A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.4 Environmental Statement – Chapter 16 Assessment of Cumulative Effects

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/6.4
Author:	A1 in Northumberland: Morpeth to Ellingham Project Team, Highways England

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Rev 0	June 2020	Application Issue

CONTENTS

TABLES

16 ASSESSMENT OF CUMULATIVE EFFECTS

16.1 INTRODUCTION

16.1.1. This chapter reports the likely significant, cumulative environmental effects associated with the A1 in Northumberland: Morpeth to Ellingham (the Scheme).

16.1.2. The following types of cumulative effects are assessed within this chapter:

a. **Combined effects** – these occur due to impacts from a single project on the same common sensitive receptor. Combined effects have been split into two components:
   i. **Within Topic** – Impacts that arise from Part A: Morpeth to Felton (Part A) and Part B: Alnwick to Ellingham (Part B) acting on the same common sensitive receptor within an individual environmental topic. For example, there may be effects on noise sensitive receptors due to operational road traffic from both Part A and Part B when considered together.
   ii. **Cross Topic** – these occur due to impacts from different environmental topics associated with Part A and Part B that combine to cause multiple effects on a single common sensitive receptor. For example, there may be multiple effects on residents from the use of the Main Compound (for example, visual impacts) and construction traffic traveling between the Main Compound and Part B (for example, noise impacts).

b. **Cumulative effects** – these occur due to the impacts of the Scheme interacting with the impacts from other proposed developments in the vicinity of a receptor. For example, a residential receptor may be affected by noise from the Scheme as well as from another proposed development.

16.2 COMPETENT EXPERT EVIDENCE

16.2.1. **Table 16-1** 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 16-1 – Qualifications and Professional Membership

Name	Role	Qualifications and Professional Membership	Experience
Lowri McCann	Author	BSc (Hons) Conservation and Biodiversity MSc (Merit) Environmental Consultancy and Project Management	Principal Consultant 6 years' experience in environmental regulation, and assessment and management of engineering projects. Relevant experience includes:

Name	Role	Qualifications and Professional Membership	Experience
		Practitioner IEMA	- Assistant environmental coordinator for the A19 Norton to Wynyard improvement scheme for preliminary design stage. - Environment lead for Leeds Corridor Improvement Package. - Assistant environmental coordinator for Testo's and Downhill Lane Junctions Improvement.
Victoria Wilson	Author	BSc (Hons) Ecology MSc Environmental Analysis and Assessment Full Member of the IEMA Chartered Environmentalist (CEnv)	Associate 20 years' experience in environmental regulation, and assessment and management of engineering schemes. Other recent relevant experience includes: - Environmental assessment lead for the A19 Norton to Wynyard improvement scheme for preliminary design stage - Environmental assessment lead for several strategic road studies including: - Trans-Pennine Tunnel: Wider Transport Connectivity Assessment; and - Oxford to Cambridge Expressway

Name	Role	Qualifications and Professional Membership	Experience
			Environmental Impact Assessment (EIA) Project Manager for A45 Daventry Development Link for Northamptonshire County Council
Kevin Stubbs	Reviewer	Higher National Diploma in Rural Resources and their Management MA in Landscape Management Chartered Member of the Landscape Institute Member of the Chartered Institute of Ecology and Environmental Management (CIEEM)	Technical Director 30 years' experience in the environmental sector. Other recent relevant experience includes: - Technical Director for the A1 Birtley to Coalhouse scheme for Options Identification, Options Selection and preliminary design stage. - Environment Technical Director for A19/A1058 Coast Road Improvement and A19 Norton to Wynyard Improvements (preliminary design stage). - Environment Technical Director for A1 Scotswood to North Brunton Improvement scheme (option identification and option selection stage).

16.3 LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATION

Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations)

16.3.1. Paragraph 5, Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (**Ref. 16.1**) requires that an ES includes:

"*A description of the likely significant effects of the development on the environment resulting from, inter-alia –*

…

(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

…

The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects of any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development."

POLICY

16.3.2. National policy relevant to the potential cumulative effects is outlined in **Table 16-2** below. There are no relevant local policies.

Table 16-2 – Assessment of the Scheme Against National Policies and Plans Relevant to Cumulative Effects

Policy	Relevant Policy Objectives	Significance of the Scheme on Policy Objective
National Policy Statement for National Networks (NPS NN) (**Ref. 16.2**)	Paragraph 4.16 of the NPS NN states: *"When considering significant cumulative effects, any environmental statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence)."* Paragraph 4.17 of the NPS NN further states: "*The Examining Authority should consider how significant cumulative effects and the*	An assessment of cumulative effects has been carried out in accordance with the requirements of the policy. **Table 16-7** within this chapter presents a description of the significance of Cross Topic combined effects on the Scheme. **Section 16.9** within this chapter presents a

Policy	Relevant Policy Objectives	Significance of the Scheme on Policy Objective
	interrelationship between effects might affect the environment, even though they may be acceptable when considered on an individual basis with mitigation measures in place."	description of the significance of cumulative effects on the Scheme.

16.4 ASSESSMENT METHODOLOGY

16.4.1. The assessment methodologies are based on the guidance documents detailed in **paragraph 16.4.75** and previous professional experience from other similar highways schemes. They take into account the types of receptors assessed, the nature of the Scheme and the environmental information available to inform the assessment.

SCOPE OF ASSESSMENT

16.4.2. The scope of the combined and cumulative effects assessment is in line with the **Scoping Report** for Part A (**Application Document Reference: TR010041/APP/6.10**) and for Part B (**Application Document Reference: TR010041/APP/6.11**). The assessment is also consistent with the **Scoping Opinion** for Part A (**Application Document Reference: TR010041/APP/6.12**) and for Part B (**Application Document Reference: TR010041/APP/6.13**). **Appendix 4.1**: **Scoping Opinion Response Tracker**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) presents commentary of how each item within the Scoping Opinion has been addressed in relation to the assessment of cumulative effects.

16.4.3. The topics assessed in Part A **Technical Chapters 5** to **13** and **15**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13** and **15**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) have been scoped into the assessment of the Cross Topic combined effects and cumulative effects. The topics assessed in Part A **Technical Chapters 5** to **15**, **Volume 2** of this ES and Part B **Technical Chapters 5** to **15, Volume 3** of this ES have been scoped into the assessment of Within Topic combined effects.

16.4.4. In relation to Climate, (for Part A refer to **Chapter 14: Climate, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and for Part B **Chapter 14: Climate, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)), the impacts of greenhouse gases (GHG) emissions, in terms of their contribution to climate change, are global and cumulative in nature, with every tonne contributing to impacts on natural and human systems. GHGs are natural and anthropogenic gases occurring in the atmosphere that absorb and emit infrared radiation, thereby maintaining the sun's energy within the earth's atmosphere.

16.4.5. There is an overwhelming scientific consensus that the major increase in the atmospheric concentration of GHGs since the industrial revolution, is contributing to climate change. It is the increase in concentrations of GHGs in the global atmosphere due to all GHG caused by human activities that causes climate change. As such, it is the cumulative effect of all GHG-emitting human activities that cause climate change, and therefore the assessment of the GHGs due to the Scheme implicitly assesses the cumulative effect of GHG emissions. Therefore, the quantification of emissions from the Scheme in the assessment of Cross Topic combined effects and cumulative effects inherently assesses the combined and cumulative impacts. No further assessment of GHG emissions has therefore been undertaken for the Cross Topic combined effects and cumulative effects assessment. However, a Within Topic combined effects assessment has been undertaken for climate (refer to **paragraphs 16.4.40** to **16.4.42**).

16.4.6. The resilience assessment looks at the potential impacts of environmental change on the Scheme, rather than impacts of the Scheme on the environment: the receptor for the resilience assessment is the Scheme. As such, no assessment of Cross Topic and Within Topic combined effects for climate resilience has been made as there are no receptors in common with other assessments. In terms of cumulative effects, the effect of other proposed developments in the vicinity of the Scheme in relation to flood risk have been assessed for Part A within **Chapter 10: Road Drainage and the Water Environment**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and for Part B within **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). No other cumulative effects have been identified.

16.4.7. The cumulative effects assessment for air quality and noise topics are inherently built into the assessments for the operational phase in Part A **Chapter 5: Air Quality** and **Chapter 6: Noise and Vibration, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) as well as Part B **Chapter 5: Air Quality** and **Chapter 6: Noise and Vibration**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). The cumulative influences of other developments (application sites with, or likely to gain, planning permission) in the region are covered by analysis using traffic model data, which has been used in both the air quality and noise assessments for the Scheme. As such, a cumulative effects assessment for the operational phase for air quality and noise has focused on the other developments not considered in the traffic model. Refer to **Section 5.10** in Part A **Chapter 5: Air Quality, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and **Section 5.10** in Part B **Chapter 5: Air Quality, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). and **Section 6.10** in Part A **Chapter 6: Noise and Vibration, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and **Section 6.10** in Part B **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), for their operational assessment for this EIA.

METHODOLOGY FOR THE ASSESSMENT OF COMBINED EFFECTS

16.4.8. The combined assessment considers the changes in baseline conditions at common sensitive receptors for the Scheme. Common sensitive receptors for the combined assessment are those receptors that would be affected by more than one element of the Scheme or technical topic in this ES, during construction and operation of the Scheme. For the combined assessment, common sensitive receptors would be affected by both Part A and Part B when considered together. The effects of Part A on its own are reported in **Technical Chapters 5** to **15**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B on its own in **Technical Chapters 5** to **15**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). As described in **paragraph 16.1.2**, the combined assessment for the Scheme consists of two separate components: Within Topic and Cross Topic effects.

Within Topic Combined Effects

16.4.9. The Within Topic combined effects assessment considers effects on common sensitive receptors within an individual environmental topic (e.g. landscape and visual). A common sensitive receptor is a receptor that could be affected by both Part A and Part B when considered together. Due to the approximate 15 km distance between Part A and Part B, there are relatively few common sensitive receptors for the Within Topic combined assessment. Where there are no common sensitive receptors, the technical assessment for Part A (refer to **Technical Chapters 5** to **14**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Technical Chapters 5** to **14, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) are the assessment of the Scheme.

16.4.10. To identify common sensitive receptors, the Study Areas for each environmental topic, as defined in Part A **Technical Chapters 5** to **14**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **14**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), have been reviewed. If there is an overlap between the Study Areas for Part A and Part B, it is anticipated that there could be common sensitive receptors between the two parts of the Scheme. Therefore, a Within Topic combined effects assessment has been undertaken where the Study Areas of an individual environmental topic overlap and there are common sensitive receptors between Part A and Part B.

16.4.11. Traffic data for the Scheme that considers traffic movements from both Part A and Part B together has been prepared for the Scheme. Refer to **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**) for further detail on the Scheme traffic data. For the traffic related environmental topics, the Scheme traffic data has been interrogated to determine whether there would be combined effects when considering Part A and Part B together. For the non-traffic related topics where sensitive receptors are impacted by both Part A and Part B, a qualitative assessment has been undertaken to identify combined effects of the Scheme.

16.4.12. The Main Compound is located within the Order Limits of Part A and would be used for both Part A and some additional activities for Part B, the details of which are set out in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). The direct and indirect effects of the establishment and use of the Main Compound have been considered within Part A (refer to **Technical Chapters 5** to **15**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)). The Part B **Technical Chapters 5** to **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) have considered whether there would be any significant effects as a result of using the Main Compound for Part B. No significant effects have been identified as part of this process and therefore Within Topic combined effects in relation to the Main Compound have not been considered further in this chapter.

Air Quality

16.4.13. The Study Area for the construction air quality assessment for both Part A (refer to **Chapter 5: Air Quality**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 5: Air Quality**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) was 200 m from the Order Limits. Due to the approximate 15 km distance between Part A and Part B, there are anticipated to be no Within Topic combined effects and therefore this has not been considered further in this chapter.

16.4.14. A screening assessment of the construction traffic movements on air quality for the Scheme has been undertaken for the Within Topic combined assessment based on the methodology for Part A (refer to **Chapter 5: Air Quality**, **Volume 2** of this ES **(Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 5: Air Quality**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). The results of the screening assessment are reported in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES. This screening exercise determined that ambient concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}) would remain well below the air quality objectives. Therefore, the potential local air quality impacts from construction traffic emissions are unlikely to give rise to a significant effect and no further assessment is required.

16.4.15. An operational air quality assessment has been undertaken using the Scheme traffic data. The same methodology used for the operational air quality assessment for Part A (refer to **Chapter 5: Air Quality**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 5: Air Quality**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) has been used for the Within Topic combined assessment.

Noise and Vibration

16.4.16. The Study Area for the construction noise and vibration assessment for both Part A (refer to **Chapter 6: Noise and Vibration**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 6: Noise and Vibration**,

Volume 3 of this ES (**Application Document Reference: TR010041/APP/6.3**)) was 300 m from construction activities. Due to the distance between the construction activities associated with Part A and Part B, there are anticipated to be no Within Topic combined effects in relation to on-site construction activities and therefore this has not been considered further in this chapter. However, construction traffic movements have been considered as part of the Within Topic combined effects assessment.

16.4.17. An operational noise assessment has been undertaken using the Scheme traffic data. The same methodology used for the operational noise assessment for Part A (refer to **Chapter 6: Noise and Vibration**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 6: Noise and Vibration**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) has been used for the Within Topic combined assessment.

Landscape and Visual

16.4.18. The Study Area for the landscape assessment was 5 km from the centreline for Part A. For the visual assessment for Part A, a 2 km Study Area was used for establishing representative viewpoints and a 1 km Study Area was used for the visual impact assessment for individual receptors and groups. Refer to **Chapter 7: Landscape and Visual**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) for further details.

16.4.19. For Part B, the Study Area for the visual impact and landscape character assessment was initially defined by the extent to which the Scheme would be visible as shown on the ZTV plan (refer to **Figure 7.1: Zone of Theoretical Visibility**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)). However, the Study Area was refined to 2 km due to fieldwork identifying that significant effects would be unlikely beyond 2 km due to the intervening vegetation, built form and topography limiting broader visibility. Refer to **Chapter 7: Landscape and Visual**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) for further details.

16.4.20. In addition, the national character areas (NCAs) and local landscape character areas (LCAs) are different for Part A and Part B. The NCA and LCAs that were scoped into the assessment for Part A are:

a. NCA 12 Mid Northumberland
b. LCA 35a Broad Lowland Valley – Coquet Valley
c. LCA 35b (2) Broad Lowland Valley – Northgate
d. LCA 38b Lowland Rolling Farmland – Longhorsley
e. LCA 38b (1) Lowland Rolling Farmland - Hub of Recreational Activity

16.4.21. The LCAs that were scoped into the assessment for Part B are:

a. LCA 8c Charlton Ridge
b. LCA 3c Rock
c. LCA 2a Lower Aln

d. LCA 6 North East Farmed Coastal Plain
e. LCA 11 Charlton Ridge
f. LCA 7 Lower Aln Valley

16.4.22. Due to the approximate 15 km distance between Part A and Part B there is no possibility of common visual or landscape receptors given the size of the respective Study Areas. Different NCAs and LCAs were considered in the Part A and Part B assessment and there are therefore no common character areas, whether national or local. Therefore, landscape and visual has not been considered further in this chapter.

Cultural Heritage

16.4.23. The Study Areas for the cultural heritage assessment for Part A (refer to **Chapter 8: Cultural Heritage**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 8: Cultural Heritage**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) include an Inner Study Area of 500 m from the Order Limits and outer Study Area of 1 km from the Order Limits. Due to the approximate 15 km distance between Part A and Part B, there are anticipated to be no Within Topic combined effects and therefore this has not been considered further in this chapter.

Biodiversity

16.4.24. Study Areas have been used for different ecological receptors or issues for both Part A (refer to **Chapter 9: Biodiversity**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 9: Biodiversity**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). For the desk based review, the Study Areas ranged from 2 km to 5 km for protected species records, designated sites and bat species records / sites. A larger 10 km Study Area was used for European designated sites, which extended to 30 km for Special Areas of Conservation for bats. The Study Area in relation to ancient woodland was informed principally by the Zone of Influence (ZOI) for the air quality assessment and ZOI for hydrological connection (1 km Study Area from the Order Limits). The field survey Study Areas ranged from the Order Limits itself to a 1 km buffer from the Order Limits.

16.4.25. With the exception of operational air quality impacts, there are anticipated to be no Within Topic combined effects on ecological receptors due to the approximate 15 km distance between Part A and Part B. As detailed in the **Habitats Regulation Assessment** (**Application Document Reference: TR010041/APP/6.14**), there would be no Within Topic combined effects for European designated sites. Therefore, potential effects, excluding operational air quality, on ecological receptors during construction and operation are not considered further in this chapter.

16.4.26. An assessment has been undertaken on the potential effects on statutory designated sites, non-statutory sites and ancient woodland as a result of changes in air quality due to the Scheme. The same methodology used for Part A (refer to **Chapter 9: Biodiversity**,

Volume 2 of this ES (**Application Document Reference: TR010041/APP/6.2**)) has been used for the assessment. An assessment on ecological receptors due to changes in air quality was not required for Part B (refer to **Chapter 9: Biodiversity**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) because there were no ecological receptors within the Study Area.

Road Drainage and the Water Environment

16.4.27. As detailed in Part A **Chapter 10: Road Drainage and the Water Environment, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the assessment of risks to water quality during the operation of Part A on its own and Part B on its own was undertaken in accordance with the methods outlined in DMRB (HD 45/09) (**Ref. 16.3**). The assessment was based on the Highways Agency [now Highways England] Water Risk Assessment Tool (HAWRAT). The assessment included both Method A and Method D of DMRB (HD 45/09):

a. Method A was used to assess pollution impacts from routine runoff to surface waters.
b. Method D was used to assess pollution impacts from accidental spillage.

16.4.28. One of the inputs required for Method A of the assessment was the Scheme traffic flow of the road (two-way Annual Average Daily Traffic (AADT)). As detailed in DMRB (HD 45/09) (**Ref. 16.3**), traffic data is separated into three traffic bands for the purpose of the assessment:

a. ≥10,000 to <50,000
b. ≥50,000 to <100,00
c. ≥100,000

16.4.29. The two-way AADT traffic data for the Scheme, Part A on its own and Part B on its own all fall within the first traffic band (≥10,000 to <50,000). Therefore, the Method A assessment presented for Part A in **Appendix 10.3: Drainage Network Water Quality Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and for Part B in **Appendix 10.3: Drainage Network Water Quality Assessment**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**) are valid for the Within Topic combined assessment as well as the separate parts of the Scheme. Refer to **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**) for further detail on the Scheme traffic data. In addition, in accordance with DMRB (HD 45/09) (**Ref. 16.3**), an aggregated assessment is not required because Part A and Part B are located further than 1 km from each other.

16.4.30. It is considered that the Method D assessment undertaken for Part A (refer to **Appendix 10.3: Drainage Network Water Quality Assessment, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) and for Part B (refer to **Appendix 10.3: Drainage Network Water Quality Assessment, Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) are also valid for the Within Topic combined

Scheme. This is because the two-way AADT traffic data for the Scheme, Part A on its own and Part B on its own show similar traffic flows; with the Scheme showing a 1.5% increase in traffic flows when compared to Part A. In addition, it is understood, based on previous experience, that the Method D assessment is inherently not sensitive to changes in traffic flows.

16.4.31. The Study Areas for the Water Framework Directive assessment and Flood Risk Assessment for Part A (refer to **Appendix 10.1: Flood Risk Assessment** and **Appendix 10.2: Water Framework Directive Assessment, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) and Part B (refer to **Appendix 10.1: Flood Risk Assessment** and **Appendix 10.2: Water Framework Directive Assessment, Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) was up to 1 km from the Order Limits. Due to the approximate 15 km distance between Part A and Part B, there are anticipated to be no Within Topic combined effects and therefore this has not been considered further in this chapter.

16.4.32. A geomorphology assessment was undertaken for Part A (refer to **Chapter 10: Road Drainage and the Water Environment**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)). However, as this assessment was specific to Part A, no Within Topic combined effects are anticipated between Part A and Part B and this has not been considered further in this chapter.

Geology and Soils

16.4.33. The Study Area used for the geology and soils assessment for both Part A (refer to **Chapter 11: Geology and Soils**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 11: Geology and Soils**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) was 250 m from the Order Limits. The assessment of agricultural land for Part A and Part B conclude that there would be a significant effect and therefore, the Within Topic combined effect would also be significant. Therefore, this has not been considered further in this chapter.

Population and Human Health

16.4.34. The population and human health assessment for Part A (refer to **Chapter 12: Population and Human Health, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) cover a number of sub-topics. In general, the Study Areas for the sub-topics range between the Order Limits itself to 1 km from the Order Limits and communities surrounding the Order Limits. Due to the approximate 15 km distance between Part A and Part B, there are anticipated to be no Within Topic combined effects for the majority of the sub-topics in Part A **Chapter 12: Population and Human Health, Volume 2** of this ES and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES and, therefore, these sub-topics have not been considered further in this chapter. The Study Area for views from the road is detailed in Part A (refer to **Chapter 12: Population and Human Health, Volume 2** of this

ES), but was scoped out of Part B (refer to **Appendix 4.1: Scoping Opinion Response Tracker**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)) and therefore there cannot be Within Topic combined effects in relation to views from the road.

16.4.35. However, the driver stress assessment covers the extent of the road network in the Order Limits and connected roads during operation. For the construction period, the driver stress Study Area consists of the operational Study Area, and the likely routes to be taken by construction traffic from the Main Compound and Lionheart Enterprise Park Compound to access Part B. The economy and employment assessment covers the county of Northumberland. The human health assessment considers the air quality, noise and vibration and road drainage and the water environment Study Areas which have potential common sensitive receptors between Part A and Part B as detailed above. Based on the population and human health Study Areas, the following sub-topics have therefore been considered in the Within Topic combined effects assessment: driver stress; economic and employment; and human health.

16.4.36. A driver stress assessment has been undertaken qualitatively for construction and quantitatively based on the Scheme traffic data for operation. The same methodology used for Part A (refer to **Chapter 12: Population and Human Health**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 12: Population and Human Health**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) has been used for the Within Topic combined effects assessment.

16.4.37. The economic and employment assessment considers the effects of the Scheme on the county of Northumberland. Therefore, a qualitative assessment has been undertaken based on the generated employment opportunities presented in Part A (refer to **Chapter 12: Population and Human Health**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 12: Population and Human Health**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)).

16.4.38. The human health assessment considers the outputs from the air quality, noise and vibration and road drainage and the water environment assessments. Therefore, a qualitative human health assessment has been carried out taking into consideration the air quality, and noise and vibration Within Topic combined effects assessments. The same methodology used for the human health assessment in Part A (refer to **Chapter 12: Population and Human Health**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 12: Population and Human Health**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) was used for the Within Topic combined assessment.

Material Resources

16.4.39. The primary Study Area for the materials assessment for Part A (refer to **Chapter 13: Materials Resources, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 13: Materials Resources, Volume 3** of

this ES (**Application Document Reference: TR010041/APP/6.3**)) is the Order Limits itself. The secondary Study Area for the materials assessment is the availability of construction and recovered material resources within north east England (Northumberland, Tyne and Wear, Durham and the Tees Valley) and the UK, and the capacity of waste management facilities in the north east of England. Therefore, a qualitative assessment has been undertaken to take into consideration effects from both Part A and Part B on common material and waste receptors using the methodology set out in Part A (refer to **Chapter 13: Materials Resources, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 13: Materials Resources, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)).

Climate

16.4.40. The climate assessment compromises two separate assessments: emission of GHGs due to the Scheme; and resilience of the Scheme to climate change. The Study Area for GHGs emitted during the construction phase for Part A (refer to **Chapter 14: Climate**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 14: Climate**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) includes construction site activities as well as, further afield, where the materials would be manufactured. Therefore, a quantitative assessment has been undertaken to consider effects from both Part A and Part B on common sensitive receptors. The same methodology used for the construction GHG assessment for Part A (refer to **Chapter 14: Climate**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 14: Climate**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) has been used for the Within Topic combined assessment.

16.4.41. The operational GHG assessment relies on traffic data modelled for the Scheme. As a result, an operational GHG assessment has been undertaken using the Scheme traffic data. The same methodology used for the operational GHG assessment for Part A (refer to **Chapter 14: Climate**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Chapter 14: Climate**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)) has been used for the Within Topic combined assessment.

16.4.42. The assessment of the Scheme's resilience to climate change is specific to the Scheme proposed and it is not anticipated that there would be any Within Topic combined effects in relation to climate resilience. Therefore, this has not been considered further in this chapter.

Updated DMRB Guidance

16.4.43. Some DMRB guidance documents were updated in 2019 and 2020 (and associated IANs replaced), by which time the EIA for the Scheme was largely complete. However, this chapter reports Within Topic combined effects assessments that are compliant with the updated DMRB either by explaining how the assessments already undertaken are already compliant with the updated text, by a sensitivity test identifying that the conclusions of the

EIA would not have changed as a result of the DMRB update, or by carrying out refreshed assessments that accord with the updated DMRB. The DMRB sensitivity test for the Within Topic combined effects assessment is based on the same methodology as detailed in Part A **Technical Chapters 5** to **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**), Part B **Technical Chapters 5** to **15**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). The DMRB sensitivity test for each Within Topic combined effects topic is reported in **Section 16.8** of this chapter beneath the sub-heading for each environmental topic.

Cross Topic Combined Effects

16.4.44. The Cross Topic combined effects assessment considers the changes in baseline conditions at common sensitive receptors (as described in **paragraph 16.4.8**) due to more than one technical topic in this ES, during construction and operation of the Scheme. A Cross Topic combined effects assessment has been undertaken for Part A on its own (refer to **Chapter 15: Assessment of Combined Effects**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B on its own (refer to **Chapter 15: Assessment of Combined Effects**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). Therefore, the Cross Topic combined effects assessment within this chapter only considers sensitive receptors that are common between Part A and Part B (i.e. sensitive receptor that would be affected by both Part A and Part B when considered together but not Part A or Part B on its own). Common sensitive receptors have been identified where the Study Area of an environmental topic for one part of the Scheme overlaps with a Study Area of a different environmental topic from the other part of the Scheme. For example, residents may be affected by the use of the Main Compound (for example, visual impacts) and construction traffic traveling between the Main Compound and Part B (for example, noise impacts).

16.4.45. For the purposes of the Cross Topic combined effects assessment, common sensitive receptors identified have been grouped based upon their shared attributes, characteristics or features e.g. residents. In determining whether an effect is considered significant, effects of 'minor' or above significance are taken into consideration, to account for the potential for multiple 'not significant effects' to combine to result in an overall significant effect. For example, there is potential for multiple minor (not significant) effects to result in a moderate (significant) effect.

16.4.46. In determining the significance of effect for each category of common sensitive receptors, the assessment considers the worst-case effects reported in Part A **Technical Chapters 5** to **13, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) for receptors relevant to each respective common sensitive receptor group. For example, in the category ‘Residents’, Part A **Chapter 7:**

Landscape and Visual and Part A **Chapter 12: Population and Human Health**, **Volume 2** of this ES respectively assess the effects upon residents and reports a range of different significance of effects for residents. This assessment therefore considers the highest level of significance reported for each common sensitive receptor. Therefore, the overall significance of effect presented in **Table 16-9** reports worst-case combined effects for each common sensitive receptor group.

Updated DMRB Guidance

16.4.47. A DMRB sensitivity test has been undertaken for the Cross Topic combined effects which draws on the results of the DMRB sensitivity test of the Within Topic combined assessment (refer to **Section 16.4** and **Section 16.8** of this chapter). Part A **Technical Chapters 5** to **13** and **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13** and **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the findings of the DMRB sensitivity test for the ES. The DMRB sensitivity test for the Cross Topic combined assessment considers the additional significant effects for the Scheme identified as part of the above DMRB sensitivity tests. The outcomes of the DMRB sensitivity test for the Cross Topic combined assessment is reported in **paragraphs 16.8.65** and **16.8.66** of this chapter.

METHODOLOGY FOR THE ASSESSMENT OF CUMULATIVE EFFECTS

16.4.48. The approach to the assessment of cumulative effects considers the deviation from the baseline conditions at common sensitive receptors between the Scheme and one or more other development applications (referred to as ‘other developments’).

16.4.49. Scheme traffic data that incorporates traffic movements from both Part A and Part B together has been prepared. This Scheme traffic model considers ‘other developments’ in the surrounding region to allow assumptions to be made about traffic growth over time (further details can be found in **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**).

16.4.50. The Planning Inspectorate Advice Note Seventeen (**Ref. 16.4**) sets out a four-stage approach to the assessment of cumulative effects:

a. **Stage 1**: Establish the Zone of Influence (ZOI) and long list of ‘other developments’
b. **Stage 2**: Identify short list of ‘other development’ for cumulative effects assessment
c. **Stage 3**: Information gathering for ‘other developments’
d. **Stage 4**: Assessment of cumulative effects

16.4.51. Further details of these stages are provided below.

Stage 1 – Establish the Zone of Influence and Long List of 'Other Developments'

Identification of the ZOI

16.4.52. The ZOI for each discipline was established to determine which 'other developments' were relevant to each environmental topic. If a receptor was present, and there was also an overlap between the time periods in which the impacts would occur, then the potential for a cumulative effect was considered.

16.4.53. The likely occurrence of a cumulative effect was confirmed in the first instance through the examination of the available environmental information for the 'other developments', and use of professional judgement to establish whether a receptor was identified as being affected by both developments.

Identification of the Long List

16.4.54. An initial long list of 'other developments' was produced (refer to **Appendix 16.2: Cumulative Long List** of this ES) based upon the largest Study Area of the environmental topics and, extending beyond this, the routes included in the Scheme's Affected Road Network (ARN), which is used in the air quality and noise and vibration assessments of this ES. The long list was developed by carrying out a desk study and using publicly available online information available at the time of the search. The desk study was originally undertaken in September 2018 for Part A and May 2019 in Part B. However, the long list has been checked and updated for the Scheme in February 2020.

16.4.55. The criteria for 'other developments' included in the assessment of cumulative effects is described below in **Table 16-3,** and is based upon the Planning Inspectorate Advice Note Seventeen (**Ref. 16.4**)**.**

16.4.56. Regarding the 'other development' types set out in **Table 16-3** below, the following criteria were applied:

a. Any local Nationally Significant Infrastructure Projects (NSIPs) within 2 km of the Study Area.

b. Applications under 'other regimes' were limited to 'major applications' which are defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015 (TCPO) as:

i. The winning and working of minerals or the use of land for mineral-working deposits
ii. Waste development
iii. The provision of dwelling houses where:
   - The number of dwelling houses to be provided is 10 or more
   - The development is to be carried out on a site having an area of 0.5 hectares or more
iv. The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more
v. Development carried out on a site having an area of 1 hectare or more.

Table 16-3 – Criteria for Identifying 'Other Developments' for Inclusion in the Assessment of Cumulative Effects

Tier	Criteria	Available Information
Tier 1	- Projects under construction. - Projects with permission whether under the Planning Act 2008 (2008 Act) or other regimes, but not yet implemented. - Submitted applications whether under the 2008 Act or other regimes, but not yet determined.	 Decreasing level of information likely to be available.
Tier 2	- Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted. - Potential applications under other regimes where the competent authority has issued a statutory EIA Scoping Opinion and a Scoping Report or Environmental Report is available.	
Tier 3	- Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted. - Potential applications under other regimes where the competent authority has not issued a statutory EIA Scoping Opinion and there is no Environmental Report or Scoping Report available. - Identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move closer to adoption), recognising that that much information on any relevant proposals will be limited.	

16.4.57. In addition to development applications and allocations, as defined by the Department for Transport's online Transport and Analysis Guidance (WebTAG) (**Ref. 16.5**), the long list also included relevant 'other developments' from the 'Scheme's traffic model uncertainty log' (**Ref. 16.6**). All developments considered within the Scheme traffic model, and the documents from which they have been derived are presented within the 'Uncertainty Log'. This contains an assessment of the likelihood of any development within the policy

documents to be constructed. Based upon guidance within TAG Unit M4 (**Ref. 16.5**), the uncertainty log is divided into four key categories:

a. Near Certain
b. More than Likely
c. Reasonably Foreseeable
d. Hypothetical

16.4.58. Further detail on the above categories' classification are described in **Table 16-4** below.

16.4.59. Developments deemed sufficiently certain were included in the 'core scenario' for traffic modelling.

16.4.60. The Scheme traffic model included scoping criteria that were used to decide which developments should be included. This was based on the certainty of outcome shown in **Table 16-4** below, which was developed in line with TAG guidance (**Ref. 16.5**). In order to align with the Scheme's traffic model, the assessment of cumulative effects included only those developments that were considered as being 'Near Certain' and 'More Than Likely'.

Table 16-4 – Uncertainty Log Certainty of Outcome and Development Status Criteria

Certainty of Outcome	Development Status
Near Certain: The outcome will happen or there is a high probability that it will happen.	- Intent announced by proponent to regulatory agencies. - Projects under construction.
More Than Likely: The outcome is likely to happen but there is some uncertainty.	- Submission of planning or consent application imminent. - Development application within the consent process.
Reasonably Foreseeable: The outcome may happen, but there is significant uncertainty.	- Identified within a development plan. - Not directly associated with the transport strategy / scheme, but may occur if the strategy scheme is implemented. - Development conditional upon the transport strategy / scheme proceeding. - Committed policy goal, subject to tests (e.g. of deliverability) whose outcomes are subject to significant uncertainty.
Hypothetical: There is considerable uncertainty	- Conjecture based upon currently available information.

Certainty of Outcome	Development Status
whether the outcome will ever happen.	- One of a number of possible inputs in an initial consultation process. - Policy aspiration.

WSP Traffic Model Uncertainty Log (2018) (**Ref. 16.6**)

16.4.61. In addition to the above, a search for major applications was undertaken via the Northumberland County Council (NCC) website using their online application search facility (**Ref. 16.7**) based on the following criteria:

a. Major Applications validated within a three-year period (based upon the default period of three years in which planning permission must be implemented). The cut-off date for the 'other development' search was February 2020 to allow the assessment to be completed prior to the application (in line with the guidance provided in Advice Note 17 (**Ref. 16.4**)).

b. Consideration of the following type of planning applications of 'approved' or 'awaiting decision' status, and discounting any 'withdrawn':

i. Full permission - provides planning permission for a development which can commence following the discharge of conditions outlined in the decision notice.

ii. Outline permission - provides permission in principle for the development, however, matters such as access, design, landscape planting, surface water management, etc. are often excluded and addressed in a separate application for Reserved Matters. This is a secondary application stage where full details of the reserved matters must be submitted to, and approved by, the Local Planning Authority. Conditions will be applied to the granting of the Reserved Matters which themselves will also have to be discharged.

iii. Reserved Matters – details of matters which were reserved in a permitted Outline application. However, only Reserved Matters applications whereby the application concerning matters which may affect the environment, such as plot layout or landscape planting, have been considered.

iv. Hybrid permission - provides full and outline permission applications.

c. Planning applications types 'awaiting decision' and 'approved', and have 'refused' status but are still within the timescales for appeal (six-months from decision notice).

16.4.62. In October 2018, March 2019, July 2019 and February 2020, NCC was contacted to comment on the initial proposed methodology for the cumulative effects assessment (refer to **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)). NCC indicated that refused applications within the timescales for appeal should be included within the long list of 'other developments'. As such, the assessment methodology was amended to include all 'refused'

applications within the timescales for appeal, discounting only 'withdrawn' or 'refused' applications outside of this timescale.

Stage 2 and 3 – Information Gathering and Identification of a Short List of 'Other Developments '

16.4.63. The long list developed in Stage 1 was screened to refine a short list of relevant other development applications to be considered within the next stage (i.e. Stage 4) and taken forward into the assessment of cumulative effects.

16.4.64. In the first instance, data was obtained from websites of the relevant competent authorities (i.e. NCC and Planning Inspectorate). Where possible, this was supplemented by liaising with third parties (Local Authorities and relevant applicants / developers).

16.4.65. Environmental information about the 'other developments', where available, was reviewed with the intention of identifying the predicted environmental effects of the other development, the period over which the effects could occur, the scale and nature of the development and an indication of the certainty that the development would go ahead, which considered the following levels of certainty:

a. Certain (consented and started construction)
b. Likely (consented, not started construction or construction status unknown)
c. Unknown (not consented and not started construction)
d. Unlikely (any other unique circumstance)

16.4.66. Following this, some of the other developments captured in the long list were screened out of the assessment of cumulative effects, for the following reasons:

a. There was too much uncertainty about the project progressing (for example, if an application had a status of 'unknown'), and therefore of its impacts occurring, to justify its inclusion in the assessment as discussed in **Table 16-4** above.
b. There was insufficient environmental information such as environmental reports, publicly available on the 'other development', and in particular its environmental effects, to allow an assessment to be undertaken.
c. It is confirmed that the temporal scope of the 'other development' would mean that it would not act 'cumulatively' with the Scheme e.g. construction of the 'other development' would be complete prior to the Scheme being built and therefore would be considered as future baseline.
d. 'Outline' applications have not been considered if they have been updated by a Full Application for the same site and development proposal.

16.4.67. In line with the Planning Inspectorate's Advice Note Seventeen (**Ref. 16.4**), at this stage available information was gathered regarding the shortlisted 'other developments'. This information was gathered from websites of the relevant competent authorities (i.e. NCC and the Planning Inspectorate).

16.4.68. The short list is presented in **Appendix 16.1: Cumulative Short List** of this ES, with details of each project's current status and comments regarding the temporal and spatial scope of the 'other development'.

16.4.69. All the 'other developments' identified in **Appendix 16.1: Cumulative Short List** of this ES**,** are to be taken forward to the next stage (i.e. Stage 4) are considered to be of such a nature and proximity to the Scheme to have the potential to generate significant cumulative effects when considered in context with the Scheme.

Stage 4 – Assessment of Cumulative Effects

16.4.70. For each environmental topic assessment, the short list of 'other developments' was filtered to identify those 'other developments' as being within each of the environmental topic's ZOI and having the potential to cause cumulative effects, by reviewing the available environmental information and identifying potential impacts at common sensitive receptors which have the same temporal and spatial overlap. If a development is included in the short list but is outside an environmental topic's ZOI (set out in **Table 16-6** below) or is considered to not have potential for cumulative impacts for that particular topic, that development has been scoped out of assessment for that particular topic. A summary of 'other developments' identified per topic is provided in **Appendix 16.3: Cumulative Assessment Matrix** of this ES. Only the short listed 'other developments' that could be affected by each of the environmental topics are presented within **Appendix 16.3: Cumulative Assessment Matrix** of this ES.

Updated DMRB Guidance

16.4.71. As described in **paragraph 16.4.43**, some DMRB guidance documents were updated in 2019 and 2020 (and associated IANs replaced), by which time the EIA for the Scheme was largely complete. Therefore, a DMRB sensitivity test has been undertaken which draws on the results of the DMRB sensitivity test for the Within Topic combined assessment (refer to **Section 16.4** and **Section 16.8** of this chapter), Part A **Technical Chapters 5** to **13** and **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13** and **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the findings of the DMRB sensitivity test for the ES. The DMRB sensitivity test for the cumulative effects assessment considers the additional significant effects for the Scheme identified as part of the above DMRB sensitivity tests. The outcomes of the DMRB sensitivity test for the cumulative effects of Scheme is provided in **paragraphs 16.9.3** to **16.9.4** of this chapter.

SIGNIFICANCE OF EFFECTS

16.4.72. Although the EIA for the Scheme, unless otherwise stated, considers effects of moderate or above significance as a 'significant effect' in terms of the EIA Regulations (as stated in **Section 4.5** in **Chapter 4: Environmental Assessment Methodology**, **Volume 1**

(**Application Document Reference: TR010041/APP/6.1**) of this ES, this cumulative effects assessment considers effects of minor significance or above to assess whether multiple effects of minor significance (i.e. those which are not considered significant in terms of the EIA Regulations 2017) could combine to result in a significant cumulative effect. Effects of negligible significance have been excluded in this assessment as, by virtue of their definition, their measurable effect is not considered to have the potential to result in a significant cumulative effect, neither cumulative nor combined.

16.4.73. The following factors have been considered in determining the significance of cumulative effects, in accordance with DMRB Volume 11 Section 2 Part 5 Section IV (HA 205/08) (**Ref. 16.8**):

a. Which receptors / resources are affected?
b. How will the activity or activities affect the condition of the receptor / resource?
c. What are the probabilities of such effects occurring?
d. What ability does the receptor / resource have to absorb further effects before change becomes irreversible?

16.4.74. The significance of cumulative effects has been determined using professional judgement based on the following criteria, which are set out in DMRB (**Ref. 16.8**) and defined **Table 16-5** below.

Table 16-5 – Combined and Cumulative Significance of Effect Definition

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor / resource is irretrievably comprised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

GUIDANCE

16.4.75. The following guidance documents have been used to inform the methodology for this assessment:

a. DMRB, Volume 11 Section 2, Part 5 (**Ref. 16.8**).

b. The Planning Inspectorate Advice Note Seventeen - Cumulative Effects Assessment (**Ref. 16.4**). This guidance sets out a staged process for the assessment of cumulative effects for an ES.

16.4.76. DMRB, Volume 11 Section 2, Part 5 (**Ref. 16.8**) has been superseded by DMRB LA 104 (**Ref. 16.9**). As detailed in **Appendix 4.5: DMRB Sensitivity Test**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), the cumulative and combined assessment complies with the changes in LA 104. Therefore, the conclusions presented in this chapter would remain unchanged with the implementation of the updated DMRB guidance for the cumulative and combined assessment (LA 104).

16.4.77. However, the Within Topic combined assessment, Cross Topic combined assessment and cumulative effects assessment are based on the outcomes of the technical assessments as detailed in **Section 16.4** and **Section 16.8** of this chapter, Part A **Technical Chapters 5** to **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and this chapter. **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the findings of the DMRB sensitivity test for the ES. Therefore, if the updated DMRB guidance for these assessments would change the outcomes of the technical assessments, this could change the outcomes of the combined and cumulative effects assessments. A DMRB sensitivity test has therefore been undertaken in order to determine whether the updated DMRB guidance would change the outcomes of the combined and cumulative effects assessment due to changes in the outcomes of the technical assessments. The DMRB sensitivity tests for the combined and cumulative effects assessments have taken into consideration the additional significant effects for the Scheme identified as part of the DMRB sensitivity tests for the technical assessments. For the Within Topic combined assessment this DMRB sensitivity test is presented in **Section 16.8** under each of the relevant topic headings. For the Cross Topic combined effects assessment, the DMRB sensitivity test can be found in **paragraphs 16.8.65** to **16.8.67** of this chapter. For the cumulative effects assessment, the DMRB sensitivity test is presented in **paragraphs 16.9.3** to **16.9.4** of this chapter.

16.5 ASSUMPTIONS AND LIMITATIONS

16.5.1. The assessment of combined effects and cumulative effects resulting from the Scheme has focused on the residual effects from the construction and operational phase following the implementation of mitigation measures. There is an assumption all proposed mitigation measures identified in Part A **Technical Chapters 5** to **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) or identified in the environmental information obtained for the other developments, would be secured and delivered through the relevant consenting or permitting regimes.

16.5.2. The assessment of cumulative effects has used the most up to date 'other development' information wherever possible and has been limited to publicly available information obtained from the relevant planning applications on NCC's publicly accessible database (**Ref. 16.7**) or the Inspectorate's website (**Ref. 16.10**). The search for planning applications was originally undertaken in September 2018 for Part A and May 2019 in Part B. However, the long list has been checked and updated for the Scheme in February 2020.

16.5.3. Where a planning application has been submitted or has been permitted but no environmental information is available, if the application otherwise meets the criteria for inclusion in the short-list (i.e. has a reasonable level of development certainty, is within the search area and of an appropriate development type) then this application has been included and, as far as reasonably practicable, professional judgement using knowledge and experience of similar schemes has been used to consider the potential impacts.

16.5.4. Any planning applications, status updates or additional information published since February 2020 (as stated in **paragraph 16.4.61** above) have not been included within this assessment.

16.5.5. For the assessment of cumulative effects, the determination of whether an application was considered for inclusion in the short list, where construction timescales were not available, a 'worst-case' assumption was taken that the construction timescale of the 'other development' would overlap with the Scheme.

16.6 STUDY AREA

COMBINED EFFECTS

Within Topic

16.6.1. In general, the Study Areas used for the Within Topic combined effects assessment were the same as those reported in Part A **Technical Chapters 5** to **14, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **14**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). However, the following assessments used a different Study Area:

a. **Air quality** - The Within Topic combined assessment has been undertaken based on the Scheme Affected Road Network. As detailed in **Appendix 16.4**: **Air Quality Likely Significant Effects of the Scheme** of this ES**,** the extent of the ARN has been determined using the DMRB HA 207/07 (**Ref. 16.11**) scoping criteria. The Scheme air quality ARN is shown on **Figure 16.2: Scheme Air Quality Affected Road Network** of this ES.

b. **Noise** – The Study Area for noise and vibration was defined in accordance with DMRB HD 213/11 (**Ref. 16.12**). The Scheme Study Area for the operational noise and vibration assessment is made up of three elements: Scheme Study Area: Part A; Scheme Study Area: Part B; and Wider Network Affected Links. This approach has been taken because the operational road traffic noise Study Area is predominantly derived based on a distance buffer around the physical works applicable to the Scheme (i.e. Part A and Part

B), and also incorporates affected wider network routes outside of this buffer. The Scheme Study Area: Part A corresponds to the Study Area defined within Part A **Chapter 6: Noise and Vibration, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and the Scheme Study Area: Part B corresponds to the Study Area Part B **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) because the general arrangement remains unchanged for the Scheme. The noise and vibration assessment also considered road links outside the Scheme Study Area: Part A and Scheme Study Area: Part B that would be affected by changes in traffic flows due to the Scheme, as shown on **Figure 16.1: Cumulative Assessment Applications** of this ES. These Wider Network Affected Links have been identified using the methodology defined in DMRB HD 213/11 (**Ref. 16.12**). Refer to **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme,** for further detail.

c. **Biodiversity** – The Study Area is defined as 200 m from the air quality ARN as established by the modelling and presented in **Figure 16.2: Scheme Air Quality Affected Road Network.**

Cross Topic

16.6.2. The Study Areas used for the Cross Topic combined effects assessment was the same as those identified within each of the Part A **Technical Chapters 5** to **13, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). For the Cross Topic combined effects, the assessment considers the potential combined effects where the Part A and Part B Study Areas of the **Technical Chapters 5** to **13** overlap.

CUMULATIVE EFFECTS

16.6.3. The Study Area for Stage 1 was defined taking account of the relevant topic guidance and geographic scope of the Scheme's potential impacts relevant to each of the Part A **Technical Chapters 5** to **13, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

16.6.4. The 2 km buffer used in Stage 1 was based on the visual assessment Zones of Theoretical Visibility (ZTV) (described within Part A **Chapter 7: Landscape and Visual, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 7: Landscape and Visual, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)), as this is the largest topic Study Area (ZOI) of this ES that would likely give rise to significant cumulative effects. The wider Study Area of 5 km for landscape character for Part A as defined in **Chapter 7: Landscape and Visual**, **Volume 2** of this ES has not been used because no effects beyond 2 km are anticipated. However, to confirm this a sensitivity test was undertaken, which satisfactorily demonstrated that no significant cumulative effects were identified beyond 2 km for Part A (refer to **Appendix 16.10: Cumulative Study Area Sensitivity Test** of this ES). The wider Study Areas defined for

Part A **Chapter 9: Biodiversity, Volume 2** of this ES and Part B **Chapter 9: Biodiversity, Volume 3** of this ES with regards to European sites i.e. 30 km and 10 km (refer to **Table 16-6** below) have not been applied to this assessment, as no significant effects are anticipated upon European sites, as stated in the **Habitats Regulations Assessment** (**Application Document Reference: TR010041/APP/6.14**).

16.6.5. In addition to the 2 km buffer, the Study Area also included the Scheme air quality ARN (refer to **Appendix 16.4**: **Air Quality Likely Significant Effects of the Scheme** of this ES) and noise and vibration Wider Network Affected Links (refer to **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES) which extends beyond 2 km. The air quality ARN and noise and vibration Wider Network Affected Links have been developed from traffic data available for the Scheme (refer to **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**) and cover both the Scheme and extent of the surrounding road network which is likely to be impacted.

16.6.6. In addition, an approximate 200 m buffer has been included around the ARN. A 200 m buffer was considered appropriate because it is the largest ZOI for affected road links for the Scheme, which is defined by the 200 m buffer from the ARN used for the operational air quality assessment for the Scheme (refer to **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES). As detailed in DMRB HD 213/11 (**Ref. 16.12**), a 50 m boundary from an affected link was used for the operational noise assessment. The extents used for the Study Area are shown on **Figure 16.1: Cumulative Assessment Applications** of this ES**.**

16.6.7. Professional judgement was used to include applications which are slightly beyond 200 m which also have the potential for cumulative effects i.e. due to their scale or nature of the proposal. The extent was slightly increased compared to that which was used in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES. The assessment allows for two junctions beyond the southern extent of the Scheme ARN to account for the dispersion of traffic flows beyond the Scheme ARN. This allowed any other developments that are not included in the traffic model, and may cumulatively have an effect, to be captured beyond the edge of the ARN. This was not considered appropriate for the northern extent of the Scheme because this area is sparsely populated and there are a low number of sensitive receptors at this location.

16.6.8. Therefore, in summary the Study Area for the cumulative effects assessment consists of a 2 km buffer from the Order Limits, plus the air quality ARN and noise and vibration Wider Network Affected Links (where it extends beyond the 2 km buffer) and 200 m around the roads included in the ARN and Wider Network Affected Links. In addition, the Study Area has been increased to the southern extent of the ARN where it follows the A1 to allow for two junctions.

16.6.9. The Study Area, as presented in **Figure 16.1: Cumulative Assessment Applications** of this ES, form the extent of the areas used in the identification of a long list of potentially relevant ‘other developments’.

16.6.10. The extents of the Scheme's ZOI for each environmental topic are described and presented below in **Table 16-6**. The ZOIs capture the potential maximum extent for which significant cumulative environmental effects are considered possible. A description and reasoning for each ZOI is also provided in **Table 16-6**. Where a slightly different Study Area was used for the technical assessment for Part A (refer to **Technical Chapters 5** to **13, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (refer to **Technical Chapters 5** to **13**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)), the largest ZOI was used for the cumulative effects assessment as a worst-case scenario.

Table 16-6 – ZOI Extents for Assessment of Cumulative Effects

Environmental Topic	Zone of Influence (ZOI)
Air Quality **Chapter 5: Air Quality, Volume 2** of this ES **Chapter 5: Air Quality, Volume 3** of this ES	**Construction:** As reported in **Section 5.6** of Part A **Chapter 5: Air Quality, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 5: Air Quality, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) the ZOI is 200 m from the Order Limits for construction dust and emissions. A ZOI for construction traffic was determined based on a review of other development proposals and their construction programmes (where available). **Operation:** The ARN within the traffic model defines the ZOI (refer to **Figure 16.2: Scheme Air Quality Affected Road Network** of this ES). As the operational phase traffic data includes traffic associated with other developments, the air quality impact assessment reported in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES, is inherently cumulative. Therefore, the cumulative effects assessment has focused on the other developments not considered in the traffic model.
Noise and Vibration **Chapter 6: Noise and Vibration, Volume 2** of this ES **Chapter 6: Noise and Vibration, Volume 3** of this ES	**Construction:** As reported in **Section 6.6** of Part A **Chapter 6: Noise and Vibration, Volume 2** (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI has been defined by a 300 m buffer of the Order Limits and affected links (including the proposed carriageway works, structure works, the proposed construction compounds, construction traffic routes and diversions). **Operation:** The main Study Area and Wider Network Affected Links is partly determined based on the traffic data for the Scheme (refer to **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES). As the operational phase traffic data includes traffic associated with other developments, the noise and vibration impact assessment reported in **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES is inherently cumulative. As such, a cumulative effects assessment for the operational phase for air quality and noise has focused on the other developments not considered in the traffic model.
Landscape and Visual **Chapter 7: Landscape and Visual, Volume 2** of this ES **Chapter 7: Landscape and Visual, Volume 3** of this ES	**Construction** and **Operation**: As defined in **Section 7.6** of Part A **Chapter 7: Landscape and Visual, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 7: Landscape and Visual, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI for the visual assessment is 2 km from the Scheme. For Part A, the ZOI for the landscape assessment is 5 km from the centreline, while for the visual assessment a 2 km Study Area is used for establishing representative viewpoints and a 1 km Study Area is used for the visual impact assessment for individual receptors and groups. Refer to **Section 7.6** of Part A **Chapter 7: Landscape and Visual, Volume 2** of this ES for further details. For Part B, the Study Area for the visual impact and landscape character assessment was initially defined by the extent to which the Scheme would be visible as shown on the ZTV plan. However, the Study Area was refined to 2 km due to fieldwork identifying that significant effects would be unlikely beyond 2 km due to the intervening vegetation, built form and topography limiting broader visibility. Refer to **Section 7.6** of Part B **Chapter 7: Landscape and Visual, Volume 3** of this ES for further details. A 2 km Study Area has been used for the cumulative effects assessment because no significant effects beyond 2 km are anticipated (as explained in **paragraph 16.6.4** of this chapter).
Cultural Heritage **Chapter 8: Cultural Heritage, Volume 2** of this ES **Chapter 8: Cultural Heritage, Volume 3** of this ES	**Construction** and **Operation**: As reported in **Section 8.6** of Part A **Chapter 8: Cultural Heritage, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 8: Cultural Heritage, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI for heritage assets including designated, non-designated, potential archaeological remains and historic landscapes has been defined as 500 m from the Order Limits. A wider ZOI of 1 km from the Order Limits was defined for effects on the settings of designated heritage assets and Conservation Areas.
Biodiversity **Chapter 9: Biodiversity, Volume 2** of this ES **Chapter 9: Biodiversity, Volume 3** of this ES	**Construction** and **Operation**: As reported in **Section 9.6** of Part A **Chapter 9: Biodiversity, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 9: Biodiversity, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI is 30 km for a Special Area of Conservation designated for bats, 10 km for European designated sites, 5 km for bat records and statutory and non-statutory designated sites for bats and 2 km from the Order Limits for statutory and non-statutory designated sites and protected species records. Within this, the ZOI for assessment purposes varies according to specific biodiversity receptors. The Study Area

Environmental Topic	Zone of Influence (ZOI)
	for groundwater features and hydrological connectivity is 1 km from the Order Limits, and 500 m for surface water connectivity and direct effects. With regard to nitrogen deposition at designated and non-designated sites, all sites within 200 m of the Scheme ARN are assessed.
Road Drainage and the Water Environment **Chapter 10: Road Drainage and the Water Environment, Volume 2** of this ES **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES	**Construction** and **Operation**: As reported in **Section 10.6** of Part A **Chapter 10: Road Drainage and the Water Environment, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI is defined as 500 m from the Order Limits for surface water receptors and features beyond this area that are in hydraulic connectivity with the Scheme. The Study Area for groundwater features and groundwater abstractions is 1 km from the Order Limits. The Study Area for flood risk was 1 km from the Order Limits.
Geology and Soils **Chapter 11: Geology and Soils, Volume 2** of this ES **Chapter 11: Geology and Soils, Volume 3** of this ES	**Construction** and **Operation**: As reported in **Section 11.6** of Part A **Chapter 11: Geology and Soils, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 11: Geology and Soils, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI is defined as 250 m from the Order Limits.
Population and Human Health **Chapter 12: Population and Human Health, Volume 2** of this ES **Chapter 12: Population and Human Health, Volume 3** of this ES	**Population – Construction** and **Operation**: As reported in **Section 12.6** of Part A **Chapter 12: Population and Human Health, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI for economic impacts is considered on a regional scale (i.e. Northumberland). The ZOI for vehicle travellers is the extent of the road network within the Order Limits and connected road network. The Study Area for assessing views from the road is the existing A1 both northbound and southbound. The ZOI for community receptors and other aspects is as follows: - Impacts on community receptors (including PRoW, journey amenity and community facilities) – 500 m from the Order Limits - Impacts on community severance – 1 km from the Order Limits and sensitive communities further afield that could be impacted by the Scheme. - Impacts on physical assets (including private property and commercial properties) – within the Order Limits and 500 m from the Order Limits - Impacts on agricultural land holdings – the area within the Order Limits. - Impacts on recreation and open space – 500 m from the Order Limits **Health – Construction** and **Operation**: As reported in **Section 12.6** of Part A **Chapter 12: Population and Human Health, Volume 2** of this ES and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES, there is currently no defined Study Area for human health. For the purposes of this assessment, the Study Areas for other environmental topics relevant to health have been used: - Air Quality – 200 m - Noise and Vibration – 600 m - Road Drainage and the Water Environment – 1 km
Material Resources **Chapter 13: Material Resources, Volume 2** of this ES **Chapter 13: Material Resources, Volume 3** of this ES	**Construction and Operation**: As reported in **Section 13.6** of Part A **Chapter 13: Material Resources, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 13: Material Resources, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the ZOI comprises the Order Limits (within which construction materials would be consumed and waste would be generated) and the region within which waste management facilities are located (i.e. North East of England). The ZOI for material resources extends to the North East of England and UK from where construction and recovered materials may be sourced.

16.6.11. **Figure 16.1: Cumulative Assessment Applications** of this ES also illustrates a 250 m, 500 m, 1 km buffer around the Order Limits and a 2 km buffer around the Order Limits and affected roads. However, these are to provide contextual reference for the ZOIs discussed in **Table 16-6** above and are not Study Areas in their own right.

16.7 BASELINE CONDITIONS

WITHIN TOPIC COMBINED EFFECTS

16.7.1. For the Within Topic combined assessment, the following common sensitive receptor types are present for the Scheme. These are sensitive receptors that would be affected by both Part A and Part B when considered together:

Air Quality

16.7.2. There are no Air Quality Management Areas within 200 m of the ARN, and concentrations of NO_2, PM_{10} and $PM_{2.5}$ are all well below their respective annual mean objectives.

16.7.3. A total of 293 receptors were identified within the Study Area for the assessment of construction air quality. The receptors included residential premises, Tritlington Church of England First School, Northgate Hospital and Northumbrian Woodland Burials. These are illustrated on Part A **Figure 5.4: Construction Receptors, Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), and Part B **Figure 5.4: Construction Receptors, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

16.7.4. Twenty-five human receptors have been identified in the Study Area for the assessment of operational air quality. Baseline concentrations for all 25 human receptors are well below the objectives for all pollutants.

16.7.5. Twenty-four designated sites for nature conservation and ancient woodland sites were identified within the Study Area for the assessment of operational air quality. For the purpose of this assessment, statutory sites have been considered as national and international sites in accordance with DMRB HA 207/07. The River Coquet and Coquet Valley Woodlands SSSI and Longhorsley Moor SSSI are the only sensitive statutory designated ecological receptors within 200 m of the ARN. There are 22 other non-statutory and ancient woodland sites within 200 m of the ARN.

16.7.6. Further baseline information is available in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES, Part A **Chapter 5: Air Quality, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 5: Air Quality, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

Updated DMRB Guidance

16.7.7. In addition to the 24 designated habitats identified above, a further 26 ancient/veteran trees were identified within the Study Area. Further baseline information is available in **Appendix 16.7: Biodiversity DMRB Sensitivity Test: The Scheme** of this ES**.**

Noise and Vibration

16.7.8. A total of 383 residential receptors and six non-residential noise-sensitive receptors were identified within the Scheme Study Area: Part A. The six non-residential noise sensitive receptors are two hospital buildings, a school, a church and two holiday cottages.

16.7.9. For the Scheme Study Area: Part B, a total of 77 residential receptors and 11 non-residential noise-sensitive receptors were identified. The non-residential receptors are seven holiday let / accommodation /short-term lets, a museum, a tennis court, a dog kennels and a riding centre.

16.7.10. For areas remote from existing road traffic routes, existing baseline noise and vibration levels are expected to be low. As well as road traffic noise from the A1, other local roads in the area are expected to dominate the existing noise and vibration environment for many receptors local to the Scheme.

16.7.11. Further detail regarding the baseline conditions is available in Part A **Chapter 6: Noise and Vibration, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

Updated DMRB Guidance

16.7.12. The baseline conditions for the DMRB sensitivity test is the same as the original assessment, and therefore the same as **paragraphs 16.7.8** to **16.7.12**.

Biodiversity

16.7.13. Twenty-four ecological receptors were identified within the Study Area including: six statutory sites (two Sites of Special Scientific Interest (SSSIs) and four Local Nature Reserves); eight non-statutory sites (Local Wildlife Sites (LWSs)); and 10 ancient woodland sites. Ecological receptors identified for this assessment are detailed in **Tables 9-7** and **9-8** of Part A **Chapter 9: Biodiversity, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and shown on **Figure 5.2: Human and Ecological Receptors Assessed, Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). There were no additional ecological receptors identified in the biodiversity chapter for Part B relevant to this assessment.

Updated DMRB Guidance

16.7.14. In addition to ecological receptors (designated habitats) identified above, 26 ancient / veteran trees were identified within the Study Area. As ancient and veteran trees are irreplaceable habitat, they are considered of comparable importance to ancient woodland. As such, ancient and veteran trees are considered of National importance. Further baseline information is available in **Appendix 16.7: Biodiversity DMRB Sensitivity Test: The Scheme** of this ES**.**

Population and Human Health

Driver Stress

16.7.15. Baseline conditions for vehicle travellers and the resulting driver stress are outlined within Part A **Chapter 12: Population and Human Health, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

16.7.16. **Appendix 16.8: Driver Stress Analysis of the Scheme** of this ES presents the driver stress analysis for the Do-minimum scenario (without the Scheme). The analysis shows that driver stress for road users would be primarily high or moderate for four road sections through the Scheme Study Area: Part A. The users of the remainder of road sections through Scheme Study Area: Part A are likely to experience low levels of driver stress. Driver stress would be low for the majority of links between nodes through the Scheme Study Area: Part B, with the exception of those for one road section, where driver stress would be high.

Economy and Employment

16.7.17. The Office for National Statistics Labour Market Profile indicates that in comparison to the England average, a lower proportion of the population of Northumberland are in employment (67.9% in Northumberland compared to 69.9% nationally). A higher proportion of the population of Northumberland is economically inactive compared to the national average. This suggests that the local economy in Northumberland is performing poorly compared to the national average.

16.7.18. Further baseline information is available in Part A **Chapter 12: Population and Human Health, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**), and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

Human Health

16.7.19. The Public Health England health profile for Northumberland indicates that the health of the Northumberland population is slightly worse than the England average. The PHE health profile indicates that the adult population in Northumberland have a healthier lifestyle than the England average, with lower rates of smoking and higher rates of participation in physical activity than the England averages. The proportion of children in low income families in Northumberland is broadly in line with the England average according to the PHE health profile. The rate of obesity amongst children in Northumberland is slightly higher than the national average.

16.7.20. In 2015, Northumberland was ranked 145 most deprived out of the 326 local authorities in England. This places Northumberland in the top 50% most deprived local authorities in England.

16.7.21. Further baseline information is available in Part A **Chapter 12: Population and Human Health, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

Updated DMRB Guidance

16.7.22. A separate DMRB sensitivity assessment was not undertaken for population and human health, and therefore baseline information is not presented within this chapter.

Material Resources

16.7.23. The current operation and maintenance of the existing A1, within the Order Limits, requires a small number of specialist components (for example, signage, steelwork for replacement barriers) as well as some bulk material (asphalt for minor re-surfacing) for routine works and repairs of the highway and ancillary infrastructure. The availability of construction materials typically required for highways construction schemes in the North East of England and across the UK, indicates that stocks, production and sales remain buoyant.

16.7.24. The current operation and maintenance of the existing A1 assets currently generates small volumes of waste from routine maintenance, in combination with littering, signage replacement, replacement of reflective road studs (cats' eyes), vegetation from verge clearance and minor barrier refurbishments.

16.7.25. At the end of 2018, the landfill sites in the North East of England were recorded as having remaining capacity. Baseline data indicates that total and non-inert landfill capacity is likely to become an increasingly sensitive receptor over the life of the Scheme to the first full year of operation. Remaining capacity for non-inert wastes (hazards and non-hazardous wastes) are forecast to expire in 2022, in the absence of future provision.

16.7.26. Further baseline information is available in Part A **Chapter 13: Material Resources, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 13: Material Resources, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

Updated DMRB Guidance

16.7.27. The baseline conditions for the DMRB sensitivity test is the same as the original assessment, and therefore the same as **paragraphs 16.7.23** to **16.7.26**16.7.24.

Climate

16.7.28. In the baseline scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. The GHG assessment only considers where the Scheme results in additional or avoided emissions in comparison to the baseline scenario and its assumed evolution.

16.7.29. Construction phase baseline condition are described in Part A **Chapter 14: Climate, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 14: Climate, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

16.7.30. **Appendix 16.9: Climate Likely Significant Effects of the Scheme** of this ES presents the total end-user GHG emissions from traffic flows in the Do-minimum (baseline) scenario for the Scheme. There would be a total of 6,448,000 tonnes of GHG emissions as a result of traffic in the region of the Scheme, without the Scheme in place.

Updated DMRB Guidance

16.7.31. A separate assessment was not undertaken for climate, and therefore baseline information is not presented within this chapter.

CROSS TOPIC COMBINED EFFECTS

16.7.32. The common sensitive receptor types identified for the Cross Topic combined effects assessment are residents within the vicinity of the Main Compound that could be affected by the use of the Main Compound and construction traffic traveling between the Main Compound and Part B.

CUMULATIVE EFFECTS

16.7.33. For the cumulative effects assessment, a short-list of 'other developments' has been identified and is outlined in **Table 16-8**.

16.8 ASSESSMENT OF COMBINED EFFECTS

Combined Effects Within Topic

Air Quality

16.8.1. During construction, the Scheme could result in potential adverse impacts on air quality arising from construction works. However, with the application of mitigation measures, no significant effects are likely during the construction of the Scheme. Mitigation measures would, for example, include that construction traffic entering and leaving the Site with dust generating potential would be covered and wheel washing facilities made available. These mitigation measures are outlined in the **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES and the **Outline Construction Environmental Management Plan (Outline CEMP)** (**Application Document Reference: TR010041/APP/7.3**).

16.8.2. During operation, the Scheme has the potential to impact on ambient concentrations of NO_2, PM_{10} and $PM_{2.5}$ through changes to vehicle emission rates due to traffic re-routing and changes to fleet mix and speeds. Six human health receptors would experience a perceptible improvement in NO_2 concentrations due to reductions in traffic flows as a result of the Scheme along the de-trunked A1 and A697. Ten human health receptors would experience a perceptible worsening in NO_2 concentrations located adjacent to the existing

A1, adjacent to the Scheme, along Lemmington Bank and along A192 in Morpeth. Imperceptible change in annual mean NO_2 concentrations would occur at nine of the 25 receptors with the Scheme. For annual mean PM_{10}, 17 of the 25 receptors would experience imperceptible change. However, the pollutant concentrations would be below the assessment thresholds at all receptors in the Scheme opening year (NO_2 and PM_{10} / $PM_{2.5}$). Therefore, there are no properties that would experience a worsening or improvement of air quality where pollutant concentrations are already above an assessment threshold, or create a new exceedance of air quality assessment thresholds. As a result, there would be no significant effects on human receptors due to changes in air quality during the operation of the Scheme. No mitigation measures have been proposed for the operation of the Scheme because no significant impacts are anticipated.

16.8.3. The Scheme could lead to changes in traffic flows during operation which could cause a change in nitrogen deposition at ecological receptors. Of the 24 ecological receptors, seven would experience exceedances of the critical level 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)
c. Cawledge Burn (transects Eco18W and Eco18E)
d. Coney Garth Pond (transect Eco19)

Local Nature Reserve

a. Borough Wood (transect Eco7E)

16.8.4. The impact of the Scheme on nitrogen deposition at each of these ecological receptors was assessed. It is anticipated that there would be no significant effects at ecological receptors due to changes in nitrogen deposition. Further commentary on this is provided in **paragraphs 16.8.24** to **16.8.27** and **Appendix 16.6: Biodiversity Likely Significant Effects of the Scheme** of this ES.

16.8.5. At a regional level, the Scheme would increase emissions of all pollutants. This is due to the increase in vehicle-km travelled having a greater effect than the improvements in traffic flows brought on by the Scheme. It is anticipated that there would be an increase of 24,399 tonnes in CO_2, 19.3 tonnes of NOx and 3.5 tonnes of PM_{10} emissions with the Scheme in place during the design year.

16.8.6. An assessment to identify where the Scheme would be compliant with the EU limit value for annual mean NO_2 has been undertaken. There are no roads at risk of exceeding the EU limit value for annual mean NO_2 within the Scheme (refer to **Appendix 16.4: Air Quality**

Likely Significant Effects of the Scheme of this ES). As such, the Scheme poses a low risk in relation to EU limit value compliance.

16.8.7. Overall, following the guidance on the evaluation of significant effects, the effects of the Scheme are not significant.

16.8.8. Further details on the assessment of potential impacts of the Scheme on air quality, as well as the proposed mitigation measures, are presented in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES.

DMRB Sensitivity Test

16.8.9. As detailed in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES, the updated DMRB guidance would not change the assessment of construction dust and operational air quality on human receptors. However, the updated DMRB guidance would change the assessment of operational air quality on designated habitats. Under the updated guidance, more designated habitat types require consideration, changes in annual mean NOx in relation to the critical level are not required to be considered, and new deposition rates have been specified for grassland and forest type habitats (refer to **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) for further details). In total, 16 designated sites for nature conservation or ancient woodland sites and 9 veteran and ancient trees may experience a change in nitrogen deposition of greater than 1% of the lower critical load[1]. An assessment, based on professional judgement, was undertaken to determine if the change in nitrogen deposition would lead to the theoretical loss of one plant species at the designated habitats. The analysis demonstrated that there would be no significant effects on ecological receptors due to nitrogen deposition. Further commentary is provided in **paragraphs 16.8.28** to **16.8.32** of this chapter and **Appendix 16.7: Biodiversity DMRB Sensitivity Test: The Scheme** of this ES .

Noise and Vibration

16.8.10. As detailed in **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES, there is potential for the Scheme to result in adverse noise and vibration impacts arising from construction works. However, with the application of mitigation measures, no significant effects are likely. Mitigation measures are set out within:

a. **Appendix 6.8: Construction Noise and Vibration Mitigation Clauses**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

[1] Air Pollution Information System 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”.

b. **Appendix 6.9: Construction Noise and Vibration Mitigation Clauses**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
c. **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).

16.8.11. The operational noise and vibration assessment was based on traffic data for the Scheme, and a Scheme Study Area has also been adopted. As detailed in **paragraph 16.6.1**, the Scheme Study Area for the operational noise and vibration assessment is made up of three elements: Scheme Study Area: Part A; Scheme Study Area: Part B; and Wider Network Affected Links. Refer to **Figure 6.1: Noise and Vibration Assessment Extents, Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), **Figure 6.1: Operational Noise Calculation / Study Area, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) and **Figure 16.1: Cumulative Assessment Applications** of this ES.

16.8.12. The assessment consists of two components:

a. An assessment of whether the Scheme is compliant with the aims of the National Policy Statement of England (NPSE).
b. An assessment in accordance with DMRB guidance and determining significance of effect under the EIA regulations.

16.8.13. The existing baseline noise levels are expected to be low for areas remote from existing road traffic routes. As well as road traffic noise from the A1, other local roads in the area are expected to dominate the existing noise and vibration environment for many receptors local to the Scheme.

16.8.14. An overview of the noise and vibration assessment for the Scheme is provided below. Further detail on the assessment of potential impacts of the Scheme on noise and vibration is presented in **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES.

Scheme Study Area: Part A

16.8.15. Detailed noise predictions have been undertaken for a total of 383 residential receptors and six non-residential noise-sensitive receptors within Scheme Study Area: Part A. Two noise barriers are proposed near Causey Park (PNB2) and New Houses Farm (PNB3). Two noise barriers are also proposed at Northgate Farm (PNB1), as well as Felmoor park and Bockenfield Holiday park (PNB4), although further investigation would be undertaken at the next stage of design to determine whether there is sufficient space to build these barriers. These noise barriers are shown on **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). In addition, low noise road surface would be incorporated into the Scheme. Overall, the assessment in terms of the NPSE shows that the Scheme is not expected to change the category into which most receptors fall. The Scheme has a slight beneficial effect in the short-term and a slight adverse effect in the long-term (mainly due to the number of properties exceeding the Lowest Observed Adverse Effect Level (LOAEL)).

16.8.16. The changes in terms of noise levels within Scheme Study Area: Part A as a result of the Scheme traffic data are generally small. The DMRB assessment criteria set out in Part A **Chapter 6: Noise and Vibration**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) have been used for the assessment. In accordance with DMRB guidance, the Scheme would result in three significant adverse effects and 16 (13 dwellings and three other sensitive receptors) significant beneficial effects when considering the mitigation set out above (not including barriers PNB1 or PNB4 as it cannot yet be confirmed if they can be built). An additional two moderate adverse effects were identified but they were not deemed significant due to the noise level changes on other facades and the absolute noise levels at the receptors. Further information regarding the two moderate adverse effects is provided in **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES.

Scheme Study Area: Part B

16.8.17. Detailed noise predictions have been undertaken for a total of 77 residential receptors and 11 non-residential noise-sensitive receptors within the Scheme Study Area: Part B. Overall, the assessment in terms of the NPSE shows that the Scheme is not expected to change the category into which most receptors fall. The Scheme in the short-term, particularly during the day is predicted to result in a small reduction in the number of receptors experiencing noise levels above the Significant Observed Adverse Effect Level (SOAEL) and a small increase in receptors experiencing noise levels below the LOAEL, suggesting a beneficial effect at a small number of properties. In the long-term, the Scheme is predicted to result in an increase in receptors predicted to experience noise levels above the SOAEL and a reduction in receptors experiencing noise levels below the LOAEL, indicating an adverse effect at a small number of receptors.

16.8.18. Assessment within the Scheme Study Area: Part B in accordance with the DMRB HD 213/11 and Interim Advice Note 185/15 guidance shows that, in the short-term, the Scheme is predicted to result in four significant beneficial effects, with three being moderate beneficial effects and one being major beneficial. These beneficial effects are as a consequence of the new online widening distributing traffic further to the east and at a greater distance from dwellings to the west of the A1 within the vicinity of Patterson Cottage. The Scheme would also include low noise road surface.

Wider Network Affected Links

16.8.19. Several road links (seven in the short-term) are predicted to experience beneficial noise level changes of moderate or major magnitude as a result of the Scheme. Moderate adverse impacts are predicted for two road links in the short-term. For one of these links, there are no sensitive receptors falling within 50 m of the link. Predicted changes on this link have therefore not been considered further. For the other identified moderate adverse link, it has been identified that this is a rural road located over 9 km to the west of the Scheme. Given the low traffic flows on this link and the large distance from the Scheme, coupled with

the predicted moderate adverse change being at the bottom of the moderate noise change band, the identified noise level change is deemed to be not significant.

Updated DMRB Guidance

As detailed in **Appendix 16.5: Noise and Vibration Likely Significant Effects of the Scheme** of this ES and **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), a sensitivity test has been undertaken in order to understand the potential implications of the updated DMRB guidance on the operational road traffic noise assessment. The identified key changes are largely associated with a change from using banded and pivoted speeds to just pivoted speeds as well as a change to the building façade which is to be selected for assessment when determining significance of effects. A change from pivoted and banded speeds to just pivoted speeds could result in changes to traffic speeds used within the operational road traffic noise model, which consequently could alter the predicted noise levels. Further detail on the implications of the updated DMRB guidance on operational road traffic noise assessments is provided within **Appendix 6.10: Noise and Vibration DMRB Sensitivity Test, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.8**) and **Appendix 6.10: Noise and Vibration DMRB Sensitivity Test, Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.9**). The key implications of the updated DMRB guidance in relation to noise and vibration Scheme Study Area are outlined below.

Scheme Study Area: Part A

16.8.20. The three likely significant adverse effects identified in the Scheme Study Area: Part A would remain significant adverse effects following the updated DMRB guidance. There is the potential for one additional significant adverse effect at Northgate Farm if the noise barrier (PNB1) cannot be built at this location, however, it is likely that this property would be eligible for compensation under the Noise Insulation Regulations (NIR) if this is the case. A full assessment in accordance with the NIR would be carried out for the Scheme. There are 27 significant beneficial effects (24 dwellings and three other sensitive receptors) predicted following the updated DMRB guidance. Whilst there is the potential for one additional significant adverse effect at Northgate Farm, the proposed acoustic mitigation measures included as part of the Scheme (four noise barriers and a low noise road surface) remain appropriate for the Scheme.

Scheme Study Area: Part B

16.8.21. In the short-term, there would be an increase in **minor adverse** (**not significant**) effects from five to 19 residential receptors when applying the updated DMRB guidance. This is likely to be caused mainly by the change from banded speeds to pivoted speeds. However, the use of the updated DMRB guidance does not result in any additional significant adverse effects.

16.8.22. There is an increase in minor and major beneficial results which is likely to be mainly due to selecting the façade with the greatest magnitude of change to represent each building rather than the least beneficial change (which would always favour an adverse result over a beneficial one, regardless of the magnitude). Predicted beneficial changes at Patterson Cottage of major magnitude are considered to be significant, however, the moderate beneficial effects predicted at this property applying the previous DMRB guidance are also significant.

Wider Network Affected Links

16.8.23. A review of the wider network roads has shown that, compared to the above assessment, there are no additional significant adverse affected links as a result of the updated DMRB guidance.

Biodiversity

16.8.24. The potential for increased levels of nitrogen deposition at ecological receptors due to the Scheme has been assessed. Nitrogen is a major growth nutrient and changes in nitrogen deposition can result in negative impacts on biodiversity. Twenty-four ecological receptors were identified within the Study Area including: six statutory sites (two SSSIs and four Local Nature Reserves), eight non-statutory sites (LWSs) and 10 ancient woodland sites. The assessment used outputs from the air quality model to identify if there would be a significant effect on ecological receptors. Criteria set out in Part A **Chapter 9: Biodiversity**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) have been used for the assessment. Concentrations of annual mean NOx are used as the main basis for evaluating significant effects in relation to air quality. Where the annual mean NO_x concentration critical level of 30 µg/m^3 is exceeded and the change is greater than 1% of the critical level, the impact on nitrogen deposition was also considered in order to determine the significance of effect. The relevant assessment criteria for nitrogen deposition impacts is the critical load. Significance of effects were considered where the change in total nitrogen deposition (kg N/ha/yr.) in comparison to the baseline was greater than 1% (rounded to the nearest whole number) critical load for the site/habitat. Critical loads for sites/habitat were ascertained from the Air Pollution Information System (APIS) database.

16.8.25. The significance of effects was determined through quantifying the area of the designated site impacted by the change in air quality (exceedance of the critical load/levels) and the potential impact this may have on the integrity of the site. Where compensation has been provided to address the loss of habitat within a designated site during construction, the area of habitat lost within the designated site has been excluded from the area that may be impacted by operation changes in air quality. This is because habitat that has been removed can no longer be affected by operational changes in air quality. In accordance with IAN 174/13 (**Ref. 16.13**), the level at which an impact is deemed significant is based on professional judgement.

16.8.26. It is anticipated that the Scheme would not have significant effects on ecological receptors as a result of operational air quality. Therefore, there are no specific design, mitigation or enhancement measures identified as part of this assessment.

16.8.27. Further details on the assessment of the potential impacts of the Scheme on ecological receptors arising from operational air quality are presented in **Appendix 16.6: Biodiversity Likely Significant Effects of the Scheme** of this ES.

Updated DMRB Guidance

16.8.28. The updated DMRB guidance would change the assessment of operational air quality on ecological receptors (refer to **paragraph 16.8.9** of this chapter and **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) for further details). In accordance with the updated DMRB guidance, an assessment on Nature Improvement Areas and veteran trees within 200 m of the ARN, as determined by the air quality modelling, was undertaken. As both ancient and veteran trees are considered of similar and high ecological importance and are irreplaceable, both were considered in the assessment. In addition to the 24 ecological receptors (designated sites for nature conservation and ancient woodland sites) previously identified, 26 ancient / veteran trees were identified within the Study Area (these are collectively referred to as designated habitats in accordance with LA 105 Air Quality). There were no Nature Improvement Areas within the Study Area.

16.8.29. In accordance with the updated DMRB guidance, nitrogen deposition for designated habitats is used as the main basis for evaluating significant effects in relation to air quality. Significance of effects were considered where the change in total nitrogen deposition (kg N/ha/yr.) with the Scheme ('Do Something' scenario) in comparison to the future baseline ('Do Minimum' (without the Scheme) scenario) was >1% (as an absolute number) of the critical load for the site / habitat and the critical load is exceeded. In all instances, the critical load of the designated habitat was exceeded with or without the Scheme. Critical loads for sites / habitats were ascertained from the APIS database. In total, 16 designated sites for nature conservation or ancient woodland sites and 9 veteran and ancient trees may experience a change in nitrogen deposition of >1% of the lower critical load.

16.8.30. Where the change in nitrogen deposition is >1% of the critical load, LA 105 Air Quality prescribes a need to identify whether the designated habitat air quality attribute is either 'Restore' or 'Maintain'. Air quality attributes are generally determined for European designated sites (those protected at an international level) and are not usually attributed to locally or nationally designated sites for nature conservation or ancient woodland. As such, air quality attributes are not available for the designated habitats considered within this assessment. Where information is available, this has been used to inform a professional judgement to determine the air quality attribute for the designated habitat. The justification for the attribution is presented within **Appendix 16.7: Biodiversity DMRB Sensitivity Test: The Scheme** of this ES. Where insufficient information is available, the air quality attribute has been set to 'Restore', as acknowledged in LA 105 Air Quality.

16.8.31. An assessment based on professional judgement was then made to determine if the change in nitrogen deposition would lead to the theoretical loss of one plant species, using Table 21 of the nitrogen deposition dose response report published by Natural England (**Ref. 16.14**) and the approach detailed in LA 105 Air Quality. The analysis demonstrated that there would be no significant effects on ecological receptors due to operational air quality.

16.8.32. Further details of the assessment of potential impacts of the Scheme on ecological receptors arising from operational air quality using the updated DMRB guidance is provided in **Appendix 16.7**: **Biodiversity DMRB Sensitivity Test: The Scheme** of this ES.

Population and Human Health

Driver Stress

16.8.33. During construction, there would be some temporary disruption to motorised travellers on the A1 and surrounding road network, particularly on the online widening sections of the Scheme. Once in operation, the new arrangement would serve to separate strategic, long-distance traffic from local traffic, reducing driver stress for local journeys and making local journeys safer. The Scheme would also increase capacity which would improve resilience; improve journey times; improve journey time reliability; and improve safety along the route.

16.8.34. It is assumed that during construction, driver stress would be high for vehicle travellers along the A1, as traffic diversions and construction works would likely cause increased user confusion and disruption on the road network in the Part A and Part B Study Area. Therefore, there is likely to be an overall increase to the level of driver stress experienced along the A1 during construction, however implementation of measures set out in the **Construction Traffic Management Plan** (**Application Document Reference: TR010041/APP/7.4**) would limit effects where possible.

16.8.35. The Scheme would be designed with appropriate signage and grade separated crossings to reduce fear of accidents for road users. According to the criteria within DMRB guidance, the figures show that the level of driver stress would decrease to a larger proportion of moderate than high levels for the A1 within the Scheme Study Area: Part A, and from moderate to low for three road sections through the Scheme Study Area: Part A. The majority of all other links through the Scheme Study Area: Part A would remain as low. Therefore, there is not likely to be a significant change in the driver stress experienced by road users in the locality of the Scheme Study Area: Part A.

16.8.36. Driver stress would remain low for the majority of links between nodes through the Scheme Study Area: Part B, with the exception of those in one road section, where driver stress would remain as high, and therefore, there is not likely to be a significant change in the driver stress experienced by road users in the locality of the Scheme Study Area: Part B.

16.8.37. The analysis demonstrates that there would be a **Slight Beneficial** (**not significant**) effect on driver stress under the ‘Do Something’ scenario for the opening and design years. This would primarily be due to the decrease in frustration resulting from reductions in the peak

hourly flow. However, motorised users would also benefit from a reduction in the fear of potential accidents and route uncertainty.

16.8.38. Further details on the driver stress analysis for the Scheme is included in **Appendix 16.8: Driver Stress Analysis of the Scheme** of this ES.

Economy and Employment

16.8.39. The construction of the Scheme would generate direct, indirect and induced employment opportunities. It is assumed that employment opportunities associated with the works would be made available to the local workforce where possible, although it is recognised that the installation of specialist plant and equipment may not be able to be completed by the local workforce. Additionally, the site preparation, earthworks and construction activities would lead to an increase in spending in the local economy by local contractors. The employment opportunities anticipated to be generated by Part A and Part B are presented in Part A **Chapter 12: Population and Human Health**, **Volume 2** of this ES (**Application Document Reference**: **TR010041/APP/6.2**) and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES (**Application Document Reference**: **TR010041/APP/6.3**) respectively. Assessment criteria set out in Part A **Chapter 12: Population and Human Health**, **Volume 2** of this ES and Part B **Chapter 12: Population and Human Health, Volume 3** of this ES have been used for the assessment. Based on these assessment criteria, it is anticipated that the Scheme would have **Slight Beneficial** (**not significant**) effect on economy and employment when considering the direct, indirect and induced employment opportunities generated by the Scheme.

Human Health

16.8.40. For human health, there would be works within the vicinity of human health receptors such as residential properties, community and recreational facilities and PRoWs during construction. Particulate matter and dust from enabling works, material handling and transportation and exhaust emissions from non-mobile machinery during construction would result in an increase in air pollution. An increase in air pollution would be a particular concern to children, the elderly and those with underlying respiratory ailments. Measures to mitigate these effects would be implemented during construction as detailed in **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES and **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). The magnitude of impact is **minor adverse**, because the effects would be temporary and the Scheme is located in a rural area and would not impact a large number of receptors.

16.8.41. Construction works and traffic would also result in an increase on noise and vibration levels, which would have a disproportionate impact on children and the elderly. Measures to mitigate these effects would be implemented during construction as detailed in **paragraph 16.8.10**. The magnitude of impact is **minor adverse**, because the effects would be temporary and the Scheme is located in a rural area and would not impact a large number of receptors.

16.8.42. Works within or in close proximity to watercourses may increase the risk of sedimentation and pollutant spillage (fuels or other harmful substances i.e. concrete or cement products). The land immediately adjacent to culverts and watercourse crossings are considered to have a low vulnerability in terms of flood risk, where any effects would be very localised. Measures to mitigate these effects would be implemented during construction as detailed in Part A **Chapter 10: Road Drainage and the Water Environment**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). The magnitude of impact is **minor adverse**, as the effects would be temporary in nature and particularly in relation to flood risk, because the Scheme is in a rural area and therefore would not impact a large number of receptors.

16.8.43. Therefore, there is likely to be a temporary **slight adverse** effect (**not significant**) of the Scheme on human health receptors during construction.

16.8.44. During operation, the Scheme is likely to result in an increased number of vehicles travelling through the area; however, no human receptors have been found to experience a worsening or improvement of air quality where pollutant concentrations are already above an assessment threshold, as set out in **paragraph 16.8.2** and **Appendix 16.4: Air Quality Likely Significant Effects of the Scheme** of this ES. The magnitude of impact is therefore **negligible**.

16.8.45. The Scheme is likely to result in an increased number of vehicles travelling through the area; therefore, human health receptors in close proximity to the Scheme may experience an increase in noise and vibration as the Scheme would create a new source of noise. However, receptors along the de-trunked A1 would experience a reduced noise and vibration levels due to reduced traffic flow. In addition, beneficial impacts would arise as a consequence of the new online widening distributing traffic further to the east and at a greater distance from dwellings to the west of the existing A1 and low noise road surface. Measure to mitigate adverse effects have been included in the Scheme design including four noise barriers and a low noise road surface. The magnitude of impact on human health receptors is expected to be **negligible** when considering the potential adverse and beneficial effects of the Scheme.

16.8.46. The Scheme includes surface water drainage systems which means that surface water runoff would be appropriately treated to minimise risk of pollution. In addition, surface water runoff would be attenuated to minimise the risk of flooding. The hydraulic modelling undertaken to support the Flood Risk Assessment for Part A (refer to **Appendix 10.1: Flood Risk Assessment, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) and Part B (refer to **Appendix 10.1: Flood Risk Assessment, Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) demonstrated that there would be no increase in fluvial flood risk. Therefore, there would be no increase in flood risk associated with the Scheme that would affect vulnerable receptors.

The magnitude of impact is therefore **negligible**, as the Scheme is in a rural area and adverse impacts would be mitigated by the Scheme.

16.8.47. Therefore, during operation, there is likely to be a permanent, long-term **negligible** effect (**not significant**) on human health receptors.

Updated DMRB Guidance

16.8.48. As detailed in **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), the assessment of human health is required under the updated DMRB guidance. It is considered that the human health assessment undertaken is robust and with the application of the updated guidance, the conclusions of the assessment would remain unchanged. The assessment of vehicle travellers and economy and employment is not required under the updated DMRB guidance. The assessment of economy and employment although not required under DMRB has been undertaken making reference to overall significance criteria. It is considered that the assessment of economy and employment is robust and with the application of the updated guidance the conclusions of the assessment would remain unchanged.

Material Resources

16.8.49. The Scheme has the potential to consume material resources (including those recovered from site arisings) and produce and dispose of waste during the site preparation, demolition and construction phases of the carriageways and associated infrastructure. The associated potential impacts (both direct and indirect) would occur principally during construction, and potentially in the first year of operation.

16.8.50. Potential impacts would be associated with the production, processing, consumption and disposal of material resources. The potential impacts of the Scheme as a result of the consumption of material resources (including recovered site arisings) and waste generation and disposal, are likely to occur on-site, off-site within the UK and, potentially, internationally. **Table 16-7** summarises the likely potential impacts associated with materials consumption, and waste generation and disposal.

Table 16-7 - Potential Impacts Associated with Materials and Waste

Element	Direct Impacts	Indirect Impacts
Materials	Consumption and depletion of natural and non-renewable resources	– Release of GHG emissions – Water consumption and scarcity – Nuisance to communities (visual, noise) – Detriments to health and wellbeing
Waste	Reduction in landfill capacity	– Release of GHG emissions – Nuisance to communities (visual, noise)

Element	Direct Impacts	Indirect Impacts
		– Detriments to health and wellbeing

16.8.51. The materials that would need to be imported during construction and forecast site arisings that can be reused, and site arisings that would be disposed of to landfill sites with the region for Part A and Part B are detailed in Part A **Chapter 13: Material Resources**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 13: Material Resources**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) respectively.

16.8.52. The mitigation measures for the design, construction and operation of the Scheme are detailed in Part A **Chapter 13: Material Resources**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**), Part B **Chapter 13: Material Resources**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).

16.8.53. As detailed in the Part B **Chapter 13: Material Resources, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**), approximately 160,000 tonnes of surplus earthworks and topsoil from Part A would be used for Part B, subject to suitability for reuse. Any earthworks material classified as unacceptable for reuse, would undergo treatment for reuse on the Scheme in order to divert these arisings from landfill.

16.8.54. With the above mitigation measures in place, the Scheme is considered **not significant** in relation to material resource consumption and disposal of waste to landfill during both construction and operation.

Updated DMRB Guidance

16.8.55. As detailed in **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), Part A **Chapter 13: Material Resources, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 13: Material Resources, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**), the significance criteria in the updated DMRB guidance would be likely to change the significance of effect from materials consumption. This would be due to the way that anticipated forecasts for 'recovery of arisings' for the Scheme would be assessed. The assessment thresholds for LA 110 are detailed in Table 3.13 of the same document. The former DMRB guidance does not provide any criteria or thresholds for significance of effect. However, it does set out separate processes for simple and detailed assessments of impacts and effects from materials and waste.

16.8.56. Part A would achieve less than 70% overall material recovery/recycling (by weight) of non-hazardous construction and demolition waste (to substitute use of primary materials); a high-level estimate indicates 61% recovery would be achieved. Part B would achieve more

than 70% overall material recovery/recycling (by weight) of non-hazardous construction and demolition waste (to substitute use of primary materials); a high-level estimate indicates 99% recovery would be achieved. Therefore, taking a worst case approach, the updated DMRB guidance would mean that the Scheme would achieve less than 70% overall material recovery/recycling (by weight) of non-hazardous construction and demolition waste (to substitute use of primary materials). This would mean the assessment of materials for the Scheme would reach the **moderate** threshold, which would in turn trigger a potential significant adverse effect (previously assessed as 'not significant').

16.8.57. However, with the application of the additional mitigation set out in **Section 13.10** in Part A **Chapter 13: Material Resources**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**), the effect would reduce to **slight adverse** (**not significant**) and therefore the conclusions of the assessment would remain unchanged.

16.8.58. The significance criteria for waste has not changed with the updated DMRB, meaning that the conclusions of the assessment would remain unchanged.

Climate

16.8.59. The Scheme would lead to GHG emissions being released into the atmosphere. The GHGs emissions could contribution towards global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG contributing to impacts upon natural and human systems. GHG emissions would be released during the construction of the Scheme due to construction activities and embedded carbon in materials. The operation of the Scheme would lead to GHG emissions due to vehicles using the Scheme and generating emissions. The existing A1 would contribute to GHG emissions due to the maintenance of the road and end user emissions. Design and mitigation measures to avoid and / or mitigate the generation of GHG emissions would be implemented as part of the Scheme. These measures are specific to the parts of the Scheme and therefore have not been replicated here.

16.8.60. **Table 16-8** presents the Scheme GHG emissions, taking into account the construction of the Scheme, operational replacement, land use change and operational end-user traffic for the Scheme. The construction phase impacts have been calculated on the entirety of the Study Area and Order Limits by combining separate study information whereas the operational phase of the study has required re-modelling in order to ascertain the Scheme impacts on the UK National Carbon Budgets.

Table 16-8 - Scheme Impacts on UK National Carbon Budgets

Stage / Timing	Total GHG emissions (thousand tonnes of carbon dioxide equivalent; $kTCO_2e$)
Construction phase (2021/23)	59

Stage / Timing	Total GHG emissions (thousand tonnes of carbon dioxide equivalent; $kTCO_2e$)
Operation phase (2024-2083)	2,428
Total for lifecycle (2021-2083)	2,487
Total during third Carbon Budget period* (2018-2022) [% of budget]	39 [0.00155%]
Total during fourth Carbon Budget 4 period (2023-2027) [% of budget]	161 [0.00824%]
Total during fifth Carbon Budget period (2028-2032) [% of budget]	185 [0.01074%]
Comparison of 1 Year Operational Scheme GHG Emissions against North East Total Road CO_2e Emissions for 2016 (Ref. 3)	
One year's emission's during the operational phase as a % of North East Total Road CO_2e emission estimate in 2016	0.93%

16.8.61. Assessment criteria set out in Part A **Chapter 14: Climate, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Chapter 14: Climate, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) have been used for the assessment. Based on these assessment criteria, it is anticipated there would be a slight adverse (not significant) effect for GHG during construction and operation of the Scheme when considering the mitigation measures. IEMA guidance suggests that all GHG emissions are significant in the absence of any significance criteria or defined threshold. However, given the mitigation measures for the Scheme, the magnitude of GHG emissions and the context of the Scheme, using professional judgement, it is considered that the slight adverse effect of the Scheme is not significant. Furthermore, as presented in **Appendix 16.9: Climate Likely Significant Effects of the Scheme** of this ES, the GHG impacts of the Scheme would not have a material impact on the Government meeting its carbon reduction targets.

16.8.62. Further detail on the GHG emissions assessment for the Scheme is included in **Appendix 16.9: Climate Likely Significant Effects of the Scheme** of this ES.

Updated DMRB Guidance

16.8.63. As detailed in **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), for the GHG assessment the methods used for the assessment align with the updated guidance. As such, there are no implications or changes needed to the assessment in **Appendix 16.9: Climate Likely Significant Effects of the Scheme** of this ES.

Combined Effects Cross Topic

16.8.64. A review of the technical assessments reported in Part A **Technical Chapters 5** to **13**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) has been undertaken to identify environmental effects and therefore those that could combine to result in an effect of greater significance. These combined effect interactions are detailed in **Table 16-9** below.

Table 16-9 - Matrix of Combined Effect Interactions

Common Sensitive Receptors	Impacts	Air Quality	Noise and Vibration	Landscape and Visual	Cultural Heritage	Biodiversity	Road Drainage and Water	Geology and Soils	Population and Human Health	Material Resources	Combined Effect
CONSTRUCTION											
Residents within the vicinity of the Main Compound that could be affected by the use of the Main Compound and construction traffic traveling between the Main Compound and Part B.	- Changes to air quality within 200 m of Main Compound. - Increased noise and vibration levels within 300 m of construction activities. - Changes to views due to the Main Compound. - Increased noise and vibration due to construction traffic moving between the Main Compound and Part B of the Scheme. - Changes to community severance - Impacts to human health e.g. inhalation of construction dust. - Potential for socio-economic benefits for residents during construction.	✓	✓	✓					✓		Mitigation measures relating to potential effects on residents are set out in the respective **Technical Chapters 5** to **13** and **15** of Part A (**Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**)) and Part B (**Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). The mitigation measures are also presented in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). The Scheme would not have any significant effects in relation to air quality as well as noise and vibration with the implementation of mitigation measures. The Scheme would have moderate adverse visual residual effects on residents closest to the Main Compound during construction. The Scheme would also have a slight adverse (not significant) effect on residents due to community severance. Construction traffic movements between the Main Compound and Part B would not have a significant noise effect on residents. As detailed in **paragraph 16.8.42 and 16.8.43**, there are anticipated to be **slight adverse** (**not significant**) effects on human health receptors due to the construction of the Scheme. As detailed in **paragraph 16.8.39**, there would be a **slight beneficial** (**not significant**) socio-economic effect due to the construction of the Scheme. When considering the air quality, noise and vibration as well as population and human health effects along with the visual effects, the Scheme would have a combined temporary, residual effect of **moderate adverse** to **slight beneficial** significance on residents closest to the Scheme during construction.

Updated DMRB Guidance

16.8.65. A DMRB sensitivity test has been undertaken for the Scheme (refer to the **Section 16.4** and **Section 16.8** of this chapter) and each of the technical assessments as detailed in Part A **Technical Chapters 5** to **14, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **14**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the findings of the DMRB sensitivity test for the ES. This section considers whether the outcomes of the DMRB sensitivity tests for the Within Topic combined assessment and technical assessments for Part A and Part B would change the outcomes of the assessment of Cross Topic combined effects reported in **Table 16-9**.

16.8.66. The DMRB sensitivity test identified that the updated DMRB guidance does not affect the assessment outcomes for construction dust, construction noise, community severance and human health receptors. For visual amenity, the updated DMRB guidance assigns scattered residential receptors and small settlements a reduced sensitivity, meaning the assessment in **Table 16-9** presents a worst case scenario. The assessment on the economy and employment is not required under the updated DMRB. Although not required under DMRB, the assessment of economy and employment has been undertaken making reference to overall significance criteria. It is considered that the assessment of economy and employment is robust and with the application of the updated guidance the conclusions of the assessment would remain unchanged.

16.8.67. Therefore, the assessment presented in **Table 16-9** would remain unchanged as a result of the updated DMRB guidance.

16.9 ASSESSMENT OF CUMULATIVE EFFECTS

16.9.1. A total of 54 ‘other developments’ were included in the long list at Stage 1 (refer to **Appendix 16.2: Cumulative Long List** of this ES). After refining the long list at Stage 2, 43 ‘other developments’ were included in the short list summarised in **Table 16-9** below and presented in full in **Appendix 16.1: Cumulative Short List** of this ES, and which have been included in the assessment of cumulative effects. The location of these ‘other developments’ is shown on **Figure 16.1: Cumulative Assessment Applications** of this ES.

Table 16-10 – Short List of 'Other Developments'

ID	Planning Application Reference	Development Description
1	16/00138/FUL	Development of 80 residential dwellings including associated access, infrastructure, open space and landscaping (as amended).
2	17/04453/FUL	Change of use of land within part of airfield for outdoor recreational activities including corporate team building and experience days, and off-road motor vehicle driving experiences together with construction of associated activity centre off-road motor vehicle course, screen mounding, car parking area, internal site access track and landscaping.
3	16/00078/OUT	A mixed use development comprising of trunk road service area incorporating a hotel, restaurant/public house petrol filling station and amenity building including retail (circa 650 m²), hot food (circa 400 m²) and supporting facilities (circa 400 m²), B1 employment (circa 2,100 m² in the form of an Innovation Centre), residential (up to 150 units of which 30% would be affordable), open space, SUDs, allotments and landscaping, countryside park including car parking, foul pumping station and creation of new access off Morpeth Northern By-Pass. **Note - Also 14.54ha of site listed on Northumberland SHLAA (site 3073) - site under construction with completion forecast for 2021/2022.**
4	17/02588/FUL	Proposed development of a total of 32 residential units and associated access and external works. Development consists of the refurbishment and change of use of the former police building, garages and stables into 6 houses, and the demolition of workshops, rear police building and former police houses for the new build construction of 7 houses and 19 apartments.
5	17/01942/FUL	Demolition of existing buildings and development of 13 no. homes with infrastructure and landscaping, including bat house
6	16/00994/FULES	Hybrid planning application comprising: Detailed application for construction of link road and junction to connect to Morpeth Northern Bypass. Outline application for development of up to 875 no. dwellings (C3), local centre (A1, A2, A3, A4, A5, D1, D2, B1), restaurant/public house (A3, A4) and associated open space, with all matters reserved except for site access. **Note - Also listed on Northumberland SHLAA (site 3074) - large scale strategic site permitted for development in May 2018. 90 units to be delivered in first 5 years.**
7	16/00524/REM	Reserved Matters Application seeking consent for; Appearance, Landscaping, Layout and Scale for 218 dwellings following outline approval of application ref 13/02105/OUT- (Outline Planning Application for the proposed development of approximately 255 residential dwellings with associated access). **Note - Also listed on Northumberland SHLAA (site 3050) allocated for 218 dwellings**
8	16/03770/FUL	Proposal for 20 no dwelling houses through conversion of existing buildings (10 units) and erection of 10 new build units
9	16/02824/OUT	Outline application for 10 dwellings, including all ancillary works, with all matters reserved apart from access (Amended Access Design Plan received 29 September 2016)
10	18/03647/FUL	Erection of indoor riding arena for riding of horses.
11	18/03203/FUL & 17/04565/FUL	Proposed camping pods, camping lodges and treehouse along with amenities and services (Amended 24 September 2018)
12	18/03231/FUL	Construction of 58 residential units with associated access, landscaping and amenity space.
13	18/03489/OUT	Outline permission for change of use from disused quarry to holiday park comprising 35 units of accommodation (luxury chalets, static caravans and camping pods).
14	18/03736/FUL	Proposed siting of 24 timber holiday lodges, 10 static caravans including associated site access roads and construction of miniature golf course

ID	Planning Application Reference	Development Description
15	18/04481/FUL	Erection of 179 residential dwellings with associated landscaping and infrastructure, including the diversion of existing public footpath to alternative route
16	18/03650/OUT	Outline planning application with some matters reserved for residential development of up to 50 dwellings (adjacent to 16/00994/FULES)
17	19/00500/FUL	Conversion of Duke's School to residential apartments (27 no.), including demolition and rebuild of the modern rear extension, development of specialist elderly living accommodation (49 no. apartments) and residential dwellings (22 no.), creation of a landscaped open area, all ancillary works including car parking, access and drainage.
18	19/04296/FUL	Demolition of existing buildings and construction of 3 storey building for hotel (C1) with restaurant/bar at ground floor (A3/A4), associated car parking, landscaping and other ancillary works.
19	19/04235/CCD	Construction of new leisure and community centre with associated parking, pedestrian access, landscaping and public realm.
20	19/04025/FUL	Hybrid Application incorporating: Detailed application for demolition of hospital buildings (excluding medical directorate, Tweed, Tyne, Hebron, Hepscott, Mitford unit, Gees Club, Chapel (PMVA), Bothal, Cambo and Belsay Villas), Development of medium secure in-patient unit and ancillary facilities; Refurbishment of Gees club (Villa 34), Hebron, Medical directorate and Belsay, Bothal and Cambo villas and Hepscott 1-4; Associated parking and landscape works across masterplan area; and, Outline application for residential development.
21	19/01008/FUL	Construction of 61no. dwellings with associated landscaping, access and infrastructure works.
22	19/04531/FUL	Construction of 47 residential dwellings with associated access, landscaping and amenity space
23	19/02085/OUT	Resubmission: Outline application for development of approximately 40 dwellings - amended 09/08/19
24	16/04486/FUL	Detailed planning proposal for 53 residential dwellings and associated infrastructure on land North of The Garth, Pottery Bank, Morpeth.
25	19/00530/OUT	Outline permission for construction of new warehouse and industrial building of approximately 1,580 m^2 (17,000 sqft), connected to existing building occupied by applicant together with detached building of approximately 400 m^2 (4,300 sqft) on site measuring approximately 0.55 hectares (1.35 acres)
26	19/00944/FUL	Creation of new sports facilities with associated features including new artificial grass pitch with maintenance/equipment store, ball stop fencing, pitch perimeter barrier and floodlights; new pavilion; extended vehicle parking; hard standing areas; high standing circulation areas with lighting; new cycle shelter with stands; surface water detention basin.
27	19/00673/FUL	Proposed single storey glazed side extension with terrace seating area, tennis court and lighting.
28	18/00079/FUL	Play village comprising cabins, chapel, Main hall, play structure and ancillary accommodation in a landscaped setting - Amended 19 June 2018.
29	17/04374/FUL	Retail Development of A1 (retail) and A3 (cafe) Uses - Amended 5 June 2018.
30	17/04143/FUL	Hybrid Application Full planning permission: 81 Dwellings & Temporary Construction Access from Denwick Lane Outline Permission with All Matters Reserved: 189 Dwellings - Amended 15 June 2018.
31	17/02424/FUL	Proposal to create a new external sports pitch with associated features including new pavilion; Artificial Grass Pitch; maintenance / sports equipment store; fencing; perimeter barrier; vehicle parking with lighting; floodlight system; hard standing areas; high standing circulation areas.
32	17/03582/CCM & 16/00353VAREIA	Proposed ready mixed concrete plant and asphalt plant under Condition 24 of approved planning permission.

ID	Planning Application Reference	Development Description
		Variation of condition 2 of planning permission 14/02432/VARCCM to extend the duration of mineral extraction and restoration until December 2032 to extract the remaining 3 million tonnes of whinstone.
33	17/03128/CCM	Lateral and vertical extensions to the existing extraction area alongside other minor changes to working practices on site.
34	16/03284/CCM	County Matter application for relocation of recycled aggregate processing facility.
35	18/01285/CCMEIA	Lateral extension to extraction area to provide an additional 1.75 m tonnes of dolerite and limestone and an extension of time for the extraction of mineral to 2029 with final restoration in 2030.
36	18/03233/FUL	Construction of a new wedding venue comprising of a wedding pavilion, ancillary building for catering, and 13 no. lodges including a bridal pavilion with conversion of existing gardener's room to bridal changing room and associated car parking on land within the Walled Garden and adjacent to it.
37	18/03208/FUL	Restoration of Walled Garden, including visitor shop and facilities, cafe, restaurant and venue space including bar, events room, ceremony and ancillary spaces including kitchen, toilets, storage, office, gardeners store and car parking.
38	18/02990/FUL	Change of use and conversion, and demolition and rebuild of agricultural buildings to C1 Hotel Use. New build dwelling house to be used for associated staff accommodation (Amended Site Location Plan received 3 October 2018).
39	17/04588/FUL	Demolition of modern portal frame buildings, construction of 8 new houses and 4 detached garage blocks and conversion of listed traditional farm buildings into two dwelling houses.
40	16/03075/SCREEN	Proposed re-opening and extension to quarry.
41	18/00672/FUL	Development of 14 Dwellings; Conversion of Allerburn House to 3 Apartments including demolition of later extensions and Refurbishment of Lodge Amended 27 March 2018.
42	18/01020/OUT	Outline Application (With Layout) - 15 Dwellings (100% Self Build Plots) & Landscaped Area - Amended 18 August 2018.
43	17/03617/CCM	9.5 ha extension to north of existing approved sand and gravel extraction area.

16.9.2. All the 'short listed' developments detailed in **Table 16-10** above offered no additional risk of cumulative effects because:

a. Cumulative operational effects have already been considered and reported in the Within Topic combined assessment (refer to **Section 16.4** and **Section 16.8** of this chapter).
b. No overlap or limited spatial and temporal overlap of the environmental topics' ZOI.

The full results of the assessment of cumulative effects is presented in **Appendix 16.3: Cumulative Assessment Matrix** of this ES.

Updated DMRB Guidance

16.9.3. As discussed in **paragraph 16.4.77**, the cumulative effects assessment is based on the outcomes of the technical assessments. Therefore, if the updated DMRB guidance for these assessments changes the outcomes of the technical assessments, this could change the outcome of the cumulative effects assessment. When considering the updated DMRB guidance, a number of environmental effects that arise from the Scheme would have an increased significance. Refer to the Within Topic combined assessment (**Section 16.4** and **Section 16.8** of this chapter), Part A **Technical Chapters 5** to **13** and **15, Volume 2** of this ES (**Application Document Reference**: **TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **13** and **15, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). **Appendix 4.5: DMRB Sensitivity Test, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides a summary of the findings of the DMRB sensitivity test for the ES. The additional significant effects identified when considering the updated DMRB guidance include:

a. Noise: With the updated DMRB guidance, there would be a change from using banded and pivoted speeds to just pivoted speeds as well as a change to the building façade which is to be selected for assessment when determining significance of effects. A change from pivoted and banded speeds to just pivoted speeds could result in changes to traffic speeds used within the operational road traffic noise model, which consequently could alter the predicted noise levels.
   i. When applying the updated guidance, there would be 11 additional significant beneficial noise effects on dwellings in the Scheme Study Area: Part A. There would also be the potential for one additional significant adverse effect at Northgate Farm in the Scheme Study Area: Part A if the noise barrier cannot be built at this location, however, it is likely that this property would be eligible for compensation under the Noise Insulation Regulations if this is the case.
   ii. Within the Scheme Study Area: Part B, an existing significant effect would increase from **Moderate beneficial** to **Major beneficial**.
b. Population and Human Health: When applying the updated DMRB guidance, there would be a change to the magnitude of impact for North Gate House, as although compensation has been agreed, it would not be considered as mitigation. Therefore, when not considering compensation as mitigation the magnitude of impact would be major rather than minor. The permanent loss of North Gate House remains a significant

effect, but would increase from a **moderate adverse** effect to **large adverse** effect with the application of the updated DMRB guidance.

c. **Geology and Soils**: The updated DMRB guidance includes updated assessment criteria for sensitivity and magnitude and new significance terminology. When applying the updated DMRB guidance, the effect on Grade 3b agricultural land for Part B which was previously assessed as **slight adverse** (**not significant**) would be assessed as **moderate adverse.** However, the conclusions of the geology and soils assessment would not change because agricultural soils were previously assessed as significant overall.

16.9.4. Based on the cumulative effects analysis as detailed in **Appendix 16.3: Cumulative Assessment Matrix** of this ES, it is anticipated that the additional significant effects would not cause any cumulative effects when considered with the other developments identified within **Appendix 16.1: Cumulative Short List** of this ES.

16.10 MITIGATION AND MONITORING

16.10.1. There would be no significant cumulative effects due to the Scheme and 'other development'. In addition, no further likely combined significant residual effects have been identified above the level of significance of those reported for the Scheme alone. Therefore, no further mitigation or monitoring is required, other than that set out in Part A **Technical Chapters 5** to **15, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**) and Part B **Technical Chapters 5** to **15**, **Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

REFERENCES

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Ref. 16.2 – Department for Transport (2014) *National Policy Statement for National Networks*: Presented to Parliament pursuant to Section 9 (8) and Section 5 (4) of the Planning Act. Department for Transport (2008) *National Policy Statement for National Networks* [online]. Available at:https://www.gov.uk/government/publications/national-policy-statement-for-national-networks (accessed 26 October 2018).

Ref. 16.3 - Highways Agency (2019) Design Manual for Roads and Bridges Volume 11, Section 3, Part 10 (HD 45/09).

Ref. 16.4 – The Planning Inspectorate (2015) Advice Note Seventeen. Cumulative Effects Assessment relevant to Nationally Significant Infrastructure Project [online]. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf (accessed 26 October 2018).

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Ref. 16.12 - Highways Agency (2011), Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD 213/11 revision 1. Noise and Vibration.

Ref. 16.13 - Highways England. Interim Advice Note 174/13. Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA 207/07).

Ref. 16.14 - Natural England (2016). *Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance.* Natural England Commissioned Report NECR210, 23 March 2016

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