A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.2 Environmental Statement – Chapter 5 Air Quality

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

The A1 in Northumberland: Morpeth to Ellingham

Development Consent Order 20[xx]

Environmental Statement

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010041
Application Document Reference	TR010041/APP/6.2
Author:	A1 in Northumberland: Morpeth to Ellingham Project Team, Highways England

Version	Date	Status of Version
Rev 0	June 2020	Application Issue

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TABLES

5 AIR QUALITY

5.1 INTRODUCTION

5.1.1. This chapter presents the assessment of likely significant effects due to Part A: Morpeth to Felton (Part A) on air quality. The air quality assessment covers the assessment of construction impacts and operational impacts of Part A.

5.1.2. This chapter summarises the legislative and policy framework and describes the methodology followed for the assessment along with the assessment assumptions and limitations. The model results presented in this chapter are based on traffic modelling of Part A, as set out in **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**). The chapter identifies the potential impacts as a result of Part A, details the design, mitigation and enhancement measures that have been identified and reports the assessment of the significant effects of Part A. This chapter is intended to be read as part of the wider Environmental Statement (ES) and in conjunction with its associated figures and appendices.

5.1.3. This chapter should be read together with the associated appendices (**Appendix 5.1: Traffic Data**, **Appendix 5.2: Construction Traffic Assessment**, **Appendix 5.3: Methodology and Verification, Appendix 5.4: Receptors**, **Appendix 5.5: Operational Impacts - Human Receptors**, **Appendix 5.6: Operational Impacts - Ecological Receptors** and **Appendix 5.7: European Union Limit Value Compliance Risk Assessment**, **Volume 7** of this ES (**Application Document Reference TR010041/APP/6.7**)).

5.1.4. A full description of Part A, along with the Scheme as a whole is set out in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). An assessment of combined effects of Part A is set out in **Chapter 15: Assessment of Combined Effects** of this ES and combined and cumulative effects of the Scheme are set out in **Chapter 16: Assessment of Cumulative Effects**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4).**

5.1.5. **Section 4.3** of **Chapter 4: Environmental Assessment Methodology**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) identifies any differences in the assessment methodology employed for Part A and Part B: Alnwick to Ellingham (Part B). Further to this, there are other differences between the chapters for Part A and Part B. All key differences include:

a. There are differences between Part A and Part B that relate to the scoping process, for example elements that are scoped in and out of the assessment. Refer to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.12**) for Part A, and the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.13**) for Part B.

5.1.6. The future traffic levels for the assessment of Part A are based upon an opening year predicted to be in 2023. Since the assessments reported in this ES were completed, the Part A opening year has been put back to 2024. The assessment is based on traffic modelling for an opening year of 2023 and reported on that basis. However, as explained in **Section 4.1** in **Chapter 4: Environmental Assessment Methodology, Volume 1** of this ES (**Application Document Reference: TR010041/APP6.1**) it is considered that the assessments remain valid for an opening year of 2024.

5.2 COMPETENT EXPERT EVIDENCE

5.2.1. **Table 5-1** below demonstrates that the professionals contributing to the production of this chapter have sufficient expertise to ensure the completeness and quality of this assessment.

Table 5-1 – Relevant Experience

Name	Role	Qualifications and Professional Membership	Relevant Experience
Luc Porter	Author	MSc Environmental Diagnostics and Management BSc Biochemistry Chartered Environmentalist, member of the Institute of Air Quality Management (IAQM)	Principal Consultant Nine years' experience of undertaking Design Manual for Roads and Bridges (DMRB) assessments at various stages of development. Other recent relevant experience includes: - Modeller and author on assessments of A27 Worthing-Lancing - Modeller and author on assessments of M27 Smart Motorway - Modeller and author on assessments of A27 Arundel bypass
Andy Talbot	Reviewer	MSc Environmental Water Management BSc Geology Chartered Scientist, Member of the Institute of Air Quality Management Practitioner of the Institute of Environmental	Associate Director 24 years' experience in impact assessment. Other recent relevant experience includes: - Technical lead on air quality assessments for M25 Design Build Finance Operate (DBFO)

Name	Role	Qualifications and Professional Membership	Relevant Experience
		Management and Assessment.	Sections 2 and 5 Later Upgrade Sections - Technical lead for M62 J25-30 Managed Motorway - Technical lead for M4/M5 Managed Motorway - Technical lead for M3 J9 Improvement - Technical lead for M2 J5 Improvement - Technical lead for A27 Worthing-Lancing - Technical lead for Tranche 5 Smart Motorways Programme M62 J20-25 - Technical lead for A27 East of Lewes

5.3 LEGISLATIVE AND POLICY FRAMEWORK

INTERNATIONAL LEGISLATION

European Union Ambient Air Quality Directive

5.3.1. The European Union (EU) Ambient Air Quality Directive (**Ref. 5.1**) sets limit values for the concentration of pollutants in ambient air for the protection of health and ecosystems. The Directive is transposed into legislation in the Air Quality Standards (England) Regulations 2010 (**Ref. 5.2**) (as amended) (**Ref. 5.3**). Compliance with the EU limit values for pollutants is mandatory and this is ultimately the responsibility of the Secretary of State. Failure to comply will result in infraction proceedings by the EU with potentially a substantial financial penalty.

5.3.2. The EU limit values that are relevant to this assessment are included in **Table 5-2** as 'relevant ambient air quality thresholds.

NATIONAL LEGISLATION

Environment Act and UK Air Quality Strategy

5.3.3. Under the requirements of the Environment Act 1995, the UK government published an Air Quality Strategy (AQS) (**Ref. 5.4**). The AQS sets out the UK's national standards and objectives for ambient air quality, and measures to help achieve the objectives. The overall aim of the AQS is to achieve steady improvement in air quality into the long-term. The

objectives are transcribed into regulations in the Air Quality (England) Regulations 2000 (**Ref. 5.5**) (as amended) (**Ref. 5.6**).

5.3.4. The Environment Act 1995 also sets out the principles for Local Air Quality Management (LAQM) (**Ref. 5.7**) under which Local Authorities are required to review current and future air quality within their area against the air quality objectives. Where it is anticipated that an air quality objective will not be met, the Local Authority is required to declare an Air Quality Management Area (AQMA) and to produce an Action Plan in pursuit of the achievement of the air quality objectives.

5.3.5. The air quality objectives that are relevant to this assessment – and which are numerically the same as the EU limit values – are included in **Table 5-2** as 'relevant ambient air quality thresholds.

Table 5-2 – Relevant Ambient Air Quality Thresholds

Pollutant	Concentration (µg/m³)	Measured As	Number of Exceedances Allowed in a Calendar Year
Set for the protection of human health			
Nitrogen dioxide (NO_2)	40	Annual mean	None
	200	1-hour mean	No more than 18
Particulates less than 10 micrometres in diameter (PM_{10})	40	Annual mean	None
	50	24-hour mean	No more than 35
Particulates less than 2.5 micrometres in diameter ($PM_{2.5}$)	25	Annual mean	None
Set for the protection of ecosystems (critical level)			
Nitrogen oxides (NO_x)	30	Annual mean	None

Environmental Protection Act

5.3.6. Air pollution can constitute a 'statutory nuisance', as set out in the Environmental Protection Act 1990 (**Ref. 5.8**), where fumes, dust or deposits are *"prejudicial to health or a nuisance"* (Part III Statutory Nuisances and Clean Air, Section 79). Local authorities are required to detect any such nuisances within their area. Dust generated by construction and demolition work, such as resulting from activities such as earthworks, the cutting of materials and vehicles using haul roads which results in re-suspension of deposited dust can constitute a

statutory nuisance. Local Authorities have the power to serve an abatement notice, requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence. To avoid causing a statutory nuisance the main contractor would need to demonstrate 'Best Practicable Means' in mitigating emissions. The Development Consent Order (DCO) application is accompanied by a **Statement Relating to Statutory Nuisance** (**Application Document Reference: TR010041/APP/6.15**) which sets out how the Scheme would mitigate against any potential nuisance identified under the Environmental Protection Act 1990 (**Ref. 5.8**).

POLICY

National

5.3.7. National policy relevant to air quality and the significance of Part A on the policy objectives is outlined in **Table 5-3**.

Local

5.3.8. Local policy relevant to air quality and the significance of Part A on the policy objectives is outlined in **Table 5-4**.

Table 5-3 - National Planning Policy Relevant to Air Quality

Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
National Policy Statement for National Networks (NPS NN) Requirements of the Highways England's assessment - paragraphs 5.7 and 5.9 (**Ref. 5.9**)	Paragraph 5.7 outlines that the ES should include a description of: - **"***Existing air quality levels;* - "*Forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account of the impact of the scheme; and* - "*Any significant air quality effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project"* Paragraph 5.9 states: "*In addition to information on the likely significant effects of a project in relation to EIA, the Secretary of State must be provided with a judgement on the risk as to whether the project would affect the UK's ability to comply with the Air Quality Directive."*	The assessment includes all aspects set out in NPS NN paragraph 5.7: - Existing air quality levels are described in **Section 5.7** of this chapter. - The assessment considers both "Do minimum" (without Part A) and "Do Something" (with Part A) scenarios, as set out in **Section 5.4** of this chapter. - Significant effects, mitigation (where required), and residual effects are set out in **Section 5.9** and **Section** 5.10 of this chapter. An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter**.**
National Policy Statement for National Networks (NPS NN) Secretary of State's responsibilities in decision making - Paragraphs 5.12 and 5.13 (**Ref. 5.9**)	Paragraph 5.12 of the NPS NN states: *"The Secretary of State must give air quality considerations substantial weight where a project would lead to a significant air quality impact in relation to EIA and/or where they lead to a deterioration in air quality in a zone/agglomeration."* Paragraph 5.13 of the NPS NN states: *"The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will: result in a zone /agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision".*	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter**.** The results of the assessment confirm that Part A would not have a significant impact in relation to Environmental Impact Assessment (EIA) and would not affect the UK's compliance with the limit values set out in the Air Quality Directive.
National Planning Policy Framework (NPPF) (**Ref. 5.10**)	The NPPF has an overarching environmental objective to protect and enhance our environment and to minimise pollution. In relation to air quality, paragraph 181 of the NPPF states: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas... Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan".*	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter. Part A would sustain future compliance with air quality objectives and EU limit values. The assessment addresses the impacts of cumulative traffic growth. Part A does not affect air quality within any AQMAs.
UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (UK Plan) (**Ref. 5.11**)	The UK Plan sets out measures for bringing NO_2 levels within the EU limit values in the shortest possible time. Under the UK Plan, Highways England has a responsibility to improve air quality on the strategic road network. This includes exploration and testing of innovative technologies and ideas for improving air quality.	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter. Part A would not affect the UK's compliance with the limit values set out in the Air Quality Directive.

Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
		There are no national measures in the UK plan that would be affected by Part A.
Clean Air Strategy 2019 (**Ref. 5.12**)	The Strategy sets out the comprehensive action required from all parts of government and society to help meet legally binding targets of the five most damaging air pollutants (fine particulate matter, ammonia, nitrogen oxides, sulphur dioxide, non-methane volatile organic compounds).	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter. There are no national measures in the UK plan that would be affected by Part A.
Highways England Air Quality Strategy (**Ref. 5.13**)	In August 2017, Highways England published 'Our strategy to improve air quality'. This follows on from the Department for Transport Road Investment Strategy and the Highways England Delivery Plan 2015-2020. The strategy recognises the critical importance of air quality to the UK and sets out the approach to *"achieving cleaner air for our customers and our neighbours who live alongside our network*."	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter. Part A would sustain future compliance with air quality objectives and EU limit values, whilst increasing capacity on the strategic network.

Table 5-4 - Local Planning Policy Relevant to Air Quality

Local Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
NCC Local Plan (2019) Policy STP 5 (Health and Wellbeing) (**Ref. 5.14**)	"*Development proposals will be required to demonstrate that they:* *…g. […] do not have a negative impact upon ground instability, ground and water contamination, vibration, air and noise pollution."*	An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in **Section 5.10** of this chapter. Part A would not impact significantly on any of the actions within the Local Plan.
NCC Local Plan (2019) Policy TRA2 – The effects of development on the transport network (**Ref. 5.14**).	"*1. In assessing development proposals, all developments affecting the transport network will be required to: …* *…f. Minimise any adverse impact on communities and the environment, including noise and air quality*."	The assessment identifies any adverse impacts and specifies mitigation, as set out in **Section 5.9** of this chapter, to ensure no significant residual effects**.**
NCC Local Plan (2019) Policy POL 2 - 'Pollution and Air, soil and water quality' (**Ref. 5.14**)	*"1. Development proposals in locations where they would cause, or be put at unacceptable risk of harm from, or be adversely affected by pollution by virtue of the emissions of fumes, particles, effluent, radiation, smell, heat, light, noise or noxious substances will not be supported.* *2. Development proposals that may cause pollution of water, air or soil, either individually or cumulatively, are required to incorporate measures to prevent or reduce their pollution so as not to cause nuisance or unacceptable impacts on the environment, people or biodiversity.* *3. Development proposed where pollution levels are unacceptable, and unable to be mitigated to acceptable levels, will not be supported.* *4. Development will be required to help: a. Maintain soil quality standards; b. Improve water quality standards in line with the requirements of Policy WAT 1; and c. Maintain air quality standards and*	The assessment identifies any adverse impacts and specifies mitigation to ensure no significant residual effects. Refer to **Section 5.8** and **Section 5.10** of this chapter**.**

Local Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
	support improvements in any identified Air Quality Management Areas consistent with any local air quality action plans."	

5.4 ASSESSMENT METHODOLOGY

5.4.1. This section sets out the scope of the air quality assessment which has been determined via the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**) and **Scoping Opinion** (**Application Document Reference:TR010041/APP/6.12**) and subsequent consultation as detailed in **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). **Appendix 4.1: Scoping Opinion Response Tracker**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the Scoping Opinion comments received from the Planning Inspectorate, along with the responses which have informed the scope, methodology and assessment in this chapter.

SCOPE OF ASSESSMENT

5.4.2. The following topics have been assessed in this chapter:

Construction

a. Construction dust on existing air quality receptors

Operation

a. Changes in roadside pollutant concentrations from operational traffic (local air quality assessment)
b. Emissions from operational traffic (regional air quality assessment)

5.4.3. A review of the construction traffic determined that potential construction traffic impacts on air pollutants could be screened out of the assessment as the predicted construction traffic flows fell well below the DMRB HA 207/07 scoping criteria (**Ref. 5.15**). Refer to **Appendix 5.2: Construction Traffic Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) for further details and justification of this approach.

5.4.4. Since the production of the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**), the level of assessment was changed from ‘simple’ to ‘detailed’ due to potential impacts on ecological receptors. The results presented in this chapter are based on the detailed modelling outputs.

5.4.5. The assessment of roadside air quality considers NO_x, NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) impacts on human health, ecological receptors, and EU limit value compliance. The assessment of regional vehicle emissions considers the changes in CO_2, NO_x and PM_{10}.

CONSULTATION

5.4.6. Consultation relating to potential air quality impacts on human receptors was undertaken with NCC. This is presented in **Appendix 4.2: Environmental Consultation, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**).

5.4.7. Consultation relating to ecological receptors is presented in **Chapter 9: Biodiversity** of this ES.

METHODS OF BASELINE DATA COLLECTION

5.4.8. The baseline data collected and presented in this chapter were sourced by desktop study of publicly available records obtained from NCC and documents from previous stages of this assessment.

DATA SOURCES

5.4.9. The following sources of data have been used for this assessment:

a. Part A traffic modelling, as set out in Chapter 4 of the Case for the Scheme (Application Document Reference: TR010041/APP/7.1).
b. NCC's Air Quality Annual Status Report (ASR) (**Ref. 5.16**).
c. Part A specific NO_2 diffusion tube monitoring undertaken by the Applicant between February 2017 and August 2017.
d. National forecasts for roadside and background pollutant concentrations based on the Pollution Climate Mapping (PCM) model (**Ref. 5.17**) published by the Department for Environment, Food and Rural Affairs (Defra).
e. MAGIC website (**Ref. 5.18**) provides locations of statutory designated sites such as Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, and National and Local Nature Reserves (NNRs and LNRs).
f. Nitrogen deposition and NO_x data published by the online Air Pollution Information System (APIS) (**Ref. 5.19**) for designated ecological sites.
g. Interim Advice Note (IAN) 185/15 – updated vehicle emission rates (**Ref. 5.20**).
h. Defra's NO_x to NO_2 conversion calculator (version 6.1) (**Ref. 5.21**).

METHODOLOGY

5.4.10. The NPS NN requires an assessment of the air quality impacts of a scheme to be undertaken to determine if it is compliant with the policy. This is undertaken in accordance with the DMRB HA 207/07 guidance (**Ref. 5.15**). The assessment should include a description of existing air quality, future air quality with and without Part A in place, and any significant effects, mitigation, and residual effects. The assessment should distinguish between construction and operation. The assessment methodology set out below is compliant with these requirements. This DCO application is accompanied by a **Statement Relating to Statutory Nuisance** (**Application Document Reference: TR010041/APP/6.15**) which sets out how the how the Scheme would mitigate against any potential nuisance identified under the Environmental Protection Act 1990 (**Ref. 5.8**).

5.4.11. The NPPF requires the assessment to give consideration to the impacts of cumulative traffic growth. The assessment set out in this chapter covers the Do-Something (with Part A) traffic scenario for the Part A ARN only. However, an assessment of the Do-Something traffic scenarios for the Scheme as a whole is set out in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme**, **Volume 4** of this ES (**Application Document Reference TR010041/APP/6.4**). In addition, other committed developments were included

in both the Do-Minimum (without Part A but including other committed schemes and developments) and Do-Something scenarios, as set out in **Chapter 4** of the **Case of the Scheme** (**Application Document Reference: TR010041/APP/7.1**).

5.4.12. The methodology for detailed level of assessment is in accordance with DMRB HA 207/07 (**Ref. 5.15**). The following IANs have also been followed:

a. IAN 170/12v3 Updated Air Quality Advice on the Assessment of Future NO_x and NO_2 Projections for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (**Ref. 5.22**).
b. IAN 174/13 Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 'Air Quality' (**Ref. 5.23**).
c. IAN 175/13 Updated air quality advice on risk assessment related to compliance with EU Directive on ambient air quality and on the production of scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality' (**Ref. 5.24**).
d. IAN 185/15 Updated traffic, Air Quality and Noise Advice on the Assessment of Link Speeds and Generation of Vehicle Data into 'Speed Bands' for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3, Part 7 'Noise' (**Ref. 5.20**).

5.4.13. IAN 170/12v3 (**Ref. 5.22)** advises on the projection of NO_x and NO_2 and provides a 'Gap Calculator' to account for the gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality. The calculator utilises projection factors for annual mean NO_2 and NO_x concentrations between 2008 and 2030. Updated projection factors were provided by the Applicant in May 2015 and have been used for this assessment. These updated factors reflect the latest predicted long-term trends from the introduction of Euro 6/VI vehicles (termed 'LTT_{E6}'). The results presented in this chapter are based on outputs of the Gap Calculator.

5.4.14. IAN 174/13 (**Ref. 5.23**) advises on the significance of effects and is discussed below in **paragraphs 5.4.47** to **5.4.54**.

5.4.15. IAN 175/13 (**Ref. 5.24**) has been withdrawn. However, in the absence of published updated advice, IAN 175/13 has been used to assess the impact of Part A on compliance with the Air Quality Directive on ambient air quality.

5.4.16. IAN 185/15 (**Ref. 5.20**) includes vehicle emission rates for defined traffic conditions for NO_x, PM_{10} and CO_2 for use in air quality assessments. Speed band emission factors, associated with IAN 185/15, as issued by Highways England in May 2018 were used for the assessment[1]. As IAN 185/15 does not give emission rates for $PM_{2.5}$ it was assumed that these are the same as for PM_{10}.

[1] Updated emission factors were issued by Highways England in September 2019. The differences between the September 2019 and May 2018 emission factors are too slight to materially affect the findings of the assessment presented in this chapter.

5.4.17. Traffic data for the air quality assessment were provided with a base year of 2015.

5.4.18. The assessment has also taken into account Local Air Quality Management Technical Guidance LAQM.TG (16) (**Ref. 5.25**) in the processing of monitoring data and the verification of dispersion models.

UPDATED DMRB GUIDANCE

5.4.19. Since the assessments reported in this ES were completed, the DMRB methodology HA 207/07 (**Ref. 5.15**) has been superseded and replaced with updated guidance. The updated guidance (DMRB LA 105 Air Quality (**Ref. 5.26**)) was released in November 2019 and provides an all-encompassing guidance document bringing together HA 207/07 (**Ref. 5.15**), IAN 170/2 (**Ref. 5.22**), IAN 174/13 (**Ref. 5.23**), IAN 175/13 (**Ref. 5.24**) and part of IAN 185/15 (**Ref. 5.20**).

5.4.20. To determine the implications of the updated guidance to the conclusions of the ES, a sensitivity test has been undertaken to identify key changes in the assessment methodology and determine whether there would be changes to the significant effects reported in this ES if the updated guidance had been used for the assessment.

5.4.21. The findings of the sensitivity test are detailed in **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) and summarised in **Appendix 5.8: Air Quality DMRB Sensitivity Test, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and in **Section 5.10** of this chapter.

CONSTRUCTION

5.4.22. The assessment of construction dust impacts has been undertaken qualitatively following guidance in DMRB HA 207/07 paragraph 3.45 (**Ref. 5.15**). This has accounted for sensitive receptors such as housing, schools, hospitals and sensitive features within a designated site within 200 metres (m) of the Order Limits of Part A.

OPERATION

Assessment Scenarios

5.4.23. Operational impacts have been assessed (at both a local and regional level) in relation to the following scenarios:

a. Baseline (2015)
b. Opening year (2023) Do-Something (Part A) compared to the Do-Minimum
c. Design year (2038) Do-Something (Part A) compared to the Do-Minimum

5.4.24. In considering local air quality impacts, DMRB HA 207/07 (paragraph 3.5) (**Ref. 5.15**) requires *"the worst year in the first 15 years from opening"* to be assessed. In general, the worst year from opening is the opening year itself, as it is anticipated that reductions in vehicle emission in later years would offset the impacts of traffic growth. Consequently, the assessment of local air quality impacts addresses the opening year only as the worst-case.

For the regional air quality assessment, emissions have also been calculated for the design year (15 years from the opening year).

Air Quality Modelling

5.4.25. The operational assessment has been based on traffic data representative of morning peak, inter-peak, afternoon peak and off-peak periods for the scenarios described above. The data have been derived from the traffic model for Part A (refer to **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**)). Vehicle emissions have been modelled in accordance with IAN 185/15 (**Ref. 5.20)**.

5.4.26. For the local air quality assessment, dispersion modelling using ADMS-Roads v4.1.1.0 (**Ref. 5.27**) was used to predict roadside concentrations of NO_x in the baseline and opening years. For the regional assessment, total emissions of NO_x, PM_{10} and CO_2 were calculated for all roads within the Study Area for the baseline, opening and design year scenarios.

5.4.27. The dispersion modelling used meteorological data for 2015 from Newcastle Airport.

5.4.28. The modelling of the baseline scenario was verified against monitoring data taken from Local Authority and the Applicant's surveys. Three different adjustment (or 'verification') factors were derived to address systematic differences between modelled and monitored pollutant concentrations in three different settings:

a. Morpeth Town ('Group 1')
b. Receptors near monitoring site 'A4' (Earsdon Moor) on the A1 to account for road gradient ('Group 2')
c. All other locations ('Group 3')

5.4.29. Further details of the model setup and verification are provided in **Appendix 5.3: Methodology and Verification**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Selection of Sensitive Receptors

Human Receptors

5.4.30. The Air Quality Regulations (**Ref. 5.6**) make clear that likely exceedances of the air quality objectives should be assessed at locations outside of buildings or other natural or man-made structures above or below the ground, and where members of the public are regularly present. Air quality assessments should, therefore, focus on those locations where members of the public are likely to be regularly present and are likely to be exposed for a period relevant to the averaging period of the objective (i.e. with 'relevant exposure'). The assessment does not need to consider locations where regular public exposure would not be realistic.

5.4.31. The relevant sensitive receptors considered as part of the local air quality assessment were identified using Ordnance Survey data. They comprise locations accessible to the public and locations where those more vulnerable to the effects of poor air quality, such as the young and the elderly, are likely to be present such as residential properties, schools,

hospitals and care homes within 200 m of the ARN (**Section 5.7**). For further details of the ARN refer to **Section 5.6** below.

5.4.32. It is not necessary to quantify impacts at all such receptors, rather a sub-set of receptors is selected for the analysis. Based on the ARN, twenty five representative human receptors have been selected. These receptors represent worst-case locations with likely relevant human exposure to air pollutants from the ARN. Details of these receptors can be found in **Appendix 5.4: Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) with locations shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.4.33. Further consideration of human health impacts is set out in **Chapter 12: Population and Human Health** of this ES and considered for the Scheme as a whole in **Chapter 16: Assessment of Cumulative Effects**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

Ecological Receptors

5.4.34. In relation to sensitive ecological receptors, Annex F of DMRB HA 207/07 (**Ref. 5.15**) states "*The sites that should be considered for assessment are those for which the designated features are sensitive to air pollution, either directly or indirectly, and which could be adversely affected by the effect of local air pollution on vegetation within the following nature conservation sites SAC (SCI or cSAC), SPA, pSPA, SSSIs and Ramsar sites*."

5.4.35. In the **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.12**) from the Planning Inspectorate, it was requested that *"in addition to designated sites which may be impacted by changes in air quality, the ES should additionally assess locally and non-designated sites that could be affected by the Proposed Development"*. Therefore, other non-designated nature conservation sites were considered, including Local Wildlife Sites (LWS), LNRs, and ancient woodland.

5.4.36. The details of these sites are presented in **Appendix 5.4: Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), and the sites are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.4.37. The relevant sensitive ecological receptors were identified in consultation with Natural England (refer to **Chapter 9: Biodiversity** of this ES). The locations of all ecological sites are shown in **Figure 9.3: Statutory Designated Sites** and **Figure 9.4: Non-statutory Designated Sites**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.4.38. There are two designated sites within 200 m of the ARN with features potentially sensitive to air quality impacts, the representative modelled receptor is given in brackets:

a. River Coquet and Coquet Valley Woodlands SSSI (Eco1/ Eco9 / Eco12)
b. Longhorsley Moor SSSI (Eco2)

5.4.39. The River Coquet Valley Woodland SSSI is crossed by the ARN at three locations (Weldon, Part A and Felton), and each crossing is considered separately.

5.4.40. There are also 20 non-statutory and ancient woodland sites within 200 m of the ARN with features that are sensitive to air quality impacts, the representative modelled receptor is given in brackets:

Ancient Woodland

a. Dukes Bank Wood (Eco1)
b. Park Wood/Bothal Bank (Eco3)
c. Cotting Wood (Eco4)
d. Davies Wood (Eco5)
e. Scotch Gill Wood (Eco6)
f. Borough Wood (Eco7)
g. Well Wood (Eco8)
h. Weldon Wood (Eco11)
i. Stobswood (Eco13)
j. Dukes Bank Wood (Eco 16)
k. Burnie House Dean Wood (Eco14)

Local Nature Reserve

a. Carlisle Park (Eco15)
b. Ulgham Meadow (Eco10)

Local Wildlife Sites

a. Bothal Burn and River Wansbeck (Eco3)
b. Wansbeck & Hartburn Woods (Eco7)
c. Coquet River Felton Park (Eco1)
d. Cocklaw Dene (Eco17)
e. Cawledge Burn (Eco18)
f. Coney Garth Pond (Eco19)
g. Longhorsley Moor (Eco2)

5.4.41. The potential impacts were determined at receptor points extending along a linear transect from the road edge at 0 m up to 200 m within each site, running perpendicular from the centreline of the nearest ARN road link. These transects are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

Determination of Total Pollutant Concentrations

5.4.42. Total pollutant levels have been determined through adjustment of model outputs using the adjustment factors derived in model verification (refer to **Appendix 5.3: Methodology and Verification**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

5.4.43. Following IAN 170/12v3 (**Ref. 5.22**), future year total annual mean NO_x and NO_2 concentrations have been adjusted to take account of the impact of alternative long-term trends in vehicle NO_x emissions to address the uncertainty in forecast reductions in vehicle NO_x emissions. This is a robust and worst-case approach.

5.4.44. Modelled concentrations of NO_x have been converted to NO_2 using Defra's NO_x to NO_2 Calculator v6.1 (**Ref. 5.21**), with incorporation of background concentrations of NO_2.

5.4.45. Total annual mean concentrations of NO_x and particulates were determined by adding the relevant background concentrations.

5.4.46. To determine nitrogen deposition rates at ecological receptors the methodology in the DMRB HA 207/07 Annex F (**Ref. 5.15**) has been followed.

SIGNIFICANCE OF EFFECT

Human Receptors

5.4.47. The assessment of the significance of air quality effects follows IAN 174/13 (**Ref. 5.23**).

Construction

5.4.48. DMRB HA 207/07 (**Ref. 5.15**) does not provide guidance on impact magnitude for construction dust impacts. The assessment has assumed that where sensitive receptors are present within 200 m of construction works; any impacts would risk causing a significant effect in terms of loss of amenity and require mitigation. Such measures have been incorporated into the **Outline Construction Environmental Management Plan (Outline CEMP)** (**Application Document Reference: TR010041/APP/7.3**), which accompanies the DCO application, to ensure no significant effects from dust.

Operation

5.4.49. IAN 174/13 (**Ref. 5.23**) provides guidance on describing the magnitude of local air quality impacts and determining the significance of effects for human and designated site receptors. There is no guidance on determining the significance of effects from impacts on regional emissions of NO_x, PM_{10} or CO_2. The impacts are presented for each option and scenario in terms of total emissions and differences between the Do-Something (with Part A) and Do-Minimum (without Part A).

5.4.50. The magnitude of local air quality impacts was assigned for each human receptor according to **Table 5-5.**

5.4.51. A significant effect may be adverse or beneficial. In accordance with IAN 174/13 (**Ref. 5.23**), impacts that are not imperceptible and where the Do-Minimum and/or Do-Something concentration is greater than the relevant annual mean threshold (**Table 5-2**) were considered in determining the significance of effect. Imperceptible impacts are discounted from the judgment of significant effects.

5.4.52. Determination of an overall significant effect is largely down to professional judgement using guidance (IAN 174/13 and 175/13) to consider the scale and likely duration of the impact(s),

the numbers of sensitive receptors affected, and EU limit value compliance risk. IAN 174/13 (**Ref. 5.23**) suggests ranges for the number of human receptors that could constitute a significant effect according to the magnitude of impact, refer to **Table 5-5**. IAN 175/13 (**Ref. 5.24**) provides an approach for assessing EU limit value compliance risk - with a focus on annual mean NO_2. IAN 174/13 (**Ref. 5.23**) advises that where the compliance risk is determined to be 'high' then the effect of a scheme is more likely to be significant than if the risk is 'low'.

Table 5-5 - Magnitude of Change and Guideline Significance Criteria

Classification of Magnitude	Change in Annual Mean NO_2 or PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors Constituting a Significant Effect	
		Worsening of air quality objective already above objective or creation of new exceedance	Improvement of air quality objective already above objective or removal of existing exceedance
Large	>4	1 to 10	1 to 10
Medium	>2 - 4	10 to 30	10 to 30
Small	>0.4 - 2	30 to 60	30 to 60
Imperceptible	≤0.4	Not included in the judgement of significant effects	

Ecological Receptors

5.4.53. Following IAN 174/13 (**Ref. 5.23**), concentrations of annual mean NO_x were used as the main basis for evaluating significant effects at ecological receptors. According to IAN 174/13 (**Ref. 5.23**), if annual mean NO_x concentrations with Part A are below the 'critical level'[2] of 30 $\mu g/m^3$ then significant effects are not anticipated. Also, if the critical level is exceeded but the change in concentration is less than 1% of the critical level then the impact is

[2] APIS (**Ref. 5.19**) cites the definition of the critical level as *"concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge"*

considered imperceptible and unlikely to be significant. However, where the critical level is exceeded, and the change is greater than 1% then the impact on nitrogen deposition (kg N/ha/yr) also needs to be considered by an ecologist to determine the significance of effect. The determination of significance of effect is addressed in **Chapter 9: Biodiversity** of this ES.

5.4.54. Nitrogen deposition impacts have been considered in relation to the lower 'critical load'[3,4] for the most sensitive feature (site or habitat) at each site. Critical loads were ascertained from the APIS database (**Ref. 5.19**).

FUTURE BASELINE

5.4.55. The future baseline describes the conditions that are expected if Part A was not to proceed. In the future baseline, vehicle emissions are projected to be lower than at present due to cleaner vehicle technologies becoming more pervasive within the vehicle fleet. Current emissions projections do not extend beyond 2030 after which they have been assumed to stay the same. Traffic data have taken into account future development that are likely to be progressed along the ARN.

5.4.56. Where the assessment of effects has drawn on the results of other technical assessments, any forecasting undertaken for those assessments applies.

5.5 ASSESSMENT ASSUMPTIONS AND LIMITATIONS

5.5.1. The dispersion modelling has been based on traffic data approved for use set out in **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**). Whilst there may be some residual uncertainty in the traffic data, this has been minimised as far as is practicable.

5.5.2. In the baseline year, systematic uncertainties in the model inputs and process are accounted for by verifying the modelled roadside concentrations against measured NO_2 concentrations. This process produces an adjustment factor which can then be applied to all model results. This assumes that the underlying reasons for the over or under-prediction of concentrations in the baseline year persist into the future. Different verification factors have

[3] APIS (**Ref. 5.19**) cites the definition of the critical load as *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge".*

[4] Certain ecological features are sensitive to changes in nutrient nitrogen input (**Ref. 5.19**). One input pathway is by atmospheric deposition of nitrogen compounds (e.g. NO_x). When the ambient concentration of NO_x exceeds the critical level then a change in nitrogen deposition could be important. Unlike the critical level, which is a single value threshold set for the protection of ecosystems in general, critical loads have been defined by the United Nations Economic Commission for Europe for specific features and are given as ranges rather than a single value to reflect variation in ecosystem response across Europe. In assessing the nitrogen deposition impacts, comparison against the lower critical load is the worst-case and most robust approach.

been applied to account for local conditions. The verification factors for Part A are all greater than 1, implying that concentrations in the baseline are under-predicted prior to adjustment. Details of the model verification process are provided in **Appendix 5.3: Methodology and Verification**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

5.5.3. In future years, a further uncertainty relates to the projection of vehicle emissions, in-particular the rate at which emissions per vehicle improve over time. This has been accounted for through the application of the guidance set out in IAN 170/12v3 (**Ref. 5.22**). This IAN provides advice on the adjustment of modelled concentrations of NO_2 (and NO_x) to take account of recent trends in roadside pollutant concentrations and evidence on future vehicle emissions. The latest annual projection factors (LTT_{E6}) have been used for this assessment. Of the available datasets, LTT_{E6} best reflects the most recent evidence on the impacts of Euro 6/VI vehicles entering the fleet, whilst retaining an appropriate level of conservatism.

5.5.4. For the calculation of regional emissions projections for the UK fleet mix and vehicle emissions are not available beyond 2030. Therefore, emissions in the design year (2038) have been modelled using projections for 2030. This is a conservative assumption, since the emission rates per vehicle are anticipated to decline beyond 2030 as the number of 'zero emissions' (fully electric) vehicles increases.

5.5.5. The ADMS-Roads models assume that height differences between modelled roads and receptors are minimal. For human receptors a height of 1.5 m was assumed which corresponds to the standard breathing zone (**Ref. 5.25**).

5.5.6. For ecological receptors a height of 0 m was assumed. This may result in concentrations being over-estimated in some locations where the real-world position of the receptor is at lower or higher level relative to road level. A notable location where concentrations may be over-estimated is where Part A crosses over the River Coquet and Coquet Valley Woodlands SSSI.

5.5.7. In order to undertake a conservative assessment, $PM_{2.5}$ emissions were assumed to be the same as PM_{10} emissions. For assessment purposes, background concentrations $PM_{2.5}$ were also assumed to be the same as for PM_{10}. As PM_{10} comprises $PM_{2.5}$ and particle sizes between 2.5 and 10 micrometres, the air quality assessment is likely to have overestimated $PM_{2.5}$ concentrations.

5.6 STUDY AREA

5.6.1. In accordance with DMRB HA 207/07 (**Ref. 5.15**), Study Areas were defined for the air quality impacts in construction and operational phases of Part A scoped into the assessment (**Section 5.4**).

CONSTRUCTION

5.6.2. The Study Area for construction dust consists of an area within 200 m of the Order Limits of Part A. Beyond 200 m any dust impacts are very unlikely to give rise to a significant effect, as stated in DMRB HA 207/07 (**Ref. 5.15**).

OPERATION

5.6.3. The extent of the road network to be included in the Study Area for operational local and regional air quality impacts has been determined using DMRB HA 207/07 (**Ref. 5.15**) scoping criteria to identify the ARN. These criteria have been applied to only those road links within the Traffic Reliability Area (TRA), as outlined in IAN 185/15 (**Ref. 5.20**). The ARN is shown in **Figure 5.1: Affected Road Network**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.6.4. A road link qualifies as part of the ARN if one or more of the following criteria are satisfied:

a. Road alignment will change by 5 m or more
b. Daily traffic flows will change by 1,000 annual average daily traffic (AADT) flow or more
c. Heavy duty vehicle (HDV) flows will change by 200 AADT or more
d. Daily average speed will change by 10 km/h or more
e. Peak hour speed will change by 20 km/h or more

5.6.5. Ambient concentrations of air pollutants emitted by road traffic sources decline rapidly with increasing distance away from the road edge within the first 20 m to 30 m. Beyond 30 m the decline is less pronounced but by about 200 m the contributions are nominal. The Study Area for local air quality impacts has been therefore defined as a corridor extending 200 m either side the ARN. Beyond this distance any local air quality impacts would be imperceptible.

5.6.6. Information on daily traffic flows for the affected road links within the Study Area is provided in **Appendix 5.1: Traffic Data**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

5.7 BASELINE CONDITIONS

EXISTING BASELINE

5.7.1. The following baseline section considers the Study Area for Part A.

Local Air Quality Management

5.7.2. There are no AQMA's within 200 m of the ARN. The nearest is Newcastle City Council AQMA No.5 (Gosforth), which is approximately 6.5 kilometres (km) to the south of Part A.

5.7.3. NCC undertakes air quality monitoring using a network of continuous (automatic) monitors and non-automatic (i.e. diffusion tubes) monitoring sites. NCC undertakes air quality monitoring at six locations within 200 m of the ARN. Data for the period 2013 to 2017 inclusive are given in **Table 5-6**. The locations are shown in **Figure 5.3: Air Quality Monitoring**, **Volume 5** of this ES (**Application Document Reference:**

TR010041/APP/6.5). There have been no exceedances of the annual mean objective at any of these locations. The highest concentration of 31µg/m^3 was measured for 2016 and 2017 at roadside on Bondgate Without, Alnwick.

5.7.4. NCC undertakes monitoring of PM_{10} and $PM_{2.5}$ at two sites within its jurisdiction: Blyth Library (urban centre) and Cowpen Road (roadside). Recorded concentrations for PM_{10} and $PM_{2.5}$ were less than 14 µg/m^3 and 6.5 µg/m^3 at both locations respectively. Both concentrations are well below the respective annual mean AQS objective levels of 40 µg/m^3 and 25 µg/m^3. 24-hour mean PM_{10} concentrations also met the objective in the same period.

5.7.5. According to NCC air quality monitoring data, baseline air quality in the general area of Part A is likely to be good. There are no clear long-term trends indicted by the monitoring data.

Table 5-6 - NCC NO_2 Diffusion Tube Monitoring Data

Site	Type	Co-ordinates		Annual Mean NO_2 Concentration (µg/m^3)				
		X	Y	2013	2014	2015	2016	2017
8N	Roadside	419025	613070	28	30	30	31	31
CM2	Roadside	419525	586380	22	23	19	24	25
CM4	Roadside	419947	585937	28	26	22	21	26
CM5	Roadside	420134	586329	-	-	21	26	22
CM6	Roadside	420077	585814	-	-	25	26	19
CM7	Roadside	420371	582725	-	-	26	27	20

Part A Specific Monitoring

5.7.6. Part A specific monitoring was commissioned by the Applicant over a six-month period between February and August 2017. To provide an estimate of annual mean concentrations for the assessment base year of 2015, and to account for seasonal variations across the year, the data were annualised in accordance with the approach given in Defra's LAQM.TG (16) guidance (**Ref. 5.25**). The monitoring extent covered both Part A and Part B to ensure the dataset is technically robust and was used for model verification.

5.7.7. **Table 5-7** includes data for the monitoring sites within 200 m of the Order Limits of Part A. These locations are indicated in **Figure 5.3: Air Quality Monitoring**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

Table 5-7 – Part A Specific Monitoring Data

Site	Type	X	Y	2015 Annual Mean NO_2 Concentration (µg/m^3)
A1 – A1 north of junction with A697	Roadside	418239	588637	19.7
A2 – A1 near Strafford House	Roadside	418349	589725	18.3
A3 – A1 near Shield Green	Roadside	418841	592312	14.2
A4 – A1 near Earsdon Moor	Roadside	418935	593684	26.8
A5 – A1 near Causey Park Bridge	Roadside	418945	594352	20.9
A6 – A1 near Causey Park Lodge	Roadside	419038	595322	9.8
A7 – A1 near Longdyke Burn	Roadside	417861	597325	23.7
BG (A) – Burgham	Background	417351	596921	5.8

5.7.8. **Table 5-7** indicates that the maximum measured annual mean concentration within the ARN is 26.8 µg/m^3 at site A4. All measured concentrations are well below the relevant 40 µg/m^3 objective

5.7.9. Overall, baseline air quality along Part A is likely to be good.

Defra Pollution Climate Mapping

Roadside Concentrations

5.7.10. The PCM model is used by Defra, in combination with monitoring data, for the assessment of compliance with EU limit values. Compliance information is reported within 43 zones and urban agglomerations across the UK.

5.7.11. The PCM model also includes a module for the modelling of roadside pollutant concentrations. Around 18,000 links are included in the model in the UK, 29 of which coincide with the ARN, as shown in **Figure 5.3: Air Quality Monitoring**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). Defra provide roadside projections of pollutant concentrations at annual intervals, from 2015 to 2030.

5.7.12. PCM data for 2015 were available from Defra's UK-Air website (**Ref. 5.17**). The data indicate maximum roadside annual mean NO_2 concentrations in the Study Area are up to 29.9 µg/m^3 in the baseline, which does not exceed the 40 µg/m^3 EU limit value. None of the PCM data for links within the air quality Study Area exceed or are at risk of exceeding the EU limit value in the opening year.

Background Concentrations

5.7.13. The pollutant concentration at any location has two components, namely a contribution from the local (modelled) sources and a contribution from more distant sources. Background pollutant concentrations for this assessment, that is those resulting from distant sources and pollutant transport, have been taken from the mapped PCM data provided by Defra on a 1 x 1 km grid covering the UK.

5.7.14. The background data are provided by Defra for all years from 2010 to 2030 from the output of the PCM Model.

5.7.15. **Table 5-8** shows a summary of the background data for the assessment years 2015 (baseline), 2023 (opening year) and 2030 (assumed representative of the design year, 2038) with both total pollutant concentrations, and the concentration with the contribution of major roads removed. Background concentrations are currently well within the air quality objectives for the protection of human health and ecological receptor for all pollutants. It is predicted that pollutant concentrations would improve over time due to a reduction in emissions from all emission sources and sectors, both in the UK and in Europe.

Table 5-8 – Annual Mean Background Pollutant Concentrations (µg/m^3)

Year	NO_x	NO_2	PM_{10}	$PM_{2.5}$
Objective	40	30	40	25
Total Pollutant concentrations				
2015	6.3 – 11.7	4.9 – 8.9	7.9 – 11.1	5.4 – 7
2023	4.8 – 8.4	3.8 – 6.5	7.5 – 10.7	5.1 – 6.7
2030	4 – 6.8	3.2 – 5.3	7.4 – 10.6	5 – 6.6
Concentrations with major road contribution removed				
2015	6.1 - 10.7	-	7.9 - 11	5.4 – 7
2023	4.8 - 7.9	-	7.5 - 10.7	5.1 - 6.7
2030	4 - 6.5	-	7.4 - 10.6	5 - 6.5

Human Receptors

5.7.16. Baseline (without Part A) annual mean NO_2 and PM_{10}/$PM_{2.5}$ concentrations for 2015 at receptors are presented in **Table 5-9**. Further data are provided in **Appendix 5.5: Operational Impacts – Human Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Receptor locations are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.7.17. Concentrations of all pollutants are well below their respective objectives for all pollutants. The highest annual mean concentrations of 33.0 µg/m^3 for NO_2 and 23.6 µg/m^3 for PM_{10}/$PM_{2.5}$ occur at R25, situated on Newgate Street (A192), Morpeth. 24-hour mean PM_{10} concentrations are compliant with the objective at all receptors.

Table 5-9 – Baseline Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations (µg/m^3) for 2015

Receptor	NO_2	PM_{10}/$PM_{2.5}$
R001	7.5	10.2
R002	10.5	10.9
R003	17.6	11.7
R004	16.0	10.6
R005	7.7	10.1
R006	11.6	11.8
R007	7.1	10.8
R008	13.9	11.1
R009	23.9	12.4
R010	10.7	11.1
R011	8.2	9.3
R012	13.7	10.3
R013	14.8	11.7
R014	12.3	11.6
R015	8.6	10.9
R016	7.3	8.2
R017	12.5	10.2
R018	8.6	9.8

Receptor	NO_2	$PM_{10}/PM_{2.5}$
R019	19.1	12.0
R020	6.0	10.5
R021	6.2	10.5
R022	26.8	13.4
R023	13.0	11.0
R024	7.9	9.6
R025	33.0	23.6

Ecological Receptors

5.7.18. River Coquet and Coquet Valley Woodlands SSSI and Longhorsley Moor SSSI are the only sensitive designated ecological receptors within 200 m of the ARN. There are 20 other non-statutory and ancient woodland sites within 200 m of the ARN. The annual mean NO_x concentrations and nitrogen deposition rates for 2015 are given in **Table 5-10**. Data for all transect receptors are provided in **Appendix 5.6: Operational Impacts – Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Receptor locations are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.7.19. Annual mean NO_x concentrations exceed the critical level of 30 µg/m^3 at 19 of the 33 transect sites and nitrogen deposition exceeds the lower critical load for the most sensitive feature in all cases. Therefore, there is potential that the habitats are currently adversely affected by existing ambient pollutant concentrations.

Table 5-10 – Baseline Annual Mean NO_x Concentrations and Nitrogen Deposition Rates for 2015

Site	Transect	Annual Mean NO_x		Nitrogen Deposition Rate		
		Baseline Concentration (µg/m^3) at Closest Point to Site	Distance (m) from Road to which Critical Level is Exceeded	Lower Critical Load (kg N/ha/yr.) for Most Sensitive Feature	Baseline Nitrogen Deposition Rate (kg N/ha/yr.) at Closest Point within Site to Road	Distance (m) from Road to which Lower Critical Load is Exceeded
Designated Sites (National and International)						
River Coquet Valley and Woodland SSSI (west of A1)	Eco1W	**45.9**	5	15	**25.0**	200
River Coquet Valley and Woodland SSSI (east of A1)	Eco1E	**30.7**	0	15	**24.3**	200
River Coquet Valley and Woodland SSSI (west of A697)	Eco9W	26.1	N/A	15	**24.0**	95
River Coquet Valley and Woodland SSSI (east of A697)	Eco9E	**38.5**	0	15	**24.6**	190
River Coquet Valley and Woodland SSSI (west of A1 Felton)	Eco12W	**35.7**	0	15	**16.2**	85
River Coquet Valley and Woodland SSSI (east of A1 Felton)	Eco12E	**48.4**	5	15	**16.8**	50
Longhorsley Moor SSSI	Eco2	26.9	N/A	10	**16.3**	200
Ancient Woodland						
Dukes Bank Wood (west of road)	Eco1W	**45.9**	5	15	**25.0**	200
Dukes Bank Wood (east of road)	Eco1E	**30.7**	0	15	**24.3**	200
Park Wood/Bothal Bank	Eco3	15.3	N/A	10	**16.8**	195
Cotting Wood	Eco4	14.1	N/A	15	**17.2**	195
Davies Wood	Eco5	17.0	N/A	10	**17.4**	120
Scotch Gill Wood	Eco6	12.6	N/A	10	**17.2**	170
Borough Wood (west of road)	Eco7W	**53.1**	5	10	**19.2**	160
Borough Wood (east of road)	Eco7E	**79.1**	20	10	**20.3**	200
Well Wood	Eco8	**127.6**	45	10	**19.5**	200
Weldon Wood	Eco11	12.4	N/A	10	**15.9**	200
Stobswood	Eco13	10.3	N/A	10	**15.4**	150
Dukes Bank Wood	Eco16	13.4	N/A	15	**15.6**	25
Burnie House Dean Wood	Eco14	7.1	N/A	10	**15.6**	195
Local Nature Reserve						
Carlisle Park	Eco15	15.8	N/A	10	**17.3**	135
Ulgham Meadow	Eco10	**39.7**	0	10	**16.9**	200
Borough Wood (east of road)	Eco7E	**79.1**	20	10	**20.3**	200

Site	Transect	Annual Mean NO_x		Nitrogen Deposition Rate		
		Baseline Concentration (µg/m^3) at Closest Point to Site	**Distance (m) from Road to which Critical Level is Exceeded**	**Lower Critical Load (kg N/ha/yr.) for Most Sensitive Feature**	**Baseline Nitrogen Deposition Rate (kg N/ha/yr.) at Closest Point within Site to Road**	**Distance (m) from Road to which Lower Critical Load is Exceeded**
Local Wildlife Sites						
Bothal Burn and River Wansbeck	Eco3	15.3	N/A	10	**16.8**	195
Wansbeck & Hartburn Woods (west of road)	Eco7W	**53.1**	5	10	**19.2**	200
Wansbeck & Hartburn Woods (east of road)	Eco7E	**79.1**	20	10	**20.3**	200
Coquet River Felton Park (west of road)	Eco1W	**45.9**	5	15	**25.0**	200
Coquet River Felton Park (east of road)	Eco1E	**30.7**	0	15	**24.3**	200
Cocklaw Dene (west of road)	Eco17W	**46.4**	0	15	**15.5**	0
Cocklaw Dene (east of road)	Eco17E	**71.6**	10	10	**16.7**	5
Cawledge Burn (west of road)	Eco18W	**64.0**	10	10	**19.1**	200
Cawledge Burn (east of road)	Eco18E	**68.1**	10	10	**19.2**	200
Coney Garth Pond	Eco19	**61.7**	5	5	**19.1**	200
Longhorsley Moor	Eco2	26.9	N/A	10	**16.3**	200
Cotting Wood	Eco4	14.1	N/A	15	**17.2**	195

Notes:
Values in **bold** exceed the critical level of 30µg/m^3 or lower critical load for the most sensitive feature

FUTURE BASELINE

Human Receptors

5.7.20. Future baseline annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations for 2023 are presented in **Table 5-11**. Data are also provided in **Appendix 5.5: Operational Impacts – Human Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Receptor locations are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.7.21. With forecast replacement of older, more polluting technologies in the vehicle fleet with cleaner technologies, pollutant concentrations in 2023 are predicted to be lower than in 2015. The highest annual mean concentrations of 21.8 µg/m^3 for NO_2 and 17.4 µg/m^3 for PM_{10} and $PM_{2.5}$ are predicted at R25. 24-hour mean PM_{10} concentrations are compliant with the objective at all receptors.

Table 5-11 – Future Baseline Annual Mean NO_2, PM_{10} and $PM_{2.5}$ Concentrations (µg/m^3) for 2023

Receptor	NO_2	PM_{10} and $PM_{2.5}$
R001	5.7	9.8
R002	8.2	10.4
R003	14.3	11.2
R004	13.0	10.1
R005	6.0	9.7
R006	9.1	11.3
R007	5.4	10.4
R008	10.9	10.6
R009	19.0	11.6
R010	8.4	10.7
R011	6.4	8.9
R012	11.8	9.9
R013	11.6	11.2
R014	9.7	11.2
R015	6.7	10.6
R016	5.6	7.8
R017	9.8	9.7

Receptor	NO_2	PM_{10} and $PM_{2.5}$
R018	6.7	9.4
R019	15.2	11.4
R020	4.5	10.1
R021	4.7	10.1
R022	21.5	12.6
R023	10.0	10.4
R024	6.1	9.3
R025	21.8	17.4

Ecological Receptors

5.7.22. Future baseline annual mean NO_x concentrations and nitrogen deposition rates for 2023 are given in **Table 5-12**. Data for all transect receptors are provided in **Appendix 5.6: Operational Impacts – Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Receptor locations are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

5.7.23. With forecast replacement of older, more polluting technologies in the vehicle fleet with cleaner technologies, pollutant concentrations in 2023 are predicted to be lower than in 2015. Annual mean NO_x concentrations still exceed the critical level of 30 µg/m^3 at 14 of the 33 transect sites and nitrogen deposition exceeds the lower critical load for the most sensitive feature at 28 of the 33 transect sites. Therefore, it is probable that the habitats may still be adversely affected by future ambient pollutant concentrations.

Table 5-12 – Future Baseline Annual Mean NO_x Concentrations and Nitrogen Deposition Rates for 2023

Site	Transect	Annual Mean NO_x		Nitrogen Deposition Rate		
		Future Baseline Concentration (µg/m^3) at Closest Point within Site to Road	Distance (m) from Road to which Critical Level is Exceeded	Lower Critical Load (kg N/ha/yr.) for Most Sensitive Feature	Baseline Nitrogen Deposition Rate (kg N/ha/yr.) at Closest Point within Site to Road	Future Baseline Concentration (µg/m^3) at Closest Point within Site to Road
Designated Sites (National and International)						
River Coquet Valley and Woodland SSSI (west of A1)	Eco1W	**33.4**	0	15	**21.0**	200
River Coquet Valley and Woodland SSSI (east of A1)	Eco1E	22.1	N/A	15	**20.3**	200
River Coquet Valley and Woodland SSSI (west of A697)	Eco9W	18.8	N/A	15	**20.2**	95
River Coquet Valley and Woodland SSSI (east of A697)	Eco9E	28.2	N/A	15	**20.7**	190
River Coquet Valley and Woodland SSSI (west of A1 Felton)	Eco12W	26.2	N/A	15	13.6	0
River Coquet Valley and Woodland SSSI (east of A1 Felton)	Eco12E	**35.8**	0	15	14.1	0
Longhorsley Moor SSSI	Eco2	19.2	N/A	10	**13.6**	200
Ancient Woodland						
Dukes Bank Wood (west of road)	Eco1W	**33.4**	0	15	**21.0**	200
Dukes Bank Wood (east of road)	Eco1E	22.1	N/A	15	**20.3**	200
Park Wood/Bothal Bank	Eco3	10.5	N/A	10	**14.1**	195
Cotting Wood	Eco4	9.3	N/A	15	14.5	125
Davies Wood	Eco5	11.0	N/A	10	**14.6**	190
Scotch Gill Wood	Eco6	9.0	N/A	10	**14.4**	170
Borough Wood (west of road)	Eco7W	**42.7**	0	10	**16.3**	200
Borough Wood (east of road)	Eco7E	**65.4**	10	10	**17.4**	200
Well Wood	Eco8	**95.7**	25	10	**16.5**	200
Weldon Wood	Eco11	8.7	N/A	10	**13.3**	200
Stobswood	Eco13	7.1	N/A	10	**12.9**	150
Dukes Bank Wood	Eco16	9.4	N/A	15	13.1	25
Burnie House Dean Wood	Eco14	4.8	N/A	10	**13.1**	195
Local Nature Reserve						
Carlisle Park	Eco15	10.7	N/A	10	**14.5**	135
Ulgham Meadow	Eco16	28.9	N/A	10	**14.2**	200
Local Wildlife Sites						

Site	Transect	Annual Mean NO_x		Nitrogen Deposition Rate		
		Future Baseline Concentration (µg/m^3) at Closest Point within Site to Road	**Distance (m) from Road to which Critical Level is Exceeded**	**Lower Critical Load (kg N/ha/yr.) for Most Sensitive Feature**	**Baseline Nitrogen Deposition Rate (kg N/ha/yr.) at Closest Point within Site to Road**	**Future Baseline Concentration (µg/m^3) at Closest Point within Site to Road**
Bothal Burn and River Wansbeck	Eco3	10.5	N/A	10	**14.1**	195
Wansbeck & Hartburn Woods (west of road)	Eco7W	**42.7**	0	10	**16.3**	200
Wansbeck & Hartburn Woods (east of road)	Eco7E	**65.4**	10	10	**17.4**	200
Coquet River Felton Park (west of road)	Eco1W	**33.4**	0	15	**21.0**	200
Coquet River Felton Park (east of road)	Eco1E	22.1	N/A	15	**20.3**	200
Cocklaw Dene (west of road)	Eco17W	**34.8**	0	15	13.1	0
Cocklaw Dene (east of road)	Eco17E	**54.2**	5	10	**14.0**	0
Cawledge Burn (west of road)	Eco18W	**47.9**	0	10	**16.0**	200
Cawledge Burn (east of road)	Eco18E	**50.9**	5	10	**16.2**	200
Coney Garth Pond	Eco19	**43.8**	0	5	**15.9**	200
Longhorsley Moor	Eco2	19.2	N/A	10	**13.6**	200

Notes:
Values in **bold** exceed the critical level (30 µg/m^3), or lower critical load for the most sensitive feature

5.8 POTENTIAL IMPACTS

CONSTRUCTION

5.8.1. Air quality impacts due to construction of Part A would be temporary, and typically include an increase in emissions of dust from earthworks and general construction activity and a loss of amenity due to increased dust levels.

5.8.2. There are 108 receptors within 200 m of the Order Limits of Part A. These include residential premises, Tritlington Church of England Aided First School, Northgate Hospital and Northumbrian Woodland Burials. These are illustrated on **Figure 5.4: Construction Receptors**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). The River Coquet and Coquet Valley Woodlands SSSI is crossed by Part A and could experience increased levels of dust in the absence of appropriate mitigation.

OPERATION

Human Receptors

5.8.3. Part A has the potential to impact on ambient concentrations of NO_2, PM_{10} and $PM_{2.5}$ through changes to vehicle emission rates as a result of traffic re-routing and changes to fleet mix and speeds.

5.8.4. Results for annual mean NO_2, PM_{10} and $PM_{2.5}$ at human receptors are presented in **Table 5-13** and **Table 5-14**. Receptor locations are shown in **Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). All results for both NO_2 and PM_{10} and $PM_{2.5}$ are also provided in **Appendix 5.5: Operational Impacts – Human Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

5.8.5. The potential impacts of Part A have been assessed in relation to the air quality assessment thresholds (**Table 5-2**).

Table 5-13 – Predicted Annual Mean NO_2 Concentrations (µg/m^3) for 2023

Receptor	Do-Minimum	Do-Something	Change with Do-Something
R001	5.7	5.8	0.1
R002	8.2	8.3	0.1
R003	14.3	15.2	0.9
R004	13.0	13.8	0.8
R005	6.0	6.2	0.2
R006	9.1	10.0	0.9
R007	5.4	5.7	0.3
R008	10.9	10.4	-0.5

Receptor	Do-Minimum	Do-Something	Change with Do-Something
R009	19.0	22.1	3.1
R010	8.4	8.5	0.1
R011	6.4	6.5	0.1
R012	11.8	12.6	0.8
R013	11.6	6.4	-5.2
R014	9.7	9.9	0.2
R015	6.7	6.8	0.1
R016	5.6	6.4	0.8
R017	9.8	8.4	-1.4
R018	6.7	6.3	-0.4
R019	15.2	8.2	-7.0
R020	4.5	5.3	0.8
R021	4.7	5.0	0.3
R022	21.5	8.7	-12.8
R023	10.0	8.2	-1.8
R024	6.1	5.4	-0.7
R025	21.8	22.8	1.0

Table 5-14 – Predicted Annual Mean PM_{10} and $PM_{2.5}$ Concentrations (µg/m^3) for 2023

Receptor	Do-Minimum	Do-Something	Change with Do-Something
R001	9.8	9.8	0.0
R002	10.4	10.5	0.0
R003	11.2	11.3	0.1
R004	10.1	10.2	0.1
R005	9.7	9.7	0.0
R006	11.3	11.5	0.1
R007	10.4	10.4	0.0
R008	10.6	10.5	-0.1
R009	11.6	12.0	0.4
R010	10.7	10.7	0.0

Receptor	Do-Minimum	Do-Something	Change with Do-Something
R011	8.9	8.9	0.0
R012	9.9	10.0	0.1
R013	11.2	10.4	-0.8
R014	11.2	11.2	0.0
R015	10.6	10.6	0.0
R016	7.8	7.9	0.1
R017	9.7	9.5	-0.2
R018	9.4	9.3	-0.1
R019	11.4	10.3	-1.1
R020	10.1	10.2	0.1
R021	10.1	10.1	0.0
R022	12.6	10.6	-2.0
R023	10.4	10.1	-0.3
R024	9.3	9.2	-0.1
R025	17.4	18.7	1.3

5.8.6. For 2023, annual mean NO_2 and PM_{10} concentrations at all receptors would be well below the threshold set for both pollutants of 40 µg/m^3. Annual mean $PM_{2.5}$ concentrations would be well below the threshold of 25 µg/m^3. The highest NO_2 concentration is 22.8 µg/m^3 at R025 and the highest PM_{10}/$PM_{2.5}$ concentration is 18.7 µg/m^3 at the same receptor. 24-hour mean PM_{10} concentrations would comply in all scenarios.

5.8.7. Seven receptors would experience an improvement in air quality, as a result of reductions in traffic flows as a result of Part A along the:

a. De-trunked A1 (R008, R013, R019, R022)
b. A697 (R017, R023, R024)

5.8.8. The greatest improvement is at R022 with a reduction in annual mean NO_2 concentration of 12.8 µg/m^3 (from 21.5 to 8.7 µg/m^3) and annual mean PM_{10}/$PM_{2.5}$ concentration of 2 µg/m^3 (from 12.6 to 10.6 µg/m^3). This is due a reduction of 20,336 vehicles per day with the de-trunking of the adjacent section of the existing A1.

5.8.9. Eight receptors are predicted to experience increases in annual mean NO_2 concentrations as a result of Part A along the:

a. A1 (R003, R004, R006, R012)
b. Part A (R009, R020)
c. Lemmington Bank (R016)
d. A192 in Morpeth (R025)

5.8.10. Receptor R009 experiences the largest increase in annual mean NO_2 concentration of 3.0 µg/m^3. The increase is a result of the proximity of the receptor to the new dual carriageway section of the A1 at the southern extent of Part A, and the overall increase in flows of approximately 6,913 vehicles per day. Receptor R025 experiences the largest increase in PM_{10}/$PM_{2.5}$ concentration of 1.3 µg/m^3. This is due to an increase in traffic on the A192 of approximately 1,472 vehicles per day.

5.8.11. Imperceptible change (as defined in **Table 5-5**) in annual mean NO_2 concentrations occur at 10 of the 25 receptors as a result of Part A. For annual mean PM_{10}, 21 of the 25 receptors would experience imperceptible change.

Ecological Receptors

5.8.12. Summaries of NO_x and nitrogen deposition impacts are given in **Table 5-15**, and **Table 5-16** respectively. Data for all ecological transect receptors are provided in **Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

5.8.13. The impact on annual mean NO_x concentration at the point within each site nearest the ARN is given in **Table 5-15**. This point is where the highest levels and greatest differences are likely to occur. The distance from the ARN within each site to which the critical level is exceeded is also given. The sites where the critical level would be exceeded and the change in concentration not imperceptible are identified in this table. According to IAN 174/13 (**Ref. 5.23**), these locations require calculation of nitrogen deposition.

5.8.14. The impact on nitrogen deposition for each site identified in **Table 5-15** is summarised in **Table 5-16**. The distance from the ARN within each of these sites to which the lower critical load for the most sensitive feature also given.

5.8.15. Except for transect Eco1W, the impacts at the River Coquet Valley and Woodland SSSI can be discounted as they are unlikely to give rise to a significant effect as the critical level would not be exceeded (**Table 5-15**). In the case of Eco1W, the critical level is exceeded in the Do-Minimum scenario but would be below the critical level with Part A. This beneficial impact on the western side of the A1 is due to the shift in the southbound carriageway to the east.

5.8.16. The impacts at the Longhorsley Moor SSSI can be discounted as they are unlikely to give rise to a significant effect as the critical level would not be exceeded (**Table 5-15**).

5.8.17. Of the 20 non-statutory and ancient woodland sites, seven would experience exceedances of the critical level (**Table 5-15**) with changes in annual mean NO_x that cannot be considered as imperceptible. These sites are:

Ancient Woodland

a. Borough Wood (transects Eco7W and Eco7E)
b. Well Wood (transect Eco8)

Local Wildlife Sites

a. Wansbeck & Hartburn Woods (transects Eco7W and Eco7E)
b. Cocklaw Dene (transects Eco17W and Eco17E)
c. Cawledge Burn (transects Eco18W and Eco18E)
d. Coney Garth Pond (transect Eco19)

Local Nature Reserve

a. Borough Wood (transects Eco7E)

5.8.18. The impacts on nitrogen deposition at these sites are given in **Table 5-16**. The significance of these impacts is addressed in **Chapter 9: Biodiversity** of this ES.

Table 5-15 – Summary of Notable Impacts on Annual NO_x Concentrations (µg/m^3) for 2023 at Ecological Sites

Site	Transect	Distance of habitat to roadside (m)	Annual Mean NO_x at Closest Point within Site to Road				
			Do-Minimum	Distance (m) from Road to which Critical Level Exceeded	Do-Something	Distance (m) from Road to which Critical Level Exceeded	Change with Do-Some-thing
Designated Sites (National and International)							
River Coquet Valley and Woodland SSSI (west of A1)	Eco1W	DM - 0 DS - 10	**33.4** at 0m 18.3 at 10m	Only at roadside	18.7 at 10m	N/A	0.4 at 10m
River Coquet Valley and Woodland SSSI (east of A1)	Eco1E	DM - 0 DS - 25	22.1 at 0m 13.8 at 25m	N/A	19.3 at 25m	N/A	5.5 at 25m
River Coquet Valley and Woodland SSSI (east of A1 Felton)	Eco12E	**0**	**35.8**	Only at roadside	29.1	N/A	-6.7
Ancient Woodlands							
Dukes Bank Wood (west of road)	Eco1W	DM - 0 DS - 10	**33.4** at 0m 18.3 at 10m	Only at roadside	18.7 at 10m	N/A	0.4 at 10m
Dukes Bank Wood (east of road)	Eco1E	DM - 0 DS - 25	22.1 at 0m 13.8 at 25m	N/A	19.3 at 25m	N/A	5.5 at 25m
Borough Wood (west of road)	Eco7W	**0**	**42.7**	0	**46.3**	0	3.6
Borough Wood (east of road)	Eco7E	**0**	**65.4**	10	**71.0**	10	5.7
Well Wood	Eco8	**0**	**95.7**	25	**99.2**	25	3.5
Local Wildlife Sites							
Wansbeck & Hartburn Woods (west of road)	Eco7W	**0**	**42.7**	0	**46.3**	0	3.6
Wansbeck & Hartburn Woods (east of road)	Eco7E	**0**	**65.4**	10	**71.0**	10	5.7
Coquet River Felton Park (west of road)	Eco1W	**DM - 0** **DS - 10**	**33.4 at 0m** 18.3 at 10m	Only at roadside	18.7 at 10m	N/A	0.4 at 10m

Site	Transect	Distance of habitat to roadside (m)	Annual Mean NO_x at Closest Point within Site to Road				
			Do-Minimum	Distance (m) from Road to which Critical Level Exceeded	Do-Something	Distance (m) from Road to which Critical Level Exceeded	Change with Do-Some-thing
Coquet River Felton Park (east of road)	Eco1E	DM - 0 DS - 15	22.1 at 0m 16.0 at 15m	N/A	24.3 at 15m	N/A	8.3 at 15m
Cocklaw Dene (west of road)	Eco17W	**0**	**34.8**	0	**36.0**	0	1.2
Cawledge Burn (west of road)	Eco18W	**0**	**47.9**	0	**52.2**	5	4.3
Cawledge Burn (east of road)	Eco18E	**0**	**50.9**	5	**55.5**	5	4.6
Coney Garth Pond	Eco19	**0**	**43.8**	0	**47.9**	0	4.1
Local Nature Reserve							
Borough Wood (east of road)	Eco7E	**0**	**65.4**	10	**71.0**	10	5.7
Notes: Values in bold exceed the critical level							

Table 5-16 – Summary of Impacts on Nitrogen Deposition Rates (kg/N/ha/yr.) for 2023 at Ecological Sites

Sites	Transect	Lower Critical Load for Most Sensitive Feature	Distance of habitat to roadside (m)	Nitrogen Deposition (kgN/ha/yr) at Closest Point within Site to Road			
				Do-Minimum	Do-Some-thing	Change with Do-Something	Distance (m) from Road beyond which Change <1%
Ancient Woodland							
Borough Wood (west of road)	Eco7W	10	0	**16.3**	**16.5**	0.2	<5
Borough Wood (east of road)	Eco7E	10	0	**17.4**	**17.6**	0.2	15
Well Wood	Eco8	10	0	**16.5**	**16.6**	0.1	<5
Local Wildlife Sites							
Wansbeck & Hartburn Woods (west of road)	Eco7W	10	0	**16.3**	**16.5**	0.2	<5
Wansbeck & Hartburn Woods (east of road)	Eco7E	10	0	**17.4**	**17.6**	0.2	15
Cocklaw Dene (west of road)	Eco17W	15	0	13.1	13.1	<0.1	0
Cawledge Burn (west of road)	Eco18W	10	0	**16.0**	**16.2**	0.2	5

Sites	Transect	Lower Critical Load for Most Sensitive Feature	Distance of habitat to roadside (m)	Nitrogen Deposition (kgN/ha/yr) at Closest Point within Site to Road			
				Do-Minimum	Do-Some-thing	Change with Do-Something	Distance (m) from Road beyond which Change <1%
Cawledge Burn (east of road)	Eco18E	10	0	**16.2**	**16.4**	0.2	10
Coney Garth Pond	Eco19	5	0	**15.9**	**16.2**	0.3	15
Local Nature Reserve							
Borough Wood (east of road)	Eco7E	10	0	**17.4**	**17.6**	0.2	15

REGIONAL AIR QUALITY

5.8.19. At a regional level, Part A would increase emissions of all pollutants, refer to **Table 5-17**. This is due to the increase in vehicle-km travelled having a greater effect than the improvements in traffic flows brought by Part A.

Table 5-17 – Impacts on Regional Emissions with Part A

Scenario	CO_2		NO_x		PM_{10}	
	Tonnes	Change	Tonnes	Change	Tonnes	Change
Base 2015	190,529	-	513.6	-	36.6	-
DM 2023	194,479	+8,703	282.6	+15.4	31.4	+1.4
DS 2023	203,181		298.0		32.7	
DM 2038	226,877	+18,033	199.4	+13.7	35.8	+2.5
DS 2038	244,910		213.1		38.3	

PCM COMPLIANCE RISK

5.8.20. The compliance risk assessments, following IAN 175/13 (**Ref. 5.24**) are provided in **Appendix 5.7: EU Limit Value Compliance Risk Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). There are no links at risk of exceeding the EU limit value for annual mean NO_2 with Part A. As such, Part A poses a **low risk** in relation to EU limit value compliance.

5.9 DESIGN, MITIGATION AND ENHANCEMENT MEASURES

DESIGN

Construction

5.9.1. The following mitigation would be required to reduce emissions of dust from construction works. These would be based on best practice measures for reducing emissions of dust as set out in the Annex 1 of the Minerals Policy Statement (**Ref. 5.28**) and summarised below. These measures are set out below and are detailed in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).

Site Management

a. Records of dust and air quality complaints would be kept, including likely causes and mitigation measures to reduce impacts if appropriate.
b. Site perimeter, fences, etc. would be kept clean.
c. A dust audit programme would be devised and implemented by the main contractor and would include visual inspections of offsite dust deposition. This may need to be supplemented by automatic monitoring of PM10 if the risk of impacts increases, such as during prolonged dry weather.

Site Planning

a. Consideration of weather conditions and the dust generating potential of material to be excavated would be ensured prior to commencement of works.
b. Plan site layout to maximise distance from plant/stockpiles, etc. to sensitive receptors.
c. Dusty materials would be removed from site as soon as possible.

Construction Traffic

a. Loads entering and leaving the site with dust generating potential would be covered and wheel washing facilities made available.
b. There would be no idling of vehicles.
c. Vehicles would comply with site speed limits (15 mph on hard surfaces, 10 mph on unconsolidated surfaces).
d. Water assisted sweeping of local roads would be undertaken if material tracked out of site.
e. Hard surfacing would be installed as soon as practicable on site and ensured is maintained in good condition.

Site Activities

a. Exposed soils would be protected from winds until sealed or re-vegetated.
b. Dust generating activities would be minimised, particularly near residential receptors and sensitive ecosystems during prolonged dry, dusty weather unless damping or other suppressants are used.
c. An adequate water supply to site would be ensured and water would be used as dust suppressant where applicable.
d. Any site machinery would be well maintained and in full working order.
e. Sand and aggregates would be stored away from sensitive receptors and screened or shielded. Similarly, concrete batching would take place away from receptors.

5.9.2. In addition, traffic management measures would be required during the construction phase of Part A, taking into account the cumulative effects of construction traffic from other developments, including Part B. Details of these are included in **Appendix 5.2: Construction Traffic Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Operation

5.9.3. No mitigation measures relevant to air quality are proposed as part of the design of Part A.

MITIGATION

Construction

5.9.4. There is no requirement for Part A specific mitigation as no significant effects are anticipated.

Operation

5.9.5. There is no requirement for Part A specific mitigation as no significant effects are anticipated.

ENHANCEMENT MEASURES

5.9.6. No enhancement measures are proposed for the construction and operation of Part A.

5.10 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

CONSTRUCTION

5.10.1. Part A could result in potential adverse impacts from construction works. However, with the application of mitigation measures indicated in **Section 5.9** above, **no significant effects** are likely.

OPERATION

5.10.2. IAN 174/13 (**Ref. 5.23**) sets out key criteria for the assessment of the significance of effects of developments in terms of impacts to human health. The criteria draw together the results of the assessment of local air quality impacts on population exposure, compliance with EU limit values and impacts on ecological receptors.

Human Health

5.10.3. IAN 174/13 (**Ref. 5.23**) requires the significance of effects to be assessed at properties where exceedances of the air quality assessment thresholds (**Table 5-2**) are predicted. As determined in **Section 5.8**, pollutant concentrations would be below the assessment thresholds at all receptors in the opening year of Part A (NO_2 and PM_{10}/$PM_{2.5}$). There are no properties that experience a worsening or improvement of air quality where pollutant concentrations are already above an assessment threshold, or a creation/removal of an exceedance. Furthermore, Part A is at low risk of impacting on compliance with EU limit values (refer to **Appendix 5.7: EU Limit Value Compliance Risk Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

Ecological Receptors

5.10.4. The assessment anticipates no significant effects at designated sites of national or international importance. Further commentary on this, and consideration of the impacts at ancient woodland and non-statutory sites, is provided in **Chapter 9: Biodiversity** of this ES, which concludes **no significant effects** from air quality impacts at ecological sites.

EU Limit Value Compliance

5.10.5. No PCM links within the Study Area exceed the EU limit value for annual mean NO_2. Part A is at low risk of affecting compliance with EU limit values.

ASSESSMENT SUMMARY

5.10.6. Overall, following the guidance on the evaluation of significant effects in IAN 174/13 (**Ref. 5.23**), the effects of Part A are **not significant**.

ASSESSMENT PARAMETERS

5.10.7. The Assessment Parameters, as presented in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), presents minor amendments to the design which would not affect the outcomes of the air quality modelling. Parameter 2 potentially moves the junction away from human receptors but remains within the Order Limit and therefore would not result in a change to the assessment findings. Parameters 4, 5, 8, 9 and 12 all represent additional construction/earthworks, the potential impacts of which can be mitigated for through application of the best practice measures presented **Section 5.9** above. Based on professional judgement the parameters presented do not alter the findings of the air quality assessment.

UPDATED DMRB GUIDANCE

5.10.8. Refer to **Appendix 5.8: Air Quality DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) for further details of the sensitivity test as discussed in **Section 5.4**.

5.10.9. The key differences relevant to the assessment between the DMRB HA 207/07 (**Ref. 5.15**) and LA 105 (**Ref. 5.26**) are summarised in **Table 5.18** below.

Table 5-18 - Key Differences of HA 207/07 and LA 105 DMRB Methodology

Topic	DMRB HA 207/07	LA 105	Summary of Sensitivity Test Findings
Construction Dust	- Identification of receptors within 200 m of construction site and application of mitigation measures.	- Definition of construction dust risk potential. - Identification of all sensitive receptors 0-50 m, 50-100 m and 100-200 m of all construction activity. - Definition of the receiving environment sensitivity to construction dust.	The updated guidance on the assessment of construction dust has been considered through the specification of mitigation, as detailed in **Section 5.9.** Therefore, the conclusions of the assessment would not change.
Compliance Risk Assessment	- Difference between do-something and do-minimum annual mean NO_2 concentration at the nearest relevant receptor is added to the PCM baseline roadside concentration to determine compliance.	- Validation of scheme AQ model against the PCM model; - Selection of qualifying features adjacent to AQ model links overlapping PCM links. - Comparison of scheme impact at modelled receptor and at 4m	The findings of the sensitivity test in relation to the Compliance Risk Assessment are summarised as follows: - Worse case qualifying feature identified as footway next to road, adjacent to R25. - Model results do not indicate any exceedance of EU limit Value, with increase 1.4 µg/m^3 and maximum predicted concentration of 24.9 µg/m^3. - No risk to reported date of compliance and therefore, the conclusion of the assessment would remain the same.
Assessment of Ecological Receptors	- Only considers internationally or nationally designated sites SSSI, SAC, SPA and RAMSAR. - If NOx concentration close or greater than critical level of 30 µg/m^3 then assess nitrogen deposition. - Background deposition assumed to reduce by 2% per year. - Deposition velocity of 0.001 m/s used for all vegetation.	- Definition of designated sites expanded to include local designations, including nature improvement areas and veteran trees (referred to as designated habitats). - Screen of NOx concentrations against critical level removed. - Background deposition assumed to remain constant from base year. - Differentiation of deposition velocities between long and short vegetation.	The findings of the sensitivity test in relation to revisions to the ecological habitat assessment, with the changes to background projections and application of varying deposition rates, are summarised as follows: - With the application of the updated guidance, the assessment of twenty additional veteran trees was required. This results in 46 designated habitats (24 designated habitats and 22 ancient / veteran trees) being considered in the assessment, 25 required further analysis of nitrogen deposition impacts by a competent expert. This exercise was carried out as part of the sensitivity test, as reported in Appendix **5.8: Air Quality DMRB Sensitivity Test, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and **Appendix 9.27: Biodiversity DMRB Sensitivity Test, Volume 7** of this ES (**Application Document Reference:TR010041/APP/6.7**). - The sensitivity test determined that there would be no changes to the likely significance of effects and therefore the conclusion of the assessment would remain unchanged. (refer to **Chapter 9: Biodiversity** of this ES for full details).

5.11 MONITORING

5.11.1. During construction of Part A, monitoring would be required to determine the effectiveness of the proposed mitigation, or requirement for further mitigation.

5.11.2. In the first instance, monitoring would be limited to visual inspections of emissions and dust soiling of local roads or properties. This would be undertaken daily for the duration of the construction of Part A.

5.11.3. If risk levels rise, for example during prolonged dry weather, or the visual monitoring indicates persistent soiling, it may be necessary to install continuous monitoring of particulate matter (as 15-minute average PM_{10} and $PM_{2.5}$). The monitors would be equipped with an alert mechanism, set to agreed thresholds with NCC.

5.11.4. The construction monitoring regime and reporting requirements are set out in the **Outline CEMP** (**Application Document Reference: TR010411/APP/7.3**).

5.11.5. No significant effects have been identified for the operational phase of Part A therefore no additional monitoring is necessary.

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