-10**:, where the potential effect of project-generated traffic emissions on local air pollution would be most significant. These links are identified in **Table 24-11**:. The sensitive receptor locations are detailed in **Table 24-27** and shown in **Figure 24.3**.

Table 24-27: Sensitive human receptor locations.

Local Authority	Receptor ID	OS grid reference (m)	
		X	Y
KLWNBC	R1	562081	321297
	R2	564143	322368
	R3	565745	322662
	R4	570389	324987
	R5	571633	325516
	R6	574277	325818
	R7	581782	328015
	R8	583222	328775
	R9	564840	319453
	R10	565729	316091
	R11	569207	316306
	R12	571804	315310
NNDC	R13	587864	330815
	R14	588885	330909
	R15	591434	330959
	R16	593366	330998
	R17	595352	331138
	R18	598765	333396
	R19	607659	338689
	R20	611673	330436
	R21	611489	329852
BC	R22	585205	309742
	R23	590481	312144

Local Authority	Receptor ID	OS grid reference (m)	
		X	Y
	R24	606212	313494
BDC	R25	614695	325494
	R26	615797	324609
	R27	616396	325022
	R28	619650	325210
	R29	620306	321279
	R30	621610	317564
	R31	620283	314439
	R32	623274	314306
	R33	627740	312785
	R34	630874	309049
	R35	638372	310073
	R36	611616	311202
SNC	R37	613987	310979
	R38	616318	308940
	R39	616931	307393
	R40	619708	304357
	R41	621337	303106
	R42	622215	302239
	R43	622272	304317
	R44	627470	307758
	R45	631000	302280
	R46	639280	293622
GYBC	R47	650033	308960
	R48	652055	308189
	R49	651499	307173
	R50	652239	302281

Local Authority	Receptor ID	OS grid reference (m)	
		X	Y
WDC	R51	652904	297411
	R52	653414	296228
	R53	653844	295236
	R54	654621	294752
	R55	655057	293992
	R56	654262	292434
	R57	652149	290432
	R58	651310	290514
	R59	647951	289899

24.5.4.3.2 Designated Ecological Sites

149. A number of designated ecological sites are located within 200m of roads which are anticipated to experience increases in construction-related traffic flows above the criteria detailed in **Table 24-10**: (inclusive of traffic growth from 2018 to 2025). The APIS website (CEH, 2021) was consulted to identify any habitats or features of these designated sites that are sensitive to nutrient nitrogen and acid deposition. Where sensitive habitats or features were found, the Critical Loads for nutrient nitrogen deposition were obtained.

150. An assessment of the potential impact of DEP and SEP on designated ecological sites will be presented at the ES stage. The designated ecological sites that will be considered in the assessment at the ES stage are detailed in **Table 24-28** and are shown in **Figure 24.4**. A full list of the designated ecological sites and associated Critical Load values that will be considered is presented in **Appendix 24.4**.

Table 24-28: Designated ecological sites

Designated Ecological Site	Road link	Distance from affected road link (m)
Pereers Wood Ancient Woodland	4	20
Bullfer Grove Ancient Woodland	4	155
Ancient Woodland (near Bodham)	13	0
		30
Great Wood Ancient Woodland	13	7
		22
Felbrigg Wood SSSI	13	5
	14	0

Designated Ecological Site	Road link	Distance from affected road link (m)
Broadland Ramsar and SPA	20	125
	30	50
	34	0
	39	195
The Broads SAC	20	125
	21	0
	30	50
	34	0
	39	195
Ant Broads and Marshes SSSI	20	125
Trinity Broads SSSI	21	0
Outer Thames Estuary SPA	23	0
	24	0
	25	0
	34	75
Breydon Water Ramsar and SPA	25	0
	34	40
Breydon Water SSSI	25	0
	34	40
Foxburrow Wood Ancient Woodland	28	0
Barnby Broad and Marshes SSSI	30	50
Raveningham Covert Ancient Woodland	30	0
		85
Blacks Grove Ancient Woodland	30	165
Damgate Marshes, Acle SSSI	34	0
Ancient Woodland (Ortolan's Grove)	35	105
Smallburgh Fen SSSI	39	195
Ancient Woodland (near Dobb's Beck)	40	20
Sprowston Wood Ancient Woodland	40	75
Ancient Woodland (near Hevingham)	43	160
Norfolk Valley Fens SAC	49	50
	86	0

Designated Ecological Site	Road link	Distance from affected road link (m)
Buxton Heath SSSI	49	50
Great Wood Ancient Woodland	49	160
Cawston and Marsham Heaths SSSI	51	90
River Wensum SAC	79	0
	80	0
River Wensum SSSI	79	0
	80	0
Holly Farm Meadow, Wendling SSSI	86	8
Potter and Scarning Fens, East Dereham SSSI	86	0
East Winch Common SSSI	87	0
Reffley Wood Ancient Woodland	88	5
Ancient Woodland (near Ketteringham)	114	5
Smeeth Wood Ancient Woodland	114	30

151. In addition to the designated ecological sites presented in **Table 24-28**, the following LNRs were also identified as within 200m of roads exceeding the criteria in **Table 24-10**::

- Breydon Water LNR (Link 25 and 34, 0m);
- Whitlingham LNR (Link 31, 0m);
- Whitlingham Marsh LNR (Link 31, 0m);
- Wensum Valley (Mile Cross Marsh and Sycamore Crescent) LNR (Link 96, 160m);
- Danby Wood LNR (Link 125, 40m); and
- Marston Marshes LNR (Link 125, 105m).

152. In accordance with DMRB guidance (Highways England, 2019), receptors will be included in the model as transects through the designated site, at 50m intervals set back from the road up to 200m. Beyond 200m of the road edge, impacts are considered to be insignificant as sufficient dilution and dispersion of pollutants will occur across this distance to minimise effects. Where a designated site spans both sides of a road, two transects will be included in the dispersion model to account for this. Transects for each designated site screened into the assessment will be presented in the ES, as traffic numbers will be further refined before the ES the roads and therefore ecological sites screened into the assessment may change.

153. LNRs will be assessed against Critical Levels only as Critical Loads are not provided for LNRs on the APIS website (CEH, 2021).

24.5.5 Baseline Road Traffic Emissions

154. The ADMS-Roads model was used to estimate contributions of vehicle exhaust emissions to annual and short term NO_2, PM_{10} and $PM_{2.5}$ concentrations for the 2018 base year and the 2025 'without DEP and SEP' assessment. The 24-hour AADT flows and HDV percentages used in the assessment are detailed in **Appendix 24.2**. **Table 24-29** provides the results of the baseline assessment for the base year and the peak year of construction 'without DEP and SEP' (2025), which is inclusive of background concentrations as well as the traffic contribution.

Table 24-29: Baseline road traffic emissions assessment base year (2018) and worst case year of peak construction (2025) 'without DEP and SEP'

Local Authority	Receptor ID	Base year (2018) (µg.m^{-3})			Year of peak construction (2025) 'without DEP and SEP' (µg.m^{-3})		
		NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
KLWNBC	R1	20.7	16.8	11.0	14.5	15.4	9.7
	R2	20.0	16.9	10.8	13.3	15.5	9.6
	R3	15.1	16.6	10.4	10.4	15.2	9.2
	R4	12.6	16.7	9.9	8.6	15.4	8.7
	R5	13.8	16.7	9.9	9.2	15.4	8.7
	R6	11.8	17.2	9.9	8.2	15.9	8.7
	R7	13.6	17.2	9.9	9.0	15.9	8.8
	R8	12.5	16.5	9.7	8.4	15.2	8.6
	R9	17.1	18.1	11.1	11.6	16.7	9.9
	R10	16.4	17.2	10.5	10.5	15.9	9.4
	R11	18.4	18.7	11.0	11.6	17.3	9.8
	R12	16.3	17.2	10.3	10.4	15.8	9.1
NNDC	R13	14.1	17.1	9.9	9.3	15.8	8.7
	R14	12.9	17.3	9.9	8.7	15.9	8.7
	R15	16.3	16.2	10.0	10.8	14.8	8.8
	R16	15.9	17.3	10.1	10.8	15.9	8.9
	R17	17.7	18.1	10.3	11.5	16.7	9.2
	R18	15.7	16.4	9.8	10.3	15.1	8.6
	R19	23.9	18.2	10.8	15.2	16.9	9.6

Local Authority	Receptor ID	Base year (2018) (µg.m^{-3})			Year of peak construction (2025) 'without DEP and SEP' (µg.m^{-3})		
		NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
	R20	15.5	16.9	9.9	10.2	15.5	8.8
	R21	12.4	16.6	9.7	8.5	15.2	8.5
BC	R22	14.5	17.9	10.3	9.4	16.4	9.1
	R23	14.9	17.1	10.2	9.6	15.7	9.0
	R24	13.6	17.4	10.1	9.2	15.9	8.9
BDC	R25	9.7	16.0	9.4	7.1	14.6	8.3
	R26	11.1	16.4	9.6	7.8	15.0	8.4
	R27	11.2	15.6	9.3	7.9	14.2	8.2
	R28	16.4	17.0	10.1	10.8	15.6	8.9
	R29	16.8	16.0	9.8	11.3	14.6	8.6
	R30	13.5	14.9	9.5	9.5	13.5	8.3
	R31	12.7	16.5	9.9	9.3	15.0	8.7
	R32	13.2	16.6	10.0	9.7	15.2	8.8
	R33	13.3	15.1	9.7	9.9	13.7	8.5
	R34	28.0	17.9	10.8	18.0	16.4	9.6
	R35	27.3	18.7	10.9	17.3	17.2	9.7
	R36	18.8	17.3	10.4	12.0	15.9	9.2
SNC	R37	21.5	17.3	10.6	13.8	15.9	9.3
	R38	23.1	18.0	10.9	15.0	16.5	9.7
	R39	20.2	17.6	10.7	13.3	16.2	9.5
	R40	19.8	17.2	10.6	13.1	15.8	9.4
	R41	15.3	17.2	10.2	10.8	15.8	9.1
	R42	14.2	15.8	9.8	9.6	14.4	8.6
	R43	16.2	18.0	10.6	11.2	16.6	9.4
	R44	23.2	17.5	10.6	16.3	16.2	9.5
	R45	16.9	17.9	10.3	11.3	16.6	9.2

Local Authority	Receptor ID	Base year (2018) (µg.m^{-3})			Year of peak construction (2025) 'without DEP and SEP' (µg.m^{-3})		
		NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
	R46	18.2	17.5	10.3	12.0	16.1	9.1
GYBC	R47	16.3	14.2	9.3	11.5	12.8	8.1
	R48	27.5	17.1	11.7	19.3	15.7	10.5
	R49	26.7	16.6	11.2	19.1	15.3	10.0
	R50	21.2	16.2	10.5	14.8	14.8	9.3
WDC	R51	18.2	16.9	10.2	12.3	15.6	9.1
	R52	15.2	15.2	9.7	10.7	13.8	8.5
	R53	14.4	14.9	9.8	10.3	13.4	8.6
	R54	16.7	15.5	10.6	12.1	14.0	9.5
	R55	29.5	15.4	10.5	21.1	14.0	9.3
	R56	31.7	15.8	10.8	23.7	14.3	9.5
	R57	15.1	15.7	10.4	10.9	14.2	9.2
	R58	14.0	15.7	10.3	10.1	14.2	9.1
	R59	18.2	17.2	10.4	12.2	15.8	9.2

155. As detailed in **Table 24-29**, annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted to be below the relevant Objectives at all receptors in both baseline years.

156. All predicted NO_2 concentrations were 'well below' 60µg.m^{-3} and therefore, in accordance with Defra guidance (Defra, 2018), the 1-hour mean Objective is unlikely to be exceeded (see **Table 24-5**). The short term PM_{10} Objective was predicted to be met at all modelled locations (Objective being less than 35 exceedances of the daily mean objective of 50µg.m^{-3}).

24.5.6 Anticipated Trends in Baseline Conditions

157. The baseline review of air quality in **Section 24.5.1** and **Section 24.5.2.6** provide a clear indication that the air quality in the DEP and SEP study area is good, which is to be expected in an area which is largely rural in nature, with areas of air quality concern and monitoring confined to urban areas. Air quality is managed, and improvement driven, by EU, UK and local legislation and policies. The UK's national air quality strategy and standards are enacted locally through management actions at a local authority level including a LAQM framework, as detailed in **Section 24.4.1.2**. There is a policy trend towards the achievement and maintenance of good air quality across the UK, which is reflected in the local planning policies also detailed in **Section 24.4.1.2**.

158. Air pollution in the study area is generally dominated by emissions from road vehicles. The quantity and composition of vehicle emissions is dependent on the type of fuel used, engine type, size and efficiency, vehicle speeds and the type of exhaust emissions abatement equipment employed. As such, it is anticipated that future pollutant concentrations will be reduced from baseline levels, as reflected in the predicted background concentrations provided by Defra, shown in **Table 24-25**: and provided in further detail in **Appendix 24.3**.

24.6 Potential Impacts

24.6.1 Potential Impacts during Construction

24.6.1.1 Impact 1: Construction Dust and Particulate Matter

159. A qualitative assessment of construction phase dust and PM_{10} emissions was carried out in accordance with the latest IAQM guidance (IAQM, 2016). Full details of the methodology and dust assessment undertaken are provided in **Appendix 24.1**.

160. The onshore construction works associated with DEP and SEP have the potential to impact on local air quality conditions as described below:

- Dust emissions generated by excavation, construction and earthwork activities have the potential to cause nuisance to, and soiling of, sensitive receptors (see **Section 24.5.4.1** for further details on the identification of sensitive receptors);
- Emissions of exhaust pollutants, especially NO_X and PM_{10} from construction traffic on the local road network, have the potential to impact upon local air quality at sensitive receptors situated adjacent to the routes utilised by construction vehicles; and
- Emissions of NO_X and PM_{10} from on-site plant, termed Non-Road Mobile Machinery (NRMM) operating within the onshore project area have the potential to impact local air quality at sensitive receptors in close proximity to the works.

161. The assessment consisted of four steps (Step 1, Step 2A, Step 2B and Step 2C) as outlined below.

162. Further details on why the assessments focuses on the areas where it is anticipated that the worst case works would occur (i.e. landfall, Bodham and the onshore substation for human receptors and Colton Wood ancient woodland and Alderford Common SSSI for ecological receptors) are provided in **Section 24.5.4.1**.

163. Both two-project scenarios (i.e. Scenario 2 and Scenario 3) have similar potential for generating construction dust and particulate matter impacts on receptors, as overall they both cover the maximum footprint of construction works, however the sequential build may result in the same area of land being affected twice.

24.6.1.1.1 Step 1: Screen the need for a Detailed Assessment

All DEP and SEP Construction Scenarios

164. The IAQM guidance states that a Detailed Assessment is required if there are human receptors located within 350m and ecological receptors within 200m (internal Natural England guidance) of the PEIR boundary. Human and ecological receptors are present within 350m and 200m respectively of the PEIR boundary under all Scenarios, therefore a Detailed Assessment was required. The footprint of the PEIR boundary will be further refined from 200m wide to approximately 45-60m wide between PEIR and ES and therefore the number of sensitive receptors will likely change.

24.6.1.1.2 Step 2A: Define the potential dust emission magnitude

165. The IAQM guidance recommends that the dust emission magnitude is determined for demolition, earthworks, construction and trackout. It is anticipated that no buildings/structures will be demolished as part of construction of DEP and SEP, therefore demolition has not been considered in the assessment.

DEP or SEP in isolation (Scenario 1)

166. The potential dust emission magnitude for the PEIR boundary under Scenario 1 (DEP or SEP in isolation) was determined using the criteria detailed in **Appendix 24.1**. The dust emission magnitudes were determined from the worst case assumptions identified in **Table 24-2** and are detailed in **Table 24-30**.

167. The onshore cable corridor from landfall at Weybourne to the two proposed onshore substation site options near the existing Norwich Main substation was assessed (see **Figure 24.2**). The worst case scenarios for human and ecological receptors were identified based on the number of receptors within 350m and the proximity of ecological receptors (within 200m) respectively from the PEIR boundary and 50m from the construction vehicle routes up to 500m from the PEIR boundary.

168. This represents a worst case scenario as the onshore cable corridor and onshore substation locations will be further prior to the DCO application and the potential area affected by the onshore works will significantly reduced.

Table 24-30: Defined dust emission magnitudes associated for each construction activity for the PEIR boundary (under Scenario 1)

Construction activity	Dust emission magnitude	Rationale
Human Receptors (Worst Case)		
Earthworks (site area)	**Medium** (2,500 – 10,000m^2) at landfall	**Landfall**: • The compound at landfall will facilitate HDD works/equipment as well as cable contractor, and will be up to 8,125m^2. • Earthworks within the onshore cable corridor will comprise removal and the storage of topsoil and subsoil separately at the side of the trench, followed by excavation of a trench (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 1,350m^3 of excavation could occur within 350m of the receptors considered at landfall – approx. 450m of trenching (taking into account siting of compound 100-150m back from cliff edge)) and reinstatement of stored subsoil and topsoil. • Joint bays (12m x 4m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.
	Medium (2,500 – 10,000m^2) at Bodham	**Bodham**: • The proposed construction compound near Bodham will have a footprint of up to 2,500m^2. • Earthworks within the onshore cable corridor will comprise removal and the storage of topsoil and subsoil separately at the side of the trench, followed by excavation of a trench (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 2,250m^3 of excavation could occur within 350m of the receptors considered at Bodham – approx. 750m of trenching) and reinstatement of stored subsoil and topsoil. • Joint bays (12m x 4m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.
	Large (>10,000m^2) at the onshore substation	**Onshore substation**: • The construction area at the substation will have a footprint of up to 42,500m^2 (inclusive of 10,000m^2 construction compound).

Construction activity	Dust emission magnitude	Rationale
		• Joint bays (12m x 4m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.
Construction (construction materials)	**Medium**	**All locations**: • There are not anticipated to be any buildings built within the construction compounds (offices, etc. will be prefabricated), however it has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**All locations**: • Based on the number of HDV movements for Scenario 2 (DEP/SEP together concurrently; see **Table 24-11**), it is assumed (as a worst case) that there will be between 10 and 50 outward daily HDV movements for Scenario 1.
Ecological Receptors (Worst Case)		
Earthworks (site area)	**Small** (<2,500m^2)	**Colton Wood ancient woodland**: earthworks within the onshore cable corridor will comprise removal and storage of topsoil and subsoil separately at the side of the trench, followed by excavation of a trench (an approximate 2m deep trench will be excavated in sections along the cable corridor; approximately 2,100m^3 of excavation could occur within 200m of Colton Wood – approx. 700m of trenching) and reinstatement of stored subsoil and topsoil. Joint bays (12m x 4m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m. The total earthworks area is less than 2,500m^2.
Construction (construction materials)	**Medium**	**Colton Wood ancient woodland**: It has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**Alderford Common SSSI**: it is assumed as a worst case that there will be between 10 and 50 outward daily HDV movements.

DEP/SEP together concurrently (Scenario 2)

169. The potential dust emission magnitude for the PEIR boundary under Scenario 2 (DEP/SEP together concurrently) was determined using the criteria detailed in **Appendix 24.1**. The dust emission magnitudes were determined from the worst case assumptions identified in **Table 24-2** and are detailed in **Table 24-31**.

170. The onshore cable corridor from landfall at Weybourne to the two proposed onshore substation site options near the existing Norwich Main substation was assessed (see **Figure 24.2**). The worst case scenarios for human and ecological receptors were identified based on the number of receptors within 350m and the proximity of ecological receptors (within 200m) respectively from the PEIR boundary and 50m from the construction vehicle routes up to 500m from the PEIR boundary.

171. This represents a worst case scenario as the onshore cable corridor and onshore substation locations will be further refined throughout the DCO application and the footprint of the onshore works will be reduced.

Table 24-31: Defined dust emission magnitudes associated for each construction activity for the PEIR boundary (under Scenario 2)

Construction activity	Dust emission magnitude	Rationale
Human Receptors (Worst Case)		
Earthworks (site area)	**Medium** (2,500 – 10,000m^2) at landfall	**Landfall**: • The compound at landfall will facilitate HDD works/equipment as well as a cable contractor, and will be up to 8,125m^2. • Earthworks within the onshore cable corridor will comprise removal and storage of topsoil and subsoil separately at the side of the trench, followed by excavation of up to 2 trenches (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 2,700m^3 of excavation could occur within 350m of the receptors considered at landfall – approx. 450m of trenching (taking into account siting of compound 100-150m back from cliff edge)) and reinstatement of stored subsoil and topsoil. • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.

Construction activity	Dust emission magnitude	Rationale
	Medium (2,500 – 10,000m^2) at Bodham	**Bodham**: • The proposed construction compound near Bodham will have a footprint of up to 2,500m^2. • Earthworks within the onshore cable corridor will comprise removal and the storage of topsoil and subsoil separately at the side of the trench, followed by excavation of up to 2 trenches (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 4,500m^3 of excavation could occur within 350m of the receptors considered at Bodham – approx. 750m of trenching) and reinstatement of stored subsoil and topsoil. • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.
	Large (>10,000m^2) at the onshore substation	**Onshore substation**: • The construction area at the substation will have a footprint of up to 70,000m^2 (inclusive of 10,000m^2 construction compound). • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m.
Construction (construction materials)	**Medium**	**All locations**: • There are not anticipated to be any buildings built within the construction compounds (offices, etc. will be prefabricated), however it has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**All locations**: • There will be between 10 and 50 outward daily HDV movements*.
Ecological Receptors (Worst Case)		
Earthworks (site area)	**Small** (<2,500m^2)	**Colton Wood ancient woodland**: earthworks within the onshore cable corridor will comprise removal and storage of topsoil and subsoil separately at the side of the trench, followed by

Construction activity	Dust emission magnitude	Rationale
		excavation of up to 2 trenches (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 4,200m^3 of excavation could occur within 200m of Colton Wood – approx. 700m of trenching) and reinstatement of stored subsoil and topsoil. Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m. The total earthworks area is less than 2,500m^2.
Construction (construction materials)	**Medium**	**Colton Wood ancient woodland**: it has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**Alderford Common SSSI**: it is assumed as a worst case that there will be between 10 and 50 outward daily HDV movements.
* HDV outward movements per day have been estimated from the HDV traffic flows presented in **Table 24-11**: and **Appendix 24.2**, where the number of outward HDV movements per day is half the HDV (per day) flow. While some construction routes (up to 500m from the PEIR boundary) have more than 50 HDV outward movements per day, very few human receptors (<10) and no ecological receptors are located on these routes, therefore assessing for fewer HDV movements on routes with >10 human receptors results in the same dust emission magnitude overall.		

DEP/SEP together sequentially (Scenario 3)

172. The potential dust emission magnitude for the PEIR boundary under Scenario 3 (DEP/SEP together concurrently) was determined using the criteria detailed in **Appendix 24.1**. The dust emission magnitudes were determined from the worst case assumptions identified in **Table 24-2** and are detailed in **Table 24-32**.

173. The onshore cable corridor from landfall at Weybourne to the two proposed onshore substation site options near the existing Norwich Main substation was assessed (see **Figure 24.2**). The worst case scenarios for human and ecological receptors were identified based on the number of receptors within 350m and the proximity of ecological receptors (within 200m) respectively from the PEIR boundary and 50m from the construction vehicle routes up to 500m from the PEIR boundary.

174. This represents a worst case scenario as the onshore cable corridor and onshore substation locations will be further refined throughout the DCO application and the potential area affected by the onshore works will significantly reduced.

Table 24-32: Defined dust emission magnitudes associated for each construction activity for the PEIR boundary (under Scenario 3)

Construction activity	Dust emission magnitude	Rationale
Human Receptors (Worst Case)		
Earthworks (site area)	**Medium** (2,500 – 10,000m^2) at landfall	**Landfall**: • The compound at landfall will facilitate HDD works/equipment as well as a cable contractor, and will be up to 8,125m^2 for each project (with up to a one year gap between projects). • Earthworks within the onshore cable corridor will comprise removal and storage of topsoil and subsoil separately at the side of the trench, followed by excavation of a single trenches (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 1,350m^3 of excavation could occur within 350m of the receptors considered at landfall – approx. 450m of trenching (taking into account siting of compound 100-150m back from cliff edge)) and reinstatement of stored subsoil and topsoil. This will then be repeated for the second project, with up to one year in between construction periods. • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m for each project.
	Medium (2,500 – 10,000m^2) at Bodham	**Bodham**: • The proposed construction compound near Bodham will have a footprint of up to 2,500m^2 for each project (with up to a one year gap between projects). • Earthworks within the onshore cable corridor will comprise removal and the storage of topsoil and subsoil separately at the side of the trench, followed by excavation of a single trench (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 2,250m^3 of excavation could occur within 350m of the receptors considered at Bodham – approx. 750m of trenching) and reinstatement of stored subsoil and topsoil. This will then be

Construction activity	Dust emission magnitude	Rationale
		repeated for the second project, with up to one year in between construction periods. • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m for each project.
	Large (>10,000m^2) at the onshore substation	**Onshore substation**: • The construction area at the substation will have a footprint of up to 72,500m^2 (inclusive of 10,000m^2 construction compound). • Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m for each project.
Construction (construction materials)	**Medium**	**All locations**: • There are not anticipated to be any buildings built within the construction compounds (offices, etc. will be prefabricated), however it has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**All locations**: • Based on the number of HDV movements for Scenario 2 (DEP/SEP together concurrently; see **Table 24-11**), it is assumed (as a worst case) that there will be between 10 and 50 outward daily HDV movements for Scenario 3.
Ecological Receptors (Worst Case)		
Earthworks (site area)	**Small** (<2,500m^2)	**Colton Wood ancient woodland**: earthworks within the onshore cable corridor will comprise removal and storage of topsoil and subsoil separately at the side of the trench, followed by excavation of up to a single trench (an approximate 2m deep trench will be excavated in sections along the onshore cable corridor; approximately 2,100m^3 of excavation could occur within 200m of Colton Wood – approx. 700m of trenching) and reinstatement of stored subsoil and topsoil. This will then be repeated for the second project, with up to one year in between construction periods.

Construction activity	Dust emission magnitude	Rationale
		Joint bays (12m x 7m) and link boxes (2m x 2m) will be required as a worst case of one per every *c.*500m for each project. The total earthworks area is less than 2,500m^2.
Construction (construction materials)	**Medium**	**Colton Wood ancient woodland**: it has been assumed that CBS will be used to line the cable trench and pack around the ducts then backfilled using the stored subsoil and topsoil.
Trackout (no. HDV outward movements per day)	**Medium**	**Alderford Common SSSI**: it is assumed as a worst case that there will be between 10 and 50 outward daily HDV movements for each project .

24.6.1.1.3 Step 2B: Define the sensitivity of the area

175. The sensitivity of receptors to dust soiling, impacts on human health and ecological effects was determined using the criteria in **Appendix 24.1**. **Figure 24.2** details the distance bands from the PEIR boundary used in determining the sensitivity of the area.

<u>All DEP/SEP Construction Scenarios</u>

176. The sensitivity of the area is defined as:

- Sensitivity of receptors to dust soiling:
  - **Earthworks and construction**: There are between 1 and 10 receptors within 50m of the proposed compound and onshore cable corridor (assumed worst case location of compound near houses on Beach Lane) at landfall. There are between 1 and 10 receptors within 20m of the proposed construction compound and onshore cable corridor at Bodham (assumed worst case location near The Street where onshore cable corridor crosses the road between two farms). There are between 1 and 10 receptors within 200m of the proposed construction compound at the onshore substation (assumed worst case location of construction compound adjacent to Site 2, which would be near the houses on Gowthorpe Lane). The sensitivity is therefore **medium** (for Bodham) and **low** (for landfall and the onshore substation); and
  - **Trackout**: There are between 10 and 100 receptors within 20m of roads used by construction vehicles up to 500m from the PEIR boundary at Weybourne, Bodham and Swardeston. The sensitivity is therefore **high**.
- Sensitivity of receptors to human health effects of PM_{10}:

- **Earthworks and construction**: The highest annual mean background PM_{10} concentration across the study area is less than 24µg.m^{-3}. There are between 1 and 10 receptors within 50m of the proposed compound at landfall (again assumed worst case location of compound near houses on Beach Lane), between 1 and 10 receptors within 20m of the proposed construction compound and onshore cable corridor at Bodham (again assumed worst case locations near The Street where onshore cable corridor crosses the road between two farms) and between 1 and 10 receptors within 200m of the proposed construction compound at the onshore substation (assumed worst case location of construction compound adjacent to Site 2, which would be near the houses on Gowthorpe Lane). The sensitivity is therefore **low** for all locations; and
- **Trackout**: The highest annual mean background PM_{10} concentration across the study area is less than 24µg.m^{-3} and there are between 10 and 100 receptors within 20m of roads used by construction vehicles up to 500m from the PEIR boundary at Weybourne, Bodham and Swardeston. The sensitivity is therefore **low**.

- Sensitivity of receptors to ecological effects:
  - **Earthworks and construction**: Colton Wood ancient woodland is within 20m of the onshore cable corridor. The sensitivity is therefore **high**.
  - **Trackout**: Alderford Common SSSI is within 20m of routes used by construction vehicles, up to 500m from the PEIR boundary. The sensitivity is therefore **high**.

177. The sensitivity of receptors to dust soiling, human health impacts and ecological impacts (as an assessment of the worst case scenario location) for each activity is summarised in **Table 24-33**.

Table 24-33: Sensitivity of the area to each activity under all DEP/SEP Construction Scenarios

Potential impact	Sensitivity of the surrounding area		
	Earthworks	**Construction**	**Trackout**
Dust soiling	Landfall – low Bodham – medium Onshore substation – low	Landfall – low Bodham – medium Onshore substation – low	High
Human health	Low	Low	Low
Ecological	High	High	High

24.6.1.1.4 Step 2C: Define the risk of impacts

<u>All DEP/SEP Construction Scenarios</u>

178. The dust and PM_{10} emission magnitude and sensitivity of the area(s) are combined and the risk of impacts determined using **Appendix 24.1**. The risks for dust soiling, human health and ecological effects are shown in **Table 24-34**.

Table 24-34: Risk of dust impacts under all DEP/SEP Construction Scenarios

Potential impact	Dust risk		
	Earthworks	Construction	Trackout
Dust soiling	Landfall – low risk Bodham – medium risk Onshore substation – low risk	Landfall – low risk Bodham – medium risk Onshore substation – low risk	Medium risk
Human health	Low risk	Low risk	Low risk
Ecological	Low risk	Medium risk	Medium risk

179. It is anticipated that the risk of dust impacts would be the same under all DEP/SEP Scenarios as the dust emission magnitudes and the sensitivity of the area, defined in **Section 24.6.1.1.2** and **Section 24.6.1.1.3** respectively, were the same for each Scenario. However, the risk of dust impacts in Scenario 3 would be of a longer duration than either Scenario 1 or Scenario 2.

24.6.1.1.5 Step 3: Site Specific Mitigation (under all Scenarios)

180. Step 3 of the IAQM guidance (2016) identifies the appropriate good practice mitigation measures required based on the findings of Step 2 of the assessment methodology. Step 2 of the dust assessment determined that the greatest risk of impacts was 'medium risk' under the worst case scenario, without the implementation of mitigation measures. The aim of these mitigation measures is to achieve the same residual level of impact (i.e. not significant) regardless of the DEP/SEP construction Scenario.

181. Recommended mitigation measures are listed in the IAQM guidance document according to the 'risk' of impacts associated with the release of dust and PM_{10} from construction activities. Recommended mitigation measures include minimising the production and transmission of dust from construction activities, and the requirement to carry out visual on-site and off-site inspections of dust deposition levels.

182. An outline Code of Construction Practice (CoCP) is being prepared and will be submitted at the ES stage. The outline CoCP will set out the management measures for all onshore construction works associated with DEP and SEP and will include measures to suppress the generation of dust.

183. A list of mitigation measures that are highly recommended for a **medium risk** site, as determined by Step 2 of the dust assessment, by the IAQM are provided below:

- Communications:
    - Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
    - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
    - Display the head or regional office contact information.

  - Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the local authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
- Dust 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.
  - Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
  - Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
  - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on 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.
  - Avoid site runoff of water or mud.
  - 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 re-used on site. If they are being re-used on-site cover as described below.
  - Manage stockpiles to prevent wind whipping.
  - Ensure all vehicles switch off engines when stationary - no idling vehicles.
  - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
  - 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.
   - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
   - Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
   - Avoid bonfires and burning of waste materials.
- Construction:
   - Ensure sand and other aggregates are stored in appropriate manner to minimise dust generation for example the use of bunded areas..
- Trackout:
   - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
   - Avoid dry sweeping of large areas.
   - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
   - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
   - Record all inspections of haul routes and any subsequent action in a site logbook.
   - Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
   - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
   - Access gates to be located at least 10 m from receptors where possible.

184. A list of mitigation measures that are desirable for a medium risk site, as determined by Step 2 of the dust assessment, by the IAQM are provided below:

- Dust Management:
   - Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.

    - Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph 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 the local authority, where appropriate).
    - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- Earthworks:
    - Manage earthworks and exposed areas/soil stockpiles to stabilise surfaces.
    - Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Construction:
    - Avoid scabbling (roughening of concrete surfaces) if possible.
    - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
    - For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

24.6.1.1.6 Step 4: Determine Significant Effects (under all Scenarios)

185. With the implementation of the above mitigation measures, the residual impacts from the construction of either DEP/SEP together concurrently (Scenario 2) or DEP or SEP in isolation (Scenario 1) are considered to be **not significant**, in accordance with IAQM guidance (2016).

24.6.1.2 Impact 2: Non-Road Mobile Machinery (NRMM) Emissions

186. It is anticipated at this stage that the number and type of plant per activity/location and assessment conditions (i.e. working hours, duration of works, etc.) will be the same for all DEP/SEP Scenarios, It is considered that the scale of the single project (Scenario 1) and the two projects together concurrently (Scenario 2) are such that the magnitude of impacts will no greater than that of Scenario 3, and therefore the mitigation measures recommended would be the same.
187. A qualitative assessment of DEP and SEP generated NRMM used during construction at landfall and construction of the onshore cable corridor and/or onshore substation, where impacts on receptors may occur, has been undertaken below as requested by the Planning Inspectorate in the Scoping Opinion (see **Table 24-1**). The qualitative assessment of DEP and SEP generated NRMM used during construction was undertaken using information available at this stage in application. This assessment will be updated further for the ES as the PEIR boundary is further refined ahead of the DCO application.
188. This qualitative assessment takes into account:

- The number and type of plant to be used (see **Table 24-35**);
- The working hours to be employed and the duration of works;

- Existing air quality conditions in the area (based on Defra background pollutant concentration maps);
- Prevailing meteorological conditions (see **Plate 24-1**); and
- Distances from NRMM to the nearest receptors.

189. The anticipated number and type of plant needed per activity/location are detailed in **Table 24-35**. The numbers in operation in the table are based on anticipated plant on site at any one time.

Table 24-35: Anticipated number and type of plant needed per activity/location (under all Scenarios)

Plant	Trenchless crossings (per location)	Cable duct installation (per 1km section)	Cable pull (per location)	Installation of temporary access tracks	Establishing temporary work areas/small compounds	Substation civils
Tracked excavator	2	2	2	2	2	4
Low loader	1	1	1	1	1	2
Tele handler	1	1	1	1	1	1
Hiab wagon	1	1	1	1	1	2
Operative vehicles	Multiple	Multiple	Multiple	Multiple	Multiple	Multiple
Tractor and Trailer	1	1	1	-	-	1
Tipper Wagons	-	-	-	-	-	2
Compacting Roller	-	-	-	-	-	1
Ride on Roller	-	-	-	-	-	1
Wacker Plate	-	-	-	-	-	1
Dumpers	-	-	-	-	-	1
Dozer	-	-	-	1	-	1
Cement Mixer Truck	-	-	-	-	-	1
Truck Mounted Concrete Pump	-	-	-	-	-	1
Generator	1	1	1	-	-	2
Wacker Plater	-	1	-	-	-	-

Plant	Trenchless crossings (per location)	Cable duct installation (per 1km section)	Cable pull (per location)	Installation of temporary access tracks	Establishing temporary work areas/small compounds	Substation civils
Pump	-	1	-	-	-	-
Cable winch	-	-	1	-	-	-
Drum Trailer	-	-	1	-	-	-
Compressor	-	-	1	-	-	-
Cable Rollers	-	-	1	-	-	-
Drilling rig	1	-	-	-	-	-
Mixing tank	1	-	-	-	-	-
Circulation pump	1	-	-	-	-	-
Butt Fusion Jointing Machine Cabin & Generator	1	-	-	-	-	-
Asphalt spreader and roller	-	-	-	1	-	-

190. As shown in **Table 24-35**, the greatest anticipated number of plant working at one location at the same time is for the substation civils.

191. The anticipated working hours for construction of DEP and SEP are 7am-7pm Monday to Friday and 7am-1pm Saturday, subject to any essential activities that are required to be undertaken outside of these times. The duration of trenchless crossing (i.e., HDD) at landfall is anticipated to take up to five months for Scenario 1 and 2 and for each project under Scenario 3, with up to a one year gap between the end of onshore construction of the first project and the start of onshore construction of the second project.

192. Under each Scenario, each team would typically work on a 400m length of the corridor on any given day, and within that length the extent of open trenches would typically be between 50-100m on any given day, with the trench being excavated at one end and backfilled at the other as works progress along that section. Construction may be carried out by up to ten teams along the onshore cable corridor at any one time. Under Scenario 3, these activities would then be repeated for the second project up to one year after the completion of the first project.

193. The PEIR boundary study area is largely rural in nature and, as shown in **Table 24-36**, the current 2021 and future 2025 background concentrations of NO_2, PM_{10} and $PM_{2.5}$ along the onshore cable corridor and at the two onshore substation site options are 'well below' (i.e. less than 75% of) and no greater than 50% of their respective annual mean Objectives and target and are expected to continue to decrease into the future.

Table 24-36: 2021 and 2025 Defra (2020a) background pollutant concentrations along the PEIR boundary

Local authority	Onshore works (landfall, onshore cable corridor and onshore substation) Background Concentrations		
	NO_2 (Annual Mean Objective = 40µg.m^{-3})	PM_{10} (Annual Mean Objective = 40µg.m^{-3})	$PM_{2.5}$ (Annual Mean Target = 25µg.m^{-3})
2021 (µg.m^{-3})			
NNDC	6.4 – 7.0	12.5 – 15.6	7.8 – 8.7
BDC	6.4 – 7.9	14.1 – 16.4	8.5 – 9.1
SNC	7.0 – 10.5	14.1 – 16.4	8.6 – 9.5
2025 (µg.m^{-3})			
NNDC	5.6 – 6.1	11.8 – 14.9	7.2 – 8.1
BDC	5.6 – 6.8	13.4 – 15.7	7.9 – 8.6
SNC	6.2 – 8.8	13.4 – 15.6	8.0 – 8.9

194. **Plate 24-1** shows the wind rose of meteorological conditions as used in the air quality assessment. The prevailing wind direction is from the south-west.

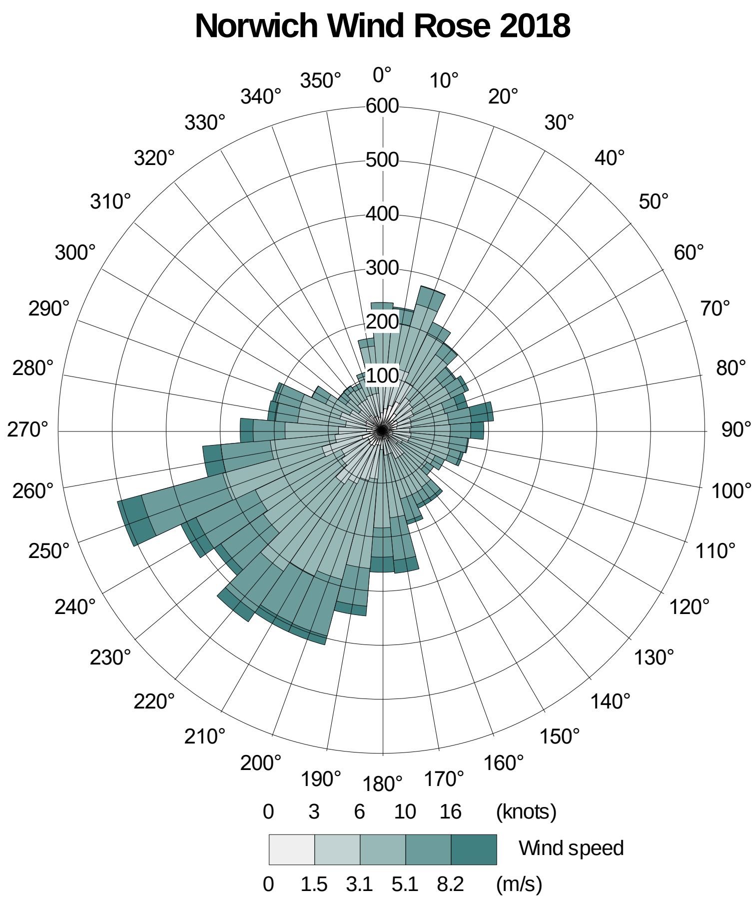

Plate 24-1: Wind Rose of 2018 Meteorological Data from the Norwich Recording Station

195. The exact locations of the construction compounds, onshore cable corridor, trenchless crossings and substation have not yet been determined. Therefore, to provide a conservative assessment, the potential effects on air quality have been conservatively assessed using realistic worst-case scenarios in terms of proximity to sensitive receptors.

24.6.1.2.1 NRMM at Landfall

196. NRMM at the landfall compound could be associated with either the trenchless crossing (HDD) and/or work within the proposed construction compound. The closest human receptors to this compound at landfall are likely to be the residential properties off Beach Lane.

197. Ecological receptors at landfall include the Greater Wash SPA, Weybourne Cliffs SSSI, The Wash and North Norfolk Coast SAC and the North Norfolk Coast Ramsar, SPA, SAC and SSSI. The landfall compound will accommodate the drilling rigs, ducting and welfare facilities for the temporary HDD works, as well as plant detailed in **Table 24-35** for both the trenchless crossing and construction compound, and will be located 100-150m from the cliff edge (and Greater Wash SPA boundary) and approximately 80-130m from the Weybourne Cliff SSSI boundary, as well as 130m from The Wash and North Norfolk Coast SAC and the North Norfolk Coast Ramsar/SPA/SAC/SSSI at its closest point to the PEIR boundary, which should allow for dilution and dispersion of pollutant emissions from NRMM within this compound.

198. The works associated with HDD would be temporary under each Scenario and, given the low background pollutant concentrations in the area, it is unlikely significant impacts will occur as a result of NRMM at landfall where relevant control and management measures are employed (see **Section 24.6.1.2.3**). Works associated with the construction compound would be of a longer duration, however, again given the low background pollutants in the area and the fact that once construction of the onshore cable corridor has been completed no more pollution sources will be present (i.e. there are no operational phase impacts on local air quality) as a result of DEP and SEP, it is unlikely significant impacts will occur as a result of NRMM at landfall where relevant control and management measures are employed (see **Section 24.6.1.2.3**).

24.6.1.2.2 NRMM along the Cable Corridor

199. The primary activities that will occur along the onshore cable corridor are temporary haul road construction and removal/excavation/backfilling works associated with the trench.

200. As detailed in **Chapter 5 Project Description**, the onshore cable corridor will be subdivided into 1km lengths between work fronts, with a typical works duration of up to six weeks at any particular location, and work would be undertaken in a practical, logical and sequential manner, e.g., topsoil stripping would be undertaken prior to construction of the haul road in advance of trench excavation. Furthermore, each item of plant present would not necessarily be fully utilised throughout the working day.

201. It is not anticipated that NRMM would be in excess of that required on a 'standard' construction site due to:

- the linear nature of works area;
- the number of items of each type of plant active in the vicinity of receptors for each activity, along the length of each section of cable corridor; and
- the short duration NRMM and plant will be active in each section.

202. Therefore it is unlikely that NRMM along the onshore cable corridor would have a significant impact on local air quality where relevant control and management measures are employed (see **Section 24.6.1.2.3**).

24.6.1.2.3 NRMM at the Onshore Substation

203. The two onshore substation site options are located in arable land south of the existing Norwich Main substation. Site 1 is located approximately 250m south of Norwich Main, immediately west of the Norwich to Ipswich rail line and approximately 600m north of the nearest village (Swainsthorpe). Site 2 is located approximately 150m south-west of Norwich Main and approximately 1km east of the nearest village (Swardeston). It has been assumed that the construction compound at the onshore substation will be located adjacent to either of these substation options.

204. The nearest human receptor to the worst case location for the substation construction compound for Site 1 would be off the A140 Ipswich Road (to the east) and for Site 2 would be off Gowthorpe Lane (to the west and south). The nearest ecological receptor is the Dunston Common LNR, approximately 650m north-east of the closest onshore substation construction compound (worst case location for Site 1).

205. Works at the onshore substation will occur for the longest duration (up to 36 months for Scenario 1 and 2, and up to 36 months for each project under Scenario 3 (with up to a one year gap between the end of onshore construction of the first project and the start of onshore construction of the second project)) and will require the most NRMM in operation at the one time (see **Table 24-35**). However, given the prevailing wind direction (see **Plate 24-1**) is from the south-west, NRMM emissions will be dispersed away from nearby human receptors for the majority of the time. It is anticipated that the distance between the Dunston Common LNR and the potential closest works at the onshore substation would allow for sufficient dilution and dispersion of pollutant emissions from NRMM. Also, given the low background pollutant concentrations in the area, and the fact that the source of NRMM emissions will be temporary during construction only, it is unlikely NRMM at the onshore substation will have a significant impact on local air quality where relevant control and management measures are employed (see **Section 24.6.1.2.3**).

24.6.1.2.4 NRMM Significance (under all Scenarios)

206. Defra technical guidance (Defra, 2018) states that emissions from NRMM used on construction sites are unlikely to have a significant impact on local air quality where relevant control and management measures are employed (see **Section 24.6.1.2.3** below).

24.6.1.2.5 Mitigation measures specific to NRMM (under all Scenarios)

207. NRMM and plant would be well maintained. If any emissions of dark smoke occur, then the relevant machinery should stop immediately, and any problem rectified. In addition, the following controls should apply to NRMM:

- All NRMM should use fuel equivalent to ultralow sulphur diesel (fuel meeting the specification within EN590:2004);
- All NRMM should comply with regulation (EU) 2016/1628 of the European Parliament and of the European Council;
- All NRMM will be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- The ongoing conformity of plant retrofitted with DPF, to a defined performance standard, should be ensured through a programme of onsite checks; and
- Fuel conservation measures should be implemented, including instructions to (i) throttle down or switch off idle construction equipment; (ii) switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded and (iii) ensure equipment is properly maintained to ensure efficient fuel consumption.

24.6.1.3 Impact 3: Construction Road Vehicle Exhaust Emissions

24.6.1.3.1 DEP/SEP together concurrently (Scenario 2)

<u>Human Receptors</u>

208. The 24-hour AADT flows and HDV percentages used in the air quality assessment for DEP and SEP are detailed in **Appendix 24.2**.

209. Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for the 2025 year of peak construction 'with DEP and SEP' scenario are detailed in **Table 24-37** to **Table 24-39**:. Concentrations for the 'without DEP and SEP' assessment and the predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations, as a result of DEP and SEP, are also shown for comparison purposes. All concentrations are inclusive of the background concentration at each receptor.

Table 24-37: Annual mean NO_2 results at sensitive human receptor locations for the worst case scenario (DEP and SEP together concurrently)

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean NO_2 Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
KLWNBC	R1	14.5	15.1	0.6	1%	Negligible
	R2	13.3	13.8	0.5	1%	Negligible
	R3	10.4	10.6	0.2	1%	Negligible
	R4	8.6	8.8	0.2	0%	Negligible
	R5	9.2	9.4	0.2	0%	Negligible
	R6	8.2	8.2	0.1	0%	Negligible
	R7	9.0	9.2	0.2	1%	Negligible
	R8	8.4	8.6	0.2	0%	Negligible
	R9	11.6	11.7	0.1	0%	Negligible
	R10	10.5	10.7	0.2	1%	Negligible
	R11	11.6	11.8	0.2	1%	Negligible
	R12	10.4	10.6	0.2	0%	Negligible
NNDC	R13	9.3	9.5	0.1	0%	Negligible
	R14	8.7	8.8	0.1	0%	Negligible
	R15	10.8	10.9	0.1	0%	Negligible
	R16	10.8	10.9	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean NO_2 Concentrations (μg.m^{-3})				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R17	11.5	11.7	0.2	1%	Negligible
	R18	10.3	10.5	0.2	0%	Negligible
	R19	15.2	15.6	0.5	1%	Negligible
	R20	10.2	10.6	0.4	1%	Negligible
	R21	8.5	8.7	0.2	1%	Negligible
BC	R22	9.4	9.5	0.1	0%	Negligible
	R23	9.6	9.8	0.2	0%	Negligible
	R24	9.2	9.2	0.1	0%	Negligible
BDC	R25	7.1	7.2	0.1	0%	Negligible
	R26	7.8	7.9	0.1	0%	Negligible
	R27	7.9	7.9	0.1	0%	Negligible
	R28	10.8	10.8	0.1	0%	Negligible
	R29	11.3	11.4	0.1	0%	Negligible
	R30	9.5	9.5	0.0	0%	Negligible
	R31	9.3	9.3	0.0	0%	Negligible
	R32	9.7	9.7	0.0	0%	Negligible
	R33	9.9	10.0	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean NO_2 Concentrations (µg.m^{-3})				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R34	18.0	18.1	0.1	0%	Negligible
	R35	17.3	17.4	0.1	0%	Negligible
	R36	12.0	12.1	0.1	0%	Negligible
SNC	R37	13.7	13.8	0.0	0%	Negligible
	R38	15.0	15.0	0.0	0%	Negligible
	R39	13.3	13.3	0.0	0%	Negligible
	R40	13.1	13.2	0.0	0%	Negligible
	R41	10.8	11.2	0.4	1%	Negligible
	R42	9.6	9.7	0.1	0%	Negligible
	R43	11.2	11.3	0.0	0%	Negligible
	R44	16.3	16.4	0.1	0%	Negligible
	R45	11.3	11.4	0.1	0%	Negligible
	R46	12.0	12.1	0.1	0%	Negligible
GYBC	R47	11.5	11.5	0.1	0%	Negligible
	R48	19.3	19.5	0.2	0%	Negligible
	R49	19.1	19.1	0.1	0%	Negligible
	R50	14.8	14.9	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean NO_2 Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
WDC	R51	12.3	12.4	0.1	0%	Negligible
	R52	10.7	10.8	0.1	0%	Negligible
	R53	10.3	10.4	0.1	0%	Negligible
	R54	12.1	12.2	0.1	0%	Negligible
	R55	21.1	21.6	0.5	1%	Negligible
	R56	23.7	24.0	0.3	1%	Negligible
	R57	10.9	10.9	0.1	0%	Negligible
	R58	10.1	10.2	0.1	0%	Negligible
	R59	12.2	12.4	0.1	0%	Negligible

Table 24-38: Annual mean PM_{10} results at sensitive human receptor locations for the worst case scenario (DEP and SEP together concurrently)

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
KLWNBC	R1	15.4	15.5	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R2	15.5	15.7	0.2	1%	Negligible
	R3	15.2	15.4	0.1	0%	Negligible
	R4	15.4	15.4	0.1	0%	Negligible
	R5	15.4	15.4	0.1	0%	Negligible
	R6	15.9	15.9	0.1	0%	Negligible
	R7	15.9	16.0	0.1	0%	Negligible
	R8	15.2	15.2	0.1	0%	Negligible
	R9	16.7	16.7	0.1	0%	Negligible
	R10	15.9	16.0	0.1	0%	Negligible
	R11	17.3	17.5	0.2	0%	Negligible
	R12	15.8	15.9	0.1	0%	Negligible
NNDC	R13	15.8	15.9	0.1	0%	Negligible
	R14	15.9	16.0	0.1	0%	Negligible
	R15	14.8	14.9	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R16	15.9	16.0	0.1	0%	Negligible
	R17	16.7	16.8	0.1	0%	Negligible
	R18	15.1	15.2	0.1	0%	Negligible
	R19	16.9	17.1	0.2	0%	Negligible
	R20	15.5	15.7	0.1	0%	Negligible
	R21	15.2	15.3	0.1	0%	Negligible
BC	R22	16.4	16.5	0.1	0%	Negligible
	R23	15.7	15.8	0.1	0%	Negligible
	R24	15.9	16.0	0.1	0%	Negligible
BDC	R25	14.6	14.7	0.0	0%	Negligible
	R26	15.0	15.0	0.0	0%	Negligible
	R27	14.2	14.2	0.0	0%	Negligible
	R28	15.6	15.6	0.0	0%	Negligible
	R29	14.6	14.7	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R30	13.5	13.5	0.0	0%	Negligible
	R31	15.0	15.0	0.0	0%	Negligible
	R32	15.2	15.2	0.0	0%	Negligible
	R33	13.7	13.7	0.0	0%	Negligible
	R34	16.4	16.5	0.1	0%	Negligible
	R35	17.2	17.3	0.1	0%	Negligible
	R36	15.9	15.9	0.1	0%	Negligible
SNC	R37	15.9	15.9	0.1	0%	Negligible
	R38	16.5	16.6	0.0	0%	Negligible
	R39	16.2	16.2	0.0	0%	Negligible
	R40	15.8	15.8	0.0	0%	Negligible
	R41	15.8	16.0	0.2	0%	Negligible
	R42	14.4	14.5	0.0	0%	Negligible
	R43	16.6	16.6	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R44	16.2	16.2	0.0	0%	Negligible
	R45	16.6	16.6	0.1	0%	Negligible
	R46	16.1	16.2	0.1	0%	Negligible
GYBC	R47	12.8	12.8	0.0	0%	Negligible
	R48	15.7	15.8	0.1	0%	Negligible
	R49	15.3	15.3	0.1	0%	Negligible
	R50	14.8	14.9	0.1	0%	Negligible
WDC	R51	15.6	15.6	0.1	0%	Negligible
	R52	13.8	13.8	0.0	0%	Negligible
	R53	13.4	13.5	0.0	0%	Negligible
	R54	14.0	14.1	0.1	0%	Negligible
	R55	14.0	14.1	0.1	0%	Negligible
	R56	14.3	14.3	0.1	0%	Negligible
	R57	14.2	14.3	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean PM_{10} Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R58	14.2	14.3	0.0	0%	Negligible
	R59	15.8	15.9	0.1	0%	Negligible

Table 24-39: Annual mean $PM_{2.5}$ results at sensitive human receptor locations for the worst case scenario (DEP and SEP together concurrently)

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
KLWNBC	R1	9.7	9.8	0.1	0%	Negligible
	R2	9.6	9.7	0.1	0%	Negligible
	R3	9.2	9.3	0.1	0%	Negligible
	R4	8.7	8.8	0.0	0%	Negligible
	R5	8.7	8.8	0.0	0%	Negligible
	R6	8.7	8.8	0.0	0%	Negligible
	R7	8.8	8.8	0.1	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R8	8.6	8.6	0.0	0%	Negligible
	R9	9.9	9.9	0.0	0%	Negligible
	R10	9.4	9.4	0.1	0%	Negligible
	R11	9.8	9.9	0.1	0%	Negligible
	R12	9.1	9.2	0.1	0%	Negligible
NNDC	R13	8.7	8.8	0.1	0%	Negligible
	R14	8.7	8.8	0.0	0%	Negligible
	R15	8.8	8.8	0.0	0%	Negligible
	R16	8.9	8.9	0.0	0%	Negligible
	R17	9.2	9.2	0.1	0%	Negligible
	R18	8.6	8.7	0.1	0%	Negligible
	R19	9.6	9.7	0.1	0%	Negligible
	R20	8.8	8.8	0.1	0%	Negligible
	R21	8.5	8.6	0.1	0%	Negligible
BC	R22	9.1	9.2	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R23	9.0	9.1	0.1	0%	Negligible
	R24	8.9	8.9	0.0	0%	Negligible
BDC	R25	8.3	8.3	0.0	0%	Negligible
	R26	8.4	8.4	0.0	0%	Negligible
	R27	8.2	8.2	0.0	0%	Negligible
	R28	8.9	8.9	0.0	0%	Negligible
	R29	8.6	8.7	0.0	0%	Negligible
	R30	8.3	8.3	0.0	0%	Negligible
	R31	8.7	8.7	0.0	0%	Negligible
	R32	8.8	8.8	0.0	0%	Negligible
	R33	8.5	8.5	0.0	0%	Negligible
	R34	9.6	9.6	0.0	0%	Negligible
	R35	9.7	9.7	0.0	0%	Negligible
	R36	9.2	9.3	0.0	0%	Negligible
SNC	R37	9.3	9.4	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean $PM_{2.5}$ Concentrations (µg.m^{-3})				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R38	9.7	9.7	0.0	0%	Negligible
	R39	9.5	9.5	0.0	0%	Negligible
	R40	9.4	9.4	0.0	0%	Negligible
	R41	9.1	9.2	0.1	0%	Negligible
	R42	8.6	8.6	0.0	0%	Negligible
	R43	9.4	9.4	0.0	0%	Negligible
	R44	9.5	9.5	0.0	0%	Negligible
	R45	9.2	9.2	0.0	0%	Negligible
	R46	9.1	9.2	0.0	0%	Negligible
GYBC	R47	8.1	8.2	0.0	0%	Negligible
	R48	10.5	10.5	0.1	0%	Negligible
	R49	10.0	10.0	0.0	0%	Negligible
	R50	9.3	9.4	0.0	0%	Negligible
WDC	R51	9.1	9.1	0.0	0%	Negligible
	R52	8.5	8.6	0.0	0%	Negligible

Local Authority	Receptor ID	Scenario 2 (DEP and SEP Concurrently) – 2025 Annual Mean $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$)				
		Without DEP and SEP	With DEP and SEP	Change	Change as % of the Objective	Impact Descriptor
	R53	8.6	8.7	0.0	0%	Negligible
	R54	9.5	9.5	0.0	0%	Negligible
	R55	9.3	9.3	0.1	0%	Negligible
	R56	9.5	9.6	0.0	0%	Negligible
	R57	9.2	9.2	0.0	0%	Negligible
	R58	9.1	9.2	0.0	0%	Negligible
	R59	9.2	9.3	0.0	0%	Negligible

210. The results of the construction phase road traffic emissions assessment show that annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted to be well below (i.e. less than 75% of) the respective air quality Objectives and target in the year of peak construction (2025) under the worst case scenario (i.e., Scenario 2 – DEP and SEP together concurrently) at all receptors, both 'with' and 'without' DEP and SEP in place.

211. The changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations were 1% or less at all receptors; this corresponded to a '**negligible**' impact due to low total pollutant concentrations at all receptors, in accordance with IAQM and EPUK guidance (IAQM & EPUK, 2017).

212. All predicted NO_2 concentrations were well below 60µg.m^{-3} and therefore, in accordance with Defra guidance in LAQM.TG (16) (Defra 2018), the 1-hour mean objective is unlikely to be exceeded (see **Table 24-5**). Based on the calculation provided by Defra, as detailed in **Section 24.4.3.3.10**, the short-term PM_{10} Objective was predicted to be met at all modelled locations (objective being less than 35 exceedances of the daily mean objective of 50µg.m^{-3}). Using the Defra calculation, there was no change in the number of days exceeding the daily mean Objective between the 'without' and 'with' DEP and SEP assessments.

213. The assessment concluded that impacts generated by DEP and SEP construction road traffic under the worst case scenario (i.e. Scenario 2 – DEP and SEP together concurrently) upon local air quality are not significant based upon:

- A predicted **negligible** impact at all receptor locations;
- Predicted pollutant concentrations were well below the relevant air quality Objectives/target at all considered human receptor locations; and
- DEP and SEP generated traffic was not predicted to cause a breach of any of the air quality Objectives/target at any identified sensitive receptor locations.

Ecological Receptors

214. The results of the impact assessment on designated ecological sites will be presented in the air quality chapter of the ES.

24.6.1.3.2 DEP or SEP in isolation (Scenario 1)

215. The results of the assessment of DEP and SEP generated construction road traffic impacts under the worst case scenario (i.e. Scenario 2 – DEP/SEP together concurrently) concluded a **negligible** impact at all human receptors and not significant impacts on local air quality, thus no mitigation measures were recommended. The scale of impacts as a result of DEP or SEP in isolation can be considered to be no greater than that for Scenario 2, as it is anticipated that less construction traffic would be generated under Scenario 1 (DEP or SEP in isolation). Therefore, road traffic impacts are also predicted to be not significant and no mitigation measures are recommended.

216. Depending on the outcome of the assessment under Scenario 2, as the results of the impact assessment on designated ecological sites will be presented in the air quality chapter of the ES, consideration of the other scenarios may be included, if necessary, at the ES stage.

24.6.2 Potential Impacts during Operation

217. Operational phase impacts were scoped out of the assessment, as agreed by the Planning Inspectorate (Planning Inspectorate, 2019; also see **Table 24-1**) and therefore have not been considered within this assessment.

24.6.3 Potential Impacts during Decommissioning

218. No decision has been made regarding the final decommissioning policy for DEP and SEP, as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be pulled through the ducts and recycled, with the transition pits and ducts capped and sealed then left in situ.

219. A full EIA will be carried out ahead of any decommissioning works being undertaken at the onshore substation. The programme for onshore decommissioning is expected to be similar in duration to the construction phase of 36 months. The detailed activities and methodology for decommissioning will be determined later within lifetime of DEP and SEP, in line with relevant policies at that time, but would be expected to include:

- Dismantling and removal of electrical equipment;
- Removal of cabling from site;
- Removal of any building services equipment;
- Demolition of the buildings and removal of fences; and
- Landscaping and reinstatement of the sites.

220. Whilst details regarding the decommissioning of the onshore substation are currently unknown, considering the worst case assumptions for all scenarios which would be the removal and reinstatement of the current land use at the site, it is anticipated that the impacts would be similar to those during construction and therefore **no significant** impact.

221. The decommissioning methodology cannot be finalised until immediately prior to decommissioning but would be in line with relevant policy at that time.

24.7 Cumulative Impacts

24.7.1 Identification of Potential Cumulative Impacts

222. The CIA was undertaken in two stages. The first stage is the identification of which residual impacts assessed for DEP and/or SEP on their own have the potential for a cumulative impact with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 24-40**: below. Only potential impacts assessed in **Section 24.6** as negligible or above are included in the CIA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

Table 24-40: Potential Cumulative Impacts (impact screening)

Impact	Potential for Cumulative Impact	Rationale
Construction		
Construction Impact 1: Construction dust and particulate matter	Yes	There is potential for cumulative construction dust impacts where projects occur within 700m each other.
Construction Impact 2: NRMM Emissions	Yes	There is potential for cumulative NRMM emission impacts where projects overlap.
Construction Impact 3: Construction phase road traffic emissions	Yes	Where construction phase of DEP and SEP overlaps with other projects, there is the potential for cumulative impacts associated with Project-generated traffic emissions on the local road network.
Operation		
Operation impacts were scoped out of the assessment, as detailed in **Section 24.3.2.3**, therefore there would be no cumulative operational impacts.		
Decommissioning		
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.		

223. In-combination increases in nutrient nitrogen and acid deposition and NOx concentrations may also cumulatively affect designated ecological sites (see **Section 24.4.3.3.14** for further details). Any projects which are within the relevant distances which meet the criteria of the included SSSI IRZs (where in-combination traffic flows exceed 1,000 AADT) will be included in the CIA for the ES. Additional contributions of nutrient nitrogen from these sources (from both NO_2 and ammonia) and airborne NOx will be included in the 'in-combination' assessment, where there was sufficient information included within the application to quantify these emissions. Any development-generated or in-combination nutrient nitrogen deposition values above 1% of the Critical Load or Level would require additional assessment by an ecologist to determine whether any significant impacts may be experienced at the affected habitats. The determination of the significance of impacts associated with nutrient nitrogen deposition and airborne NOx concentrations will be provided at the ES stage.

24.7.2 Other Plans, Projects and Activities

224. The second stage in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CIA (described as 'project screening'). This information is set out in **Table 24-41** below, together with a consideration of the relevant details of each, including current status (e.g., under construction), planned construction period, closest distance to DEP and SEP, status of available data and rationale for including or excluding from the assessment.

225. The project screening has been informed by the development of a CIA Project List which forms an exhaustive list of plans, projects and activities in a very large study area relevant to DEP and SEP. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

226. Eight projects have been identified for inclusion on the shortlist of projects to be assessed cumulatively for air quality, these are summarised in **Table 24-41**. The remaining projects on the CIA Project List have not been considered as resulting in likely cumulative significant effects for air quality as they are either outside the zone of influence, have no temporal overlap or there is no potential effect pathway. The remainder of this section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

227. Furthermore, sub-regional growth in housing and employment, as adopted by the region's Local Plans, has been captured within future year traffic growth factors applied (further detail is provided in **Chapter 26 Traffic and Transport**) and used within the air quality assessment. The cumulative effect of housing and employment projects is therefore inherent in the air quality assessment, and these projects have not been included in **Table 24-41**.

Table 24-41: Summary of projects considered for the CIA in relation to air quality.

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
Norfolk Vanguard Offshore Wind Farm	DCO consented[1]	Expected construction 2021 to 2025	0 – cable intersects DEP and SEP	Y	There is potential for the construction phases of the proposed project and DEP and SEP to overlap and traffic movements for both projects could use the same road links. The project has therefore been considered in the air quality CIA.
Hornsea Project Three Offshore Wind Farm	DCO consented	2021-2025 (single phase) 2021-2031 (two phase)	0 – cable intersects DEP and SEP 0.8 – between project onshore substations	Y	
Norfolk Boreas Offshore Wind Farm	DCO examination	Expected construction 2026 to 2027 (if Norfolk Vanguard lay ducts as part of project)	0 – cable intersects DEP and SEP	Y	

[1] Following completion of this CIA, the ruling of a Judicial Review brought against the Secretary of State for Business Energy and Industrial Strategy's (BEIS) decision to award a DCO for NV has been handed down. The decision to grant the order has been submitted to the Secretary of State for redetermination. BEIS will be considering its options, namely appeal or redetermination. Until such time as this process reached a conclusion it has been decided to maintain the NV/ NB cumulative assessment for stakeholder review.

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
Great Yarmouth Third River Crossing	DCO consented	Expected construction 2023/24 to 2024/25	36.1 (onshore substation)	N	It is anticipated that the construction works associated with the proposed project will be completed prior to commencement of DEP and SEP's construction phase. However, Highways England noted that the scheme has been paused pending a review. A review of the project will be undertaken prior to submission of the DCO application.
A47 North Tuddenham to Easton RIS	Pre-application (application due Q1 2021)	Expected construction 2023 to 2024/25	0 – redline boundary for the proposed project intersects PEIR boundary	Y	There is the potential that the construction periods for the proposed project could overlap with DEP and SEP and traffic movements for both projects could use the same road links. The project has therefore been considered in the air quality CIA.
A47/A11 Thickthorn Junction RIS	Pre-application (application due Q1 2021)	Expected construction 2023 to 2024/25	2.2 (PEIR boundary)	Y	
A47 Blofield to North Burlington RIS	Application submitted	Expected construction 2023 to 2024/25	15.9 (onshore substation)	Y	

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
East Anglia TWO Offshore Wind Farm	DCO examination	Earliest start of construction is mid-2023	44.4 (onshore substation)	N	The projects do not share the same road network or study area, therefore, there is no potential for cumulative impacts.
East Anglia THREE Offshore Wind Farm	DCO Consented	Expected construction 2020-2025	52.5 (onshore substation)	N	The projects do not share the same road network or study area, therefore, there is no potential for cumulative impacts.
Expansion of London Luton Airport	Pre-application	Expected construction 2023-2036	134.9 (onshore substation)	N	The projects do not share the same road network or study area, therefore given this and the distance between the projects, there is no potential for cumulative impacts.
Sunnica Energy Farm	Pre-application	Expected construction 2022-2025	59 (onshore substation)	N	As the project is at the pre-application stage, there is insufficient information within the public domain to enable an air quality CIA for traffic emissions to be carried out. This project was therefore not taken forward into the air quality CIA.
Sizewell C Project	Pre-examination	Expected construction 2022-2034	43.5 (onshore substation)	N	The projects do not share the same road network or study area, therefore given this and the distance

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
					between the projects, there is no potential for cumulative impacts.
Medworth Energy from Waste Combined Heat and Power Facility	Pre-application	Earliest start of construction is mid-2022	66.2 (PEIR boundary)	N	As the project is at the pre-application stage, there is insufficient information within the public domain to enable an air quality CIA for traffic emissions to be carried out. This project was therefore not taken forward into the air quality CIA.
A428 Black Cat to Caxton Gibbet Road Improvement scheme	Pre-application	Expected construction 2021-2025	100 (PEIR boundary)	N	As the project is at the pre-application stage, there is insufficient information within the public domain to enable an air quality CIA for traffic emissions to be carried out. This project was therefore not taken forward into the air quality CIA.
Lake Lothing Third Crossing	DCO consented	Construction is expected to be completed by 2022	33.3 (onshore substation)	N	It is anticipated that the construction works associated with the proposed project will be completed prior to commencement of DEP and SEP's construction phase. Cumulative impacts associated with traffic emissions are therefore not anticipated and this project has not been included in the air quality CIA.

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
Bradwell B new nuclear power station	Pre-application	N/A	94 (onshore substation)	N	Given the distance between projects, it is unlikely there would be potential for cumulative impacts on air quality.
Oikos Marine & South Side Development	Pre-application	N/A	125 (onshore substation)	N	Given the distance between projects, it is unlikely there would be potential for cumulative impacts on air quality.
Progress Power Station	DCO Consented	N/A	27.5 (onshore cable corridor)	N	Given the distance between projects, it is unlikely there would be potential for cumulative impacts on air quality.
Nautilus Interconnector	Pre-application	Expected construction 2024-2028	45.6 (onshore substation)	N	As the project is at the pre-application stage, there is insufficient information within the public domain to enable an air quality CIA for traffic emissions to be carried out. However, given the distance between projects, it is unlikely there would be potential for cumulative impacts on air quality. This project was therefore not taken forward into the air quality CIA.
TIGRE Project 1 (TP1)	Pre-application	N/A	N/A	N	As the project is at the pre-application stage, there is insufficient information within the public domain

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
					to enable an air quality CIA for traffic emissions to be carried out. This project was therefore not taken forward into the air quality CIA.
Rookery South Energy from Waste Generating Station	DCO Consented	Undergoing construction	130 (onshore cable corridor)	N	Given the distance between projects, it is unlikely there would be potential for cumulative impacts on air quality
A14 Cambridge to Huntingdon Improvement Scheme	DCO Consented	2016 to 2020	88 (onshore cable corridor)	N	It is anticipated that the construction works associated with the proposed project will be completed prior to commencement of DEP and SEP's construction phase. Cumulative impacts associated with traffic emissions are therefore not anticipated and this project has not been included in the air quality CIA.
A47 Wansford to Sutton	Pre-application	N/A	102 (onshore cable corridor)	N	As the project is at the pre-application stage, there is insufficient information within the public domain to enable an air quality CIA for traffic emissions to be carried out. However, given the distance between projects, it is unlikely there

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
					would be potential for cumulative impacts on air quality. This project was therefore not taken forward into the air quality CIA.
NP/17/1405 Agricultural storage building	Permission not required	N/A	0.13 (onshore cable corridor)	N	Given the small size of the proposed project, it is unlikely there would be potential for cumulative impacts or that the construction timeframes would overlap.
2017/2794 2020/0903 Reserved Matters Outline Application for proposed employment development Land West of Ipswich Road Keswick Norfolk 'Harford Triangle'	Approval with conditions	N/A	0.9 (PEIR boundary at onshore substation)	Y	There is the potential that the construction periods for the proposed project could overlap with DEP and SEP and traffic movements for both projects could use the same road links. The project has therefore been considered in the air quality CIA.
20181024	Registered	N/A	0.2	N	There is insufficient information within the public domain to enable an air quality CIA to be carried out.

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
Nationally Significant Infrastructure Proposal - underground cable route associated with offshore wind farm.			(onshore cable corridor)		This proposed project was not taken forward in the air quality CIA.
20181400 Demolition of 4 existing units and development of 10 residential units (Reserved Matters Application Following Outline Approval 20151644)	Final decision	N/A	0.05 (onshore cable corridor)	N	Given the small size of the proposed project, it is unlikely there would be potential for cumulative impacts or that the construction timeframes would overlap.
20201012 Screening Opinion (Environmental	Final Decision - EIA Not Required	N/A	Within PEIR boundary	N	Air quality was not assessed as part of the planning application for the proposed project as no significant environmental effects are considered

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
Impact Assessment) Regulations 2017 - Proposed Development of a Ground Mounted Solar Farm & Associated Infrastructure					to have the potential to arise; therefore, given the nature of proposed project (i.e. requires little maintenance once constructed), it is unlikely there would be potential for cumulative impacts or that the construction timeframes would overlap.
20181336 1. Infiltration Lagoon to serve Food Enterprise Park 2. Submission of details under condition 2.25 of the Local Development Order REF. 20170052	Full approval	N/A	0.5 (onshore cable corridor)	N	Given the nature of the proposed project and distance between projects, it is unlikely there would be the potential for cumulative air quality impacts.
20181294 Milling Tower Building and 6	Approved	N/A	0.5 (onshore cable corridor)	N	Air quality impacts were scoped out of the EIA for this proposed project as impacts are not considered to

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
No Storage Silos for Food Processing and Production					give rise to significant environmental effects. Therefore, there would be no potential for cumulative impacts.
2017/2270 Agricultural building	Prior approval not required	N/A	0.05 (onshore Project substation zone)	N	Given the small size of the proposed development, it is unlikely there would be potential for cumulative impacts or that the construction timeframes would overlap.
C/5/2017/5007 Change of use from B8 Warehouse: to a Sui Generis use for waste processing and the production of refuse derived fuel (RDF)	Approved	N/A	1.7 (onshore cable corridor)	N	The air quality assessment undertaken for this project only included construction dust and this project is >700m from DEP and SEP's boundary, therefore there would be no potential for cumulative dust impacts.
Norwich Western Link	Pre-application	Expected construction 2023-2025	0 – redline boundary for the proposed project intersects PEIR boundary	Y	There is the potential that the construction periods for the proposed project could overlap with DEP and SEP and traffic movements for both projects could use the same road links. In addition, the new road

Project	Status	Construction Period	Closest Distance from DEP and SEP (km)	Included in the CIA (Y/N)	Rationale
					layout would provide alternative routes for DEP and SEP's construction traffic. The project has therefore been considered in the air quality CIA.

228. In summary, the following projects will be assessed for potential direct cumulative impacts:

- Norfolk Vanguard Offshore Wind Farm;
- Hornsea Project Three Offshore Wind Farm;
- Norfolk Boreas Offshore Wind Farm;
- A47 North Tuddenham to Easton RIS (a highway improvement scheme);
- A47 Blofield to North Burlington RIS (a highway improvement scheme);
- A47/A11 Thickthorn junction improvement RIS (a highway improvement scheme);
- Land west of Ipswich Road (‘Harford Triangle); and
- Norwich Western Link (a highway improvement scheme).

24.7.3 Assessment of Cumulative Impacts

229. Having established the residual impacts from DEP and/or SEP with the potential for a cumulative impact, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of impact that may arise.

24.7.3.1 Cumulative Impact 1: Construction phase dust and particulate matter

230. There is the potential for cumulative dust impacts associated with the following projects and DEP and SEP as they intersect the PEIR boundary and therefore are located within 700m of each other:

- Norfolk Vanguard Offshore Wind Farm;
- Norfolk Boreas Offshore Wind Farm;
- Hornsea Project Three Offshore Wind Farm;
- A47 North Tuddenham to Easton RIS; and
- Norwich Western Link.

231. The Hornsea Project Three onshore substation is also located in proximity (<1km) to the proposed onshore substation site options for DEP and SEP. In addition, the DEP and SEP PEIR boundary crossed the cable corridors for Norfolk Vanguard, Norfolk Boreas and Hornsea Project Three. These three wind farm projects have all carried out construction dust assessments which include a suite of best practice mitigation methods to minimise emissions of dust and fine particulate matter during construction which will be implemented across the onshore project area.

232. It is anticipated that construction dust assessments will be undertaken and/or best practice mitigation methods will be recommended for the A47 North Tuddenham to Easton RIS and Norwich Western Link projects (as these projects are both currently at pre-application stages and the latest available information on the projects is from the Scoping Reports).

233. IAQM guidance (IAQM, 2016) states that, with the implementation of the recommended mitigation, impacts will be not significant. It is therefore not anticipated that there would be significant cumulative impacts associated with construction phase dust emissions from these other projects combined with DEP and SEP.

24.7.3.2 Cumulative Impact 2: Construction phase NRMM

234. Due to the potential for overlapping construction programmes and intersecting onshore cable corridors of Norfolk Vanguard, Norfolk Boreas and Hornsea Project Three and also overlap with the development boundaries of the A47 North Tuddenham to Easton RIS and Norwich Western Link, there is the potential (albeit unlikely) for NRMM associated with DEP and SEP to be located and operating at the same time, and in the same area as NRMM associated with the aforementioned projects. During the preparation of the ES, the potential for cumulative impacts within the respective study area will be reviewed and an assessment will be carried out if required. However, pollutant concentrations at all receptors considered in this assessment were well below the relevant Objectives/target and it is anticipated that each project will employ mitigation measures to control and manage NRMM emissions and therefore it is unlikely that there would be a significant cumulative impact associated with construction phase NRMM.

24.7.3.3 Cumulative Impact 3: Construction phase road traffic emissions

235. The construction phases of DEP and SEP and the eight projects screened into the CIA could overlap. During the preparation of the DEP and SEP ES, the potential for cumulative impacts within the respective study areas will be reviewed and an assessment will be carried out if required. However, pollutant concentrations at all receptors considered in this assessment were below the relevant Objectives/target. Additionally, it is anticipated that these other projects will employ measures to minimise vehicle movements to reduce the likelihood of air quality impacts, and therefore annual mean and short-term Objectives are unlikely to be exceeded cumulatively.

236. Traffic associated with future residential developments in the study area was included in the predicted future traffic growth, which were incorporated into the future baseline traffic flows used in the air quality assessment. A cumulative assessment has therefore been carried out. As air quality impacts at receptors were considered to be not significant, there are also no significant cumulative impacts.

24.8 Transboundary Impacts

237. As detailed in **Table 24-1**, the Planning Inspectorate has agreed that transboundary air quality effects are unlikely to occur and that this topic can be scope out of the assessment.

24.9 Inter-relationships

238. The chapters detailed in **Table 24-42**: have been identified as having inter-relationships with air quality.

Table 24-42: Air Quality inter-relationships

Topic and description	Where addressed in this chapter	Rationale
Chapter 22 Onshore Ecology	**Section 24.5.4**	Potential ecological receptors may be impacted by changes to air quality.

Topic and description	Where addressed in this chapter	Rationale
Chapter 26 Traffic and Transport	**Section 24.5.4.3**	Pollutant emissions from traffic movements associated with DEP and SEP have the potential to impact on air quality.
Chapter 30 Health	**Section 24.6**	There may be human health impacts associated with increases in pollutant concentrations at sensitive receptors.

24.10Interactions

239. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The areas of potential interaction between impacts are presented in **Table 24-43**:. This provides a screening tool for which impacts have the potential to interact. For clarity the areas of potential interaction between impacts are presented in **Table 24-43**:, along with an indication as to whether the interaction may give rise to synergistic impacts.

240. **Table 24-44** provides an assessment for each receptor group (i.e. human or ecological) as related to these impacts. Within **Table 24-44** the impacts are assessed relative to construction (it is assumed decommissioning impacts will be no greater than those during construction so have not been included to prevent repetition) to see if multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor. The worst case impacts assessed within the chapter take these interactions into account and for the impact assessments are considered conservative and robust.

Table 24-43: Interaction between impacts

Potential interactions between impacts			
Construction			
	Impact 1: Construction dust and particulate matter	Impact 2: NRMM emissions	Impact 3: Construction road vehicle exhaust emissions
Impact 1: Construction dust and particulate matter	-	Yes	Yes
Impact 2: NRMM emissions	Yes	-	Yes

Impact 3: Construction road vehicle exhaust emissions	Yes	Yes	-
Operation			
Operational impacts on air quality have been scoped out.			
Decommissioning			
It is anticipated that the decommissioning impacts would be similar in nature to those of construction.			

Table 24-44: Interaction between impacts during construction

Receptor	Highest significance level during construction	Construction phase assessment
Human receptors	• Impact 1: **not significant** with the implementation of mitigation measures detailed in **Section 24.6.1.1.5** • Impact 2: **not significant** with the implementation of best available technique mitigation measures detailed in **Section 24.6.1.2.5** • Impact 3: **not significant** (**negligible** impact at all receptors)	**No greater than individually assessed impact** The proposed mitigation will minimise the potential for significant impacts on human receptors (Impact 1 and 2) within the study area and no significant impacts are predicted for Impact 3 during the construction phase of DEP and SEP. Very few human receptors (i.e. R25, R36, R41 and R42) have the potential to be affected by all three construction impacts. It is therefore considered that there will therefore be no pathway for interaction to exacerbate the potential impacts associated with these activities during construction.
Ecological receptors	• Impact 1: **not significant** with the implementation of mitigation measures detailed in **Section 24.6.1.1.5**	**No greater than individually assessed impact** The proposed mitigation will minimise the potential for significant impacts on ecological receptors (Impact 1 and 2) within the study area (Impact 3 will be assessed at ES stage) during the construction phase of DEP and SEP. Very few ecological receptors (i.e. Smeeth Wood ancient woodland and

Receptor	Highest significance level during construction	Construction phase assessment
	• Impact 2: **not significant** with the implementation of best available technique mitigation measures detailed in **Section 24.6.1.2.5** • Impact 3: to be assessed at ES stage	the ancient woodland near Ketteringham) have the potential to be affected by all three construction impacts. It is therefore considered that there will therefore be no pathway for interaction to exacerbate the potential impacts associated with these activities during construction.

24.11 Potential Monitoring Requirements

241. No air quality monitoring is proposed.

24.12 Assessment Summary

242. A summary of the potential impacts identified with relation to air quality is provided in **Table 24-45**: for the worst case scenario assessed in relation to each impact identified in this chapter.

Table 24-45: Summary of potential impacts on air quality

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation impact	Mitigation measures proposed	Residual impact
Construction						
Impact 1: Construction dust and particulate matter	Human receptors within 350m of the onshore PEIR boundary.	Dust soiling: low to high Human health: low	Low to medium risk	Assessment methodology does not assign significance before mitigation.	Measures as recommended by the IAQM (see **Section 24.6.1.1.5**).	**Not significant**.
	Designated ecological site within 200m of the onshore PEIR boundary.	Ecological Effects: high	Low to medium risk			
Impact 2: NRMM emissions	Human and ecological receptor in close proximity to where NRMM works will occur.	High	-	Defra technical guidance (Defra, 2018) states that emissions from NRMM used on construction sites are unlikely to have a significant impact on local air quality where relevant control and management measures are employed.	Best available technique mitigation measures (see **Section 24.6.1.2.5**).	**Not significant**.

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation impact	Mitigation measures proposed	Residual impact
Impact 3: Construction road vehicle exhaust emissions	Residential properties, schools, hospitals and care homes within 200m of roads taking more than 100 HDVs per day.	High	The maximum increase in NO_2 concentrations at a receptor was 0.6µg.m^{-3} at R1. The maximum increase in PM_{10} and $PM_{2.5}$ concentrations was 0.2µg.m^{-3} and 0.1 µg.m^{-3} respectively at R2.	**Not significant**, negligible impact at all receptors.	No additional mitigation measures required.	**Not significant**.
	Designated ecological sites of roads taking more than 1,000 AADT or 200 HDVs per day (inclusive of in-combination growth between 2018 and 2025).	High	To be assessed at ES stage.			
Operation						
Operational impacts on air quality have been scoped out.						

Potential impact	Receptor	Sensitivity	Magnitude	Pre-mitigation impact	Mitigation measures proposed	Residual impact
Decommissioning						
As per construction.						

24.13 References

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