

A614/A6097 Major Road Network Improvement Environmental Statement

Volume 1
Project Overview and Cumulative Effects Assessment

Via East Midlands Ltd



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Environmental Statement Contents

Volume 1 – Project Overview and Cumulative Effects Assessment

- Volume 1A – Scheme-specific Assessment – Ollerton Roundabout
- Volume 1B - Scheme-specific Assessment – Mickledale Lane Junction
- Volume 1C - Scheme-specific Assessment – Lowdham Roundabout
- Volume 1D - Scheme-specific Assessment – Kirk Hill Junction

Volume 2 – Figures - Project Overview and Cumulative Effects Assessment

- Volume 2A – Figures – Scheme-specific Assessment – Ollerton Roundabout
- Volume 2B – Figures – Scheme-specific Assessment – Mickledale Lane Junction
- Volume 2C – Figures – Scheme-specific Assessment – Lowdham Roundabout
- Volume 2D – Figures – Scheme-specific Assessment – Kirk Hill Junction

Volume 3 – Appendices - Project Overview and Cumulative Effects Assessment

- Volume 3A – Appendices – Scheme-specific Assessment – Ollerton Roundabout
- Volume 3B – Appendices – Scheme-specific Assessment – Mickledale Lane Junction
- Volume 3C – Appendices – Scheme-specific Assessment – Lowdham Roundabout
- Volume 3D – Appendices – Scheme-specific Assessment – Kirk Hill Junction

Non-Technical Summary

Table of Contents

1.	Introduction	9
1.1	Background	9
1.2	The Requirement for EIA	9
1.3	Purpose of the Environmental Statement	10
1.4	Legislative and Policy Framework	10
1.5	Structure of this ES	13
1.6	Location of information within the Environmental Statement	14
1.7	Stakeholder Engagement	17
1.8	Competent Expert Evidence	20
2.	The Project	21
2.1	Background	21
2.2	Project Objectives	23
2.3	Project Location	23
2.4	Project Description	26
2.5	Approach to Delivery of Biodiversity Net Gain	29
2.6	Construction, Operation and Long-Term Management	29
3.	Assessment of Alternatives	31
3.1	Assessment Methodology	31
3.2	Reasonable Alternatives Studied	31
3.3	Scheme Design Development	35
3.4	Design Development Post-Scoping	40
4.	Environmental Assessment Methodology	42
4.1	Environmental Scoping	42
4.2	Changes to the Schemes	44
4.3	Assessment Boundaries	44
4.4	Surveys and Predictive Techniques and Methods	44
4.5	General Assessment Assumptions and Limitations	46
4.6	Significance Criteria	48
5.	Air Quality	51
5.1	Introduction	51
5.2	Legislative and Policy Framework	51
5.3	Consultation	53
5.4	Assessment Methodology	55
5.5	Baseline Conditions	56
5.6	Design and Mitigation	57
5.7	Project-Wide Likely Significant Cumulative Effects	57
5.8	Additional Mitigation and Monitoring	58
5.9	Summary of Project-Wide Significant Residual Effects	59
6.	Cultural Heritage	60
6.1	Introduction	60
6.2	Legislative and Policy Framework	60
6.3	Consultation	64
6.4	Assessment Methodology	67
6.5	Baseline Conditions	67
6.6	Design and Mitigation	67
6.7	Project-Wide Likely Significant Cumulative Effects	68
6.8	Additional Mitigation and Monitoring	68

6.9	Summary of Project-Wide Significant Residual Effects.....	68
7.	Landscape and Visual	69
7.1	Introduction	69
7.2	Legislative and Policy Framework	69
7.3	Consultation	72
7.4	Assessment Methodology	76
7.5	Baseline Conditions	76
	Design and Mitigation	77
7.6	Project-Wide Likely Significant Cumulative Effects.....	77
7.7	Additional Mitigation and Monitoring.....	79
7.8	Summary of Project-Wide Significant Residual Effects.....	79
8.	Biodiversity	80
8.1	Introduction	80
8.2	Legislative and Policy Framework	80
8.3	Consultation	83
8.4	Assessment Methodology	89
8.5	Baseline Conditions	90
8.6	Design and Mitigation.....	91
8.7	Project Wide Likely Significant Effects.....	92
8.8	Additional Mitigation and Monitoring.....	92
8.9	Summary of Project Wide Significant Residual Effects	92
9.	Geology and Soils.....	93
9.1	Introduction	93
9.2	Consultation	95
9.3	Assessment Methodology	97
9.4	Baseline Conditions	97
9.5	Design and Mitigation.....	98
9.6	Project Wide Likely Significant Effects.....	98
9.7	Additional Mitigation and Monitoring.....	103
9.8	Summary of Project Wide Significant Residual Effects	103
10.	Noise and Vibration	105
10.1	Introduction	105
10.2	Legislative and Policy Framework	105
10.3	Consultation	108
10.4	Assessment Methodology	108
10.5	Baseline Conditions	109
10.6	Design and Mitigation.....	109
10.7	Project-Wide Likely Significant Cumulative Effects.....	110
10.8	Additional Mitigation and Monitoring.....	110
10.9	Summary of Project-Wide Significant Residual Effects.....	110
11.	Road Drainage and the Water Environment	111
11.1	Introduction	111
11.2	Legislative and Policy Framework	111
11.3	Consultation	113
11.4	Assessment Methodology	116
11.5	Baseline Conditions	116
11.6	Design and Mitigation.....	117
11.7	Project-Wide Likely Significant Effects	117
11.8	Additional Mitigation and Monitoring.....	118

11.9	Summary of Project-Wide Significant Residual Effects.....	118
12.	Climate.....	119
12.1	Introduction.....	119
12.2	Legislative and Policy Framework.....	119
12.3	Consultation.....	122
12.4	Assessment Methodology.....	123
12.5	Design and Mitigation.....	126
12.6	Project-Wide Likely Significant Cumulative Effects – GHG Assessment.....	128
12.7	Project-Wide Likely Significant Cumulative Effects - CCV Assessment.....	129
12.8	Additional Mitigation and Monitoring.....	132
12.9	Summary of Project-Wide Residual Effects.....	132
13.	Combined Effects Assessment.....	135
13.1	Introduction.....	135
13.2	Consultation.....	135
13.3	Legislative Policy and Framework.....	135
13.4	Assessment Methodology.....	136
13.5	Assessment of Combined Effects.....	137
13.6	Additional Mitigation and Monitoring.....	145
13.7	Summary of Significant Combined Effects.....	145
14.	Cumulative Effects Assessment.....	146
14.1	Introduction.....	146
14.2	Consultation.....	146
14.3	Legislative Policy and Framework.....	146
14.4	Cumulative Assessment Methodology.....	147
14.5	Assessment of Cumulative Effects.....	152
14.6	Additional Mitigation and Monitoring.....	159
14.7	Summary of Significant Cumulative Effects.....	159
15.	Summary.....	160
15.1	Introduction.....	160
15.2	Summary of Significant Effects.....	160
16.	References.....	163
17.	Abbreviations.....	172

List of Tables

Table 1-1:	Environmental Statement Structure.....	14
Table 1-2:	Location of Information within this ES.....	14
Table 2-1:	Scheme Anticipated Construction Start Dates and Opening Years.....	30
Table 3-1:	Non-Car Alternatives Considered.....	32
Table 3-2:	Long List Intervention Packages.....	33
Table 3-3:	Package 5: Package 4 with the inclusion of Intervention 12 Kirk Hill.....	33
Table 3-4:	Package 6: Package 5 minus Intervention 5: Deerdale Lane.....	34
Table 3-5:	Alternative Scheme Design Options.....	36
Table 4-1:	Topics Scoped into the EIA for each Scheme.....	42
Table 4-2:	Summary of Assessments and Site Surveys Undertaken to Inform the ES.....	45
Table 4-3:	Significance Matrix (reproduced from DMRB LA 104).....	50
Table 5-1:	Scoping Response Summary – Air Quality.....	54
Table 6-1:	Scoping Response Summary – Cultural Heritage.....	65
Table 7-1:	Scoping Response Summary - Landscape.....	73
Table 8-1:	Comments raised in Scoping Opinion.....	84

Table 9-1: Comments raised in Scoping Opinion	96
Table 9-2 Additional Mitigation Measures.....	98
Table 9-3 Project Wide Effects – Construction	99
Table 9-4 Project Wide Effects – Operation.....	101
Table 9-5: Summary of Project Wide Significant Residual Effects	104
Table 11-1 Scoping Response Summary - Road Drainage and the Water Environment.....	114
Table 12-1: Comments raised in Scoping Opinion	122
Table 12-2 Magnitude criteria for GHG emissions	124
Table 12-3 Significance of GHG Emissions.....	124
Table 12-4 UK Carbon Budgets	124
Table 12-5 Measure of likelihood for CCV assessment.....	125
Table 12-6 Measure of consequence for CCV assessment.....	125
Table 12-7 Significance matrix ('S' significant, 'NS' not significant)	126
Table 12-8 Embedded GHG mitigation measures	126
Table 12-9 Embedded climate change vulnerability mitigation measures.....	128
Table 12-10 Project-Wide Estimated Construction GHG Emissions	129
Table 12-11 Project-Wide Contribution of the Construction Emissions to the UK Carbon Budgets	129
Table 12-12 Construction Stage Climate Vulnerability Significance Assessment.....	130
Table 12-13 Operational Stage Climate Vulnerability Significance Assessment	131
Table 12-14 Project-Wide Residual Effects of GHG Assessment	132
Table 12-15: Project-Wide Residual Effects of CCV Assessment.....	132
Table 13-1: Typical Descriptions of Combined Effects.....	136
Table 13-2: Combined Effects upon a Single Receptor During Construction	140
Table 13-3: Combined Effects upon a Single Receptor During Operation	143
Table 14-1: Cumulative Effects Assessment Zone of Influence	147
Table 14-2: Typical Descriptions of Cumulative Effects	150
Table 14-3: Short list of 'Other Development' For Cumulative Assessment	153
Table 15-1 Summary of Likely Significant Residual Effects	160

1. INTRODUCTION

1.1 Background

- 1.1.1 AECOM Infrastructure and Environment Ltd ('AECOM') and Via East Midlands Ltd ('Via') have prepared this Environmental Statement (ES) on behalf of Nottinghamshire County Council (NCC) (the 'Applicant') for the A614/A6097 Major Road Network Improvement project (the 'Project'). This ES documents the Environmental Impact Assessment (EIA) of the proposed improvements at six existing junctions along the route, hereafter referred to as 'Schemes'.
- 1.1.2 The A614 is an important north-south route from Nottingham in the south towards Worksop and Retford and beyond in the north. The A6097 provides a spur from the A614 to the A46 (a trunk road linking Leicester with Newark and Lincoln). Between the study area junctions, the A614 is a two-way single carriageway. The A6097 is a two-way single carriageway which has a short length of dual carriageway through Lowdham.
- 1.1.3 A number of junctions along the corridor are heavily congested whilst others pose difficulties and dangers for drivers trying to access the A614 from adjoining settlements. The existing problems and traffic delays are set to worsen considerably with planned and forecast traffic growth.
- 1.1.4 NCC is promoting junction improvements at six key locations on the A614/ A6097 corridor as a single project as listed below. Further information regarding the location of these Schemes is provided in Chapter 2: The Project.
- **Ollerton Roundabout** – the intersection of the A614/ A616/ A6075 roundabout.
 - **Mickledale Lane Junction** – the A614/ Mickledale Lane crossroads.
 - **White Post Roundabout** – the A614/ Mansfield Road roundabout.
 - **Warren Hill Junction** – the A614/ A6097 priority junction.
 - **Lowdham Roundabout** – the A6097/ A612 Nottingham Road/ Southwell Road roundabout.
 - **Kirk Hill Junction** – the A6097/ East Bridgford Road/ Kirk Hill crossroads.
- 1.1.5 The Project seeks to continue the strategic development of the A614/ A6097 corridor to both accommodate and facilitate economic growth.

1.2 The Requirement for EIA

- 1.2.1 Discussions were held with NCC planning department (NCC Planning) as the relevant planning authority early in design development. As noted in Chapter 4 of this report, a previous screening and scoping request was submitted to NCC Planning based on earlier designs. Feedback was also obtained from a range of consultees which confirmed a likely need for EIA at Ollerton Roundabout due to the Scheme being located within a sensitive area (Birklands West and Ollerton Corner Site of Special Scientific Interest (SSSI)).
- 1.2.2 The Outline Business Case for the Project (NCC, 2020), submitted to the Department for Transport (DfT), required clear consideration of the impacts and benefits of each Scheme both individually and cumulatively.
- 1.2.3 The Applicant also sought legal advice on the likely planning route for the Project, given that some of the Schemes that consist of smaller interventions could be considered to align with permitted development requirements, as the proposals are

all within the current highway boundary and largely constitute road network maintenance activities.

- 1.2.4 Based on legal advice, feedback from DfT and early consultation responses on the need for EIA, the Applicant has prepared this ES for the Project.
- 1.2.5 The Project is considered to constitute the construction of roads of an area greater than 1 hectare (ha) and therefore would fall within the scope of paragraph 10(f) of Schedule 2 of the Town and Country Planning (EIA) Regulations 2017 (as amended 2018) (the “EIA Regulations”) (HMSO, 2017b).
- 1.2.6 However, as some of the Schemes that consist of smaller interventions are not likely to result in significant environmental effects, either alone or when considered cumulatively with the other Schemes, a proportionate approach to the assessment was proposed in the EIA Scoping Report (AECOM/Via, 2021) (hereafter referred to as the ‘Scoping Report’).
- 1.2.7 A Scoping Opinion was sought for the Schemes in June 2021. A Scoping Opinion was provided by NCC Planning for each Scheme (See Appendix 1-1 of Volume 3). As per Regulation 18 (4)(a) this ES is based on be based on the scoping opinion issued by NCC. Further information relating to agreed scope of the assessments can be found in Section 4.1 of this report.

1.3 Purpose of the Environmental Statement

- 1.3.1 This ES reports the findings of the EIA that has been undertaken in compliance with the EIA Regulations which implement the European Union (EU) Directive 2014/52/EU. It considers the likely significant environmental effects of the Schemes (both individually and when the Project is considered as a whole) through construction and operation, as well as the proposed mitigation measures recommended to avoid, prevent, reduce or offset any significant adverse effects on the environment.

1.4 Legislative and Policy Framework

The EIA Regulations and the Impact of Brexit on Environmental Legislation

- 1.4.1 As of exit day (11pm on 31 January 2020), the UK is no longer a European Union (EU) Member State. The European Union (Withdrawal) Act 2018 (EU(W)A 2018) provides for the European Communities Act 1972 (ECA 1972) to be repealed from exit day.
- 1.4.2 EU legislation which applied directly or indirectly to the UK before 11.00 pm on 31 January 2020 has been retained in UK law as a form of domestic legislation known as ‘retained EU law’. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16). Section 4 of the 2018 Act ensures that any remaining EU rights and obligations, including directly effective rights within EU treaties, continue to be recognised and available in domestic law after exit.
- 1.4.3 Whilst this is a change, it does mean that relevant Directives previously applied directly or indirectly to the UK have been retained and therefore are still relevant to the environmental assessment within this report. This includes, for example:
- Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (and subsequent amending Directive 2014/52/EU) (the EIA Directive);

- Directive 2008/50/EC the Ambient Air Quality and Cleaner Air for Europe Directive (the EU Air Quality Framework Directive);
- Directive 92/3/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive); and
- Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive – END); and
- Directive 2000/60/EC the Water Framework Directive (WFD).

1.4.4 The EIA Regulations transpose the requirements of the EIA Directive into UK legislation. In exercise of the powers in EU(W)A 2018, the UK Government made the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 (SI 2018/1232). These regulations provide for the EIA Regulations to be amended with effect from 11pm on 31 December 2020. In particular, the amendments update references in the EIA Regulations to EU law, Member States, and related terms to reflect the UK leaving the EU. The regulations do not make any substantive changes to the way the EIA regime will operate in England and Wales following the UK's exit from the EU.

Environment Act 2021

1.4.5 The new Environment Act 2021 (HMSO, 2021) sets out how the Government plans to protect and improve the natural world. Planning Authorities have a duty to implement the requirement for developers to deliver biodiversity net gain (BNG) on developments.

1.4.6 The Act makes it mandatory for development (subject to some exemptions) to achieve at least a 10% net gain in value for biodiversity (where habitats and wildlife must be left in a measurably better state than before the development). Developers are required to submit a 'biodiversity gain plan' with their planning applications and the local authority must be satisfied that this is secured through a planning obligation or conservation covenant for at least 30 years.

National Planning Policy Framework (NPPF)

1.4.7 The Ministry of Housing, Communities and Local Government (MHCLG) revised National Planning Policy Framework (NPPF) (MHCLG, 2021a) was published in 2012 and most recently updated in July 2021. The NPPF sets out the government's planning policies for England and how these should be applied. The NPPF is a material consideration in planning decisions.

1.4.8 It sets out the overarching development principles at a national level and outlines the presumption in favour of sustainable development.

1.4.9 Paragraph 104 states that:

“Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

a) the potential impacts of development on transport networks can be addressed;

b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;

c) opportunities to promote walking, cycling and public transport use are identified and pursued;

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate

opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and

e) patterns of movement, streets, parking and other transport considerations are integral to the design of schemes, and contribute to making high quality places.”

1.4.10 Paragraph 105 then states:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.”

1.4.11 The environmental topic assessments provided in this ES have each considered the NPPF and the policies relevant to each assessment.

National Planning Practice Guidance (NPPG)

1.4.12 The National Planning Practice Guidance (PPG) (MHCLG, 2021b) provides further advice and expands on the guidance and policy outlined in the NPPF. Relevant PPG used by the environmental assessments are stated in the relevant environmental topic assessment chapter.

Local Planning Policy

1.4.13 The Project sits within the Local Planning Authority areas of Newark and Sherwood District Council (NSDC) and Rushcliffe Borough Council (RBC). The Lowdham Roundabout Scheme also has the potential to affect an area within the Gedling Borough Council (GBC) area.

1.4.14 Relevant key local policies are outlined below, with the specific environmental policies of relevance identified in each of the topic chapters within the ES.

1.4.15 The statutory development plans covering the area of interest comprises, presently:

- NSDC Local Plan: Amended Core Strategy 2019-2033;
- RBC Local Plan (2019); and
- GBC Local Plan (2018).

Newark and Sherwood District Council Local Plan: Amended Core Strategy (adopted March 2019)

1.4.16 The NSDC Amended Core Strategy (NSDC, 2019) is a key document of the NSDC Local Development Framework (LDF). It guides the use of land and new development throughout the NSDC and includes strategies, policies and proposals for the development and use of land in the district for the period of 2013 to 2033. It sets a vision and objectives, and a number of policies to help deliver the development and change identified.

1.4.17 Other key documents of the LDF include the Allocations and Development Management Development Plan Document (NSDC, 2013), the policy map and various supplementary planning documents.

Rushcliffe Borough Council Local Plan Core Strategy (adopted December 2014)

- 1.4.18 The main document of the Rushcliffe Local Plan is the Local Plan Part 1 - Core Strategy, which defines a spatial vision for Rushcliffe to 2028 (RBC, 2014). The Local Plan Part 2 - Land and Planning Policies (RBC, 2019a) allocates land to specific uses and provides relevant policy guidance, sets out policies for the management of development, against which planning applications for the development and use of land will be considered.

Gedling Borough Council Aligned Core Strategy (adopted September 2014)

- 1.4.19 The GBC Aligned Core Strategy - Local Plan Part 1 (Broxtowe Borough Council, GBC and Nottingham City Council, 2014) document is aligned with the Greater Nottingham administrative areas of Broxtowe, Gedling and Nottingham City. The document sets out the strategic policy direction for future development in Gedling Borough and is used to help decide planning applications and guide the location and design of development in the borough.
- 1.4.20 The Local Plan Part 1 is supported by the Gedling Borough Local Planning Document - Part 2 Local Plan (GBC, 2018). The two documents work together to shape future development in Gedling Borough by planning for new homes, jobs and infrastructure. These documents are used to help decide planning applications and guide the location and design of development in Gedling Borough.

NCC Local Transport Plan (2011 to 2026)

- 1.4.21 The Nottinghamshire Local Transport Plan (LTP) (2011 to 2026) (NCC, 2011) details the County Council's transport strategy for the whole of Nottinghamshire for the fifteen-year period 2011-2026. As part of this, the Local Transport Plan Strategy sets out how NCC aims to make transport improvements in Nottinghamshire during the plan period.
- 1.4.22 The A614/A6097 MRN corridor improvements accord closely with the LTP strategic objectives in terms of supporting growth along the corridor, including the regeneration of the former Thoresby Colliery site and delivering traffic relief to adjacent roads within Ollerton Village, all of which will help to support a thriving local economy and minimise the impacts of transport on people's lives, as well as improving access to and enabling new employment opportunities.

1.5 Structure of this ES

- 1.5.1 The ES has been structured to provide a stand-alone assessment of each Scheme to accompany individual planning applications, whilst also providing an assessment of Project-wide cumulative effects for each environmental topic, combined effects and cumulative effects assessment in conjunction with other forthcoming developments.
- 1.5.2 **Volume 1** of the ES (this document) provides an overview of the Project description, the assessment of Project alternatives, an assessment of the Project-wide cumulative effects for each environmental topic, the assessment of combined effects and the assessment of cumulative effects in conjunction with other developments. Supporting figures and technical appendices to this document can be found within **Volume 2 and Volume 3** respectively.
- 1.5.3 The environmental assessment of each individual Scheme has been presented within **Volumes 1A (Ollerton Roundabout), 1B (Mickledale Lane Junction), 1C (Lowdham Roundabout), and 1D (Kirk Hill Junction)** for ease of understanding of the impacts of the Schemes individually. As detailed in Chapter 4, Section 4.1, works proposed at White Post Roundabout and Warren Hill Junction have been scoped out of the ES as there are unlikely to be any significant effects associated with these Schemes. Figures to support the individual Scheme assessments are provided in

corresponding **Volumes 2A, 2B, 2C and 2D**. Technical appendices are available in corresponding **Volumes 3A, 3B, 3C and 3D**.

1.5.4 The full ES structure is outlined in Table 1-1.

Table 1-1: Environmental Statement Structure

Contents	Assessment Reports	Figures	Technical Appendices
Project Overview and Cumulative Effects Assessment	Volume 1	Volume 2	Volume 3
Ollerton Roundabout	Volume 1A	Volume 2A	Volume 3A
Mickledale Lane Junction	Volume 1B	Volume 2B	Volume 3B
Lowdham Roundabout	Volume 1C	Volume 2C	Volume 3C
Kirk Hill Junction	Volume 1D	Volume 2D	Volume 3D

1.6 Location of information within the Environmental Statement

1.6.1 Schedule 4 of the EIA Regulations identifies information that is “reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile”. This information and its location within this ES are presented in Table 1-2.

Table 1-2: Location of Information within this ES

Schedule 4 Reference	Information Required under the EIA Regulations	Location within Environmental Statement
1.	Description of the development, including in particular:	
a)	a description of the location of the development;	An overview of the location of each Scheme is provided in Section 2.3 of this Volume 1.
b)	a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;	Detailed descriptions of the Schemes are provided within Chapter 2: The Scheme in Volumes 1A to 1D.
c)	a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; and	Detailed descriptions of the Schemes are provided within Chapter 2: The Scheme in Volumes 1A to 1D.

Schedule 4 Reference **Information Required under the EIA Regulations**

Location within Environmental Statement

d)	an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases	Detailed descriptions of the Schemes are provided within Chapter 2: The Scheme in Volumes 1A to 1D. Estimates of relevant emissions are noted within the technical assessments within Volumes 1A to 1D.
2.	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	See Chapter 3: Assessment of Alternatives.
3.	A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	The current baseline is described within the technical assessments within Volumes 1A to 1D.
4.	A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	The likely significant effects are described within the technical assessments within Volumes 1A to 1D, and within the Project-wide, Combined and Cumulative Effects assessments within this report. A summary of the residual significant effects is provided in Chapter 15: Summary of this report.
5.	A description of the likely significant effects of the development on the environment resulting from, inter alia:	
a)	the construction and existence of the development, including, where relevant, demolition works;	The likely significant effects are described within the technical assessments within Volumes 1A to 1D, and within the Project-wide, Combined and Cumulative Effects assessments within this report.
b)	the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources	

Schedule 4 Reference **Information Required under the EIA Regulations**

Location within Environmental Statement

c)	the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;	
d)	the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);	
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;	Chapter 14: Cumulative Effects Assessment provides an assessment within other existing and/or approved projects.
f)	the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;	This is provided in the Climate assessments within Volumes 1A to 1D, and a Project-wide assessment is provided within Chapter 12: Climate in this report.
g)	<p>the technologies and the substances used.</p> <p>The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(a) and Directive 2009/147/EC(b).</p>	<p>The likely significant effects are described within the technical assessments within Volumes 1A to 1D, and within the Project-wide, Combined and Cumulative Effects assessments within this report.</p>
6.	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved	Chapter 4: Environmental Assessment Methodology and technical assessments within Chapters 5-14 of this report, plus Volumes 1A to 1D.
7.	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases	Mitigation measures are described within the technical assessments within Volumes 1A to 1D, and within the Project-wide, Combined and Cumulative Effects assessments within this report.

Schedule 4 Reference	Information Required under the EIA Regulations	Location within Environmental Statement
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8.	A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU (c) of the European Parliament and of the Council or Council Directive 2009/71/Euratom (d) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	An assessment of major accidents and disasters was scoped out of the ES, as noted in Chapter 4: Environmental Assessment Methodology in this report.
9.	A non-technical summary of the information provided under paragraphs 1 to 8.	A stand-alone non-technical summary has been provided to accompany the ES.
10.	A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.	References are noted at the end of each assessment report. They can be found within Chapter 16 of this report and within Volumes 1A to 1D.

1.7 Stakeholder Engagement

Public Consultation

- 1.7.1 A number of public engagement events have been held for this project since its inception. The Ollerton Roundabout has been a focus for potential improvements since 2007 when a number of public consultation events were held to consider two options, one of which is now the preferred scheme and is included in this Project after successfully attracting funding through the DfT's Major Road Network Transport Investment Strategy, "*Moving Britain Ahead*" (DfT, 2017b).
- 1.7.2 The junctions included in the Project have changed over the course of its development. The original proposals excluded the Kirk Hill Junction and included an improvement at the A614/ Deerdale Lane junction; this package was subject to public consultation events in 2019. In the summer of 2019, six consultation exhibition dates showcased the early designs for Ollerton Roundabout, Deerdale Lane Junction, Mickledale Lane Junction, White Post Roundabout, Warren Hill Junction and Lowdham Roundabout. Leaflets were distributed to properties and villages close to or accessed from the junctions along the A614/ A6097 corridor to inform the public of the event, supplemented by targeted campaigns using the NCC Communications Social Media channels.
- 1.7.3 The feedback from the first six events showed that the proposed improvements to Ollerton Roundabout, Deerdale Lane Junction and Mickledale Lane Junction were well received, however the proposals for Lowdham Roundabout were not. This led to reconsideration and significant redesign of the proposals at Lowdham Roundabout.

- 1.7.4 The second consultation event in November 2020 focused on the revised Lowdham Roundabout proposal and the introduction of Kirk Hill Junction to the Project. The potential inclusion of improvements at Kirk Hill arose after feedback from previous consultation events held in Lowdham and as a result of development in the local area (RAF Newton). Unfortunately, COVID-19 restrictions meant face to face interaction with the public was not feasible, so a virtual consultation room was used in place of face-to-face events, supplemented by hard copies which were posted out on request. The revised proposals for Lowdham Roundabout were well received, as was the addition of improvements at the Kirk Hill Junction.
- 1.7.5 After safety issues were identified associated with access and egress of Heavy Goods Vehicles (HGVs) at the Limes Café, the original junction improvements at Mickledale Lane were superseded by a conventional roundabout design which was consulted on in May 2021. This option was known as Option 2. The first consultation undertaken in 2019 showcased a junction improvement scheme (known as Option 1) where the current junction would be signalised with two entry lanes for both A614 approaches.
- 1.7.6 The results of the second consultation on this Scheme indicated that the Mickledale Lane Junction was rated out of all six junction schemes as the one most in need of improvement, with 94% of people agreeing that there was a problem with the current junction layout. 54% of people believing the proposed new roundabout layout (Option 2) was a good idea. Following these results, Option 2 was taken forward for the Project.
- 1.7.7 Further information on the options can be found in Chapter 3: Assessment of Alternatives.

Other Consultation

Natural England

- 1.7.8 Initial discussions were undertaken with Natural England in July 2019 regarding Ollerton Roundabout.
- 1.7.9 The Birklands and Bilhaugh Special Area of Conservation (SAC) was of concern to Natural England as the site contains habitats which are sensitive to changes in air quality, and currently exceeds the critical load for nitrogen deposition (Air Pollution Information System (APIS), accessed May 2021)).
- 1.7.10 Mitigation through landscaping design to create a barrier of vegetation was discussed, along with mitigation for the direct loss of habitat from Birklands West and Ollerton Corner SSSI as a result of the Scheme.
- 1.7.11 Natural England requested that a BNG assessment was prepared to demonstrate that habitats would be left in a measurably improved state than they are currently. Off-site mitigation was agreed to be an appropriate approach to compensate for the loss of habitat from the SSSI due to the limited space within the highway verge.

Nottinghamshire County Council – Archaeology

- 1.7.12 Discussions between Via and NCC archaeological representatives were undertaken in April 2021. As a result, it has been determined that an archaeological watching brief is to be provided during construction (ground works phase) for the following Schemes:
- Ollerton Roundabout;
 - Mickledale Lane Junction; and
 - Kirk Hill Junction.

Nottinghamshire County Council - Ecology

- 1.7.13 The NCC Ecologist has been involved throughout design development, particularly in relation to the design for Ollerton Roundabout due to its proximity to the Birklands West and Ollerton Corner SSSI. The scoping response received from the NCC Ecologist has steered the assessment work undertaken to ensure a number of concerns were considered across all junctions. Further information detail on this is noted within the technical assessments within Volumes 1A to 1D.
- 1.7.14 The shadow Habitat Regulations Assessment (sHRA) (Appendix 4-4 of Volume 3) was reviewed by the NCC Ecologist prior to planning submission to ensure completeness in the approach taken during preparation of the submission. Areas of focus that were requested by the NCC Ecologist include:
- evidence to support the assessment of effects on local birds;
 - surveys to support the assessment of effects on bats north of the Ollerton Roundabout;
 - evidence to support the assessment of effects from pollution and NO_x deposition; and
 - landscape design to include wildflower verges to replace loss of large swathe of verge at Kirk Hill.

Environment Agency and Lead Local Flood Authority

- 1.7.15 NCC and Via have been engaging with the Environment Agency since early in the development of the Project, specifically in relation to the Lowdham Roundabout Scheme, flood risk and proposals the Environment Agency are planning to bring forward in the area.

Nottinghamshire County Council - Countryside Access, Local Transport Planning and Public Rights of Way

- 1.7.16 NCC Countryside Access and Public Rights of Way (PRoW) teams were contacted early in design development and have been contributing to discussion around proposals for the Project.
- 1.7.17 Early meetings were held with NCC Local Transport Planning team and feedback sought from Countryside Access and PRoW, in particular in relation to addressing the issue with access to the existing bridleway 48/28/3 which links to 48/28/2 along the A6097 at Kirk Hill. This ultimately led to the inclusion of the proposed 5 m wide bridleway diversion link at Kirk Hill and associated Pegasus crossing (see Volume 1D for more details).

Previous Scoping Opinion for Ollerton Roundabout - 2019

- 1.7.18 In June 2019 a request for a Scoping Opinion for proposals at Ollerton Roundabout and a screening request for Mickledale Lane Junction, Deerdale Lane Junction (a scheme now removed from the Project package – refer to Chapter 3: Assessment of Alternatives), Warren Hill Junction and Lowdham Roundabout were submitted to NCC Planning (as the relevant planning authority).
- 1.7.19 No formal Scoping Opinion was issued at the time, however responses were made available from key consultees. These have been used to inform the scope of the assessment proposed in the Scoping Report and as presented in this report.
- 1.7.20 Responses were received from the following Statutory Consultees:
- the Environment Agency;

- Historic England (Ollerton Roundabout only);
 - NCC Nature Conservation Team;
 - NCC Highways Development Control;
 - NCC as Lead Local Flood Authority;
 - Natural England; and
 - NSDC.
- 1.7.21 Feedback confirmed a likely need for EIA at Ollerton Roundabout due to the Scheme being located partially within a sensitive area (Birklands West and Ollerton Corner Site of Special Scientific Interest (SSSI)).

Scoping Opinion for the Project – 2021

- 1.7.22 Scoping Requests were submitted in June 2021 to NCC Planning for each of the six Schemes separately.
- 1.7.23 The Scoping Opinions received (see Appendix 1-1 of Volume 3) and supporting stakeholder responses confirmed that it is appropriate for the EIA to include assessments of the environmental effects at four of the six Schemes, including at Ollerton Roundabout, Mickledale Lane Junction, Lowdham Roundabout and Kirk Hill Junction.
- 1.7.24 Further information regarding the Scoping Opinion consultee responses can be found in Section 4.1.

1.8 Competent Expert Evidence

- 1.8.1 The Regulation 14(4)(a) of the EIA Regulations requires that the ES is prepared by 'competent experts'.
- 1.8.2 The EIA has been undertaken by competent experts with the relevant and appropriate experience in their respective topics. The overall EIA Lead and competent expert responsible for the ES is a full member of the Institution of Environmental Sciences and a Chartered Environmentalist, with 15 years of experience in managing EIAs.
- 1.8.3 AECOM has also been awarded the EIA Quality Mark from the Institute of Environmental Management and Assessment (IEMA), demonstrating competency in ES preparation.
- 1.8.4 Appendix 1-2 of Volume 3 provides the relevant information regarding the expertise of individuals who have undertaken the management, coordination and specialist assessment provided in this ES.

2. THE PROJECT

2.1 Background

- 2.1.1 The A614/A6097 route was designated part of the Major Road Network (MRN) in October 2018, a middle tier of the country's busiest and most economically important local authority 'A' roads, sitting between the strategic road network (SRN) and the rest of the local road network.
- 2.1.2 Geographically, the A614/A6097 route sits between the A1 trunk road (T) to the east and M1 to the west and forms a north-south spine through the centre of Nottinghamshire. The A614/ A6097 route regularly acts as a diversion or alternative route during major works or incidents on the SRN and is named as a tactical diversion route in the event of an incident or closure of the A1(T).
- 2.1.3 Traffic congestion on the A614/A6097 MRN corridor has been the subject of considerable concern for many years. Traffic growth has continued to increase in recent years along the corridor (by as much as 10% on certain sections of the A614 since 2014) which has compounded delays that were already being experienced at a number of key junctions.
- 2.1.4 The A614/A6097 route regularly experiences congestion and journey time delays in the peak periods, particularly at the Ollerton, Lowdham and Kirk Hill junctions due to insufficient capacity to cope with current traffic demands. There are regular delays to traffic joining the A614 at the Mickledale Lane as traffic waits for suitable gaps in the A614 traffic before joining.
- 2.1.5 Historically the A614 / A6097 route had a poor safety record with speeding and overtaking a particular cause for concern. In 2011, a major safety scheme was implemented by the County Council following a fatal collision on the A614 section between Mickledale Lane and Deerdale Lane. The scheme consisted of a reduction in speed limit from derestricted to 50 mph, supplemented by the installation of speed enforcement cameras.
- 2.1.6 At its northern end, the A614 serves a number of tourist attractions, some of which are nationally important including: Clumber Park (National Trust), Rufford Abbey, Center Parcs Sherwood Forest, Sherwood Pines Forest Park, Go Ape, Sherwood Forest Country Park and Visitor Centre, The Major Oak, White Post Farm and Robin Hood's Wheelgate Family Theme Park. NCC's Visitor Economy Strategy 2019 – 2029 (NCC, 2019) identified the A614 as being a Key Development Project to:
- strengthen the sense of place for visitors along the A614;
 - use latest technology to create a high quality, well-signed visitor route that welcomes you to the County and to Sherwood Forest; and
 - create a visitor friendly bus route from Nottingham City to Sherwood Forest using existing services and Sherwood livery buses.
- 2.1.7 Within the NCC Visitor Economy Strategy 2019 – 2029 (NCC, 2019), the A614 is identified as being a Key Development Project to strengthen the sense of place for visitors along the A614 and take advantage of investment along this growth corridor to:
- use latest technology to create high quality, well-signed visitor route that welcomes you to the County and to Sherwood Forest; and

- create visitor friendly bus route from Nottingham City to Sherwood Forest using existing services and Sherwood livery buses.
- 2.1.8 As such, the A614 serves a dual-economic function: facilitating regular commuter trips and local movements, and also being an important corridor for the tourist economy which will grow in future.
- 2.1.9 Traffic congestion is forecast to increase along the corridor without intervention. Increasing congestion will have a detrimental impact on journey time reliability for all users and local economic activity. The corridor already has a high proportion of heavy goods vehicle use, and so further delays will have a direct impact on the logistics supply chain for industries and businesses both on and close to this corridor.
- 2.1.10 Without highway improvements the ability of the local district councils to release housing and employment development will be restricted. There are already development limits on some planning permissions until such time as junction capacities have been improved to accommodate existing and development generated traffic.
- 2.1.11 At Thoresby Colliery near Ollerton, planning conditions limit development to 150 dwellings and 8,094 m² employment developments until capacity improvements to Ollerton Roundabout occur. The Project would allow a further 650 dwellings & 24,281 m² of employment development to progress.
- 2.1.12 At the Teal Close development site near Lowdham, planning conditions limit development to 150 dwellings until capacity improvements to Lowdham Roundabout occur. The Project would allow for a further 680 dwellings to progress.
- 2.1.13 It is also important to make sure that the corridor is as accessible and reliable as possible, in order to make further investment in the area attractive to prospective developers.
- 2.1.14 The route also frequently acts as a diversion or alternative route during major works or incidents on the SRN. As several junctions along the A614/A6097 corridor are already operating close to, or above capacity, there would be a reduction in the effectiveness of the route for diversions from the SRN without intervention.
- 2.1.15 The following six junctions have been identified as requiring intervention for varying reasons as indicated below:
- **Ollerton Roundabout** - The roundabout currently experiences regular peak hour journey time delays and queuing and is considered to be a capacity restraint which has resulted in limits being placed on nearby planning applications.
 - **Mickledale Lane Junction** –There are regular delays to traffic joining the A614 at the Mickledale Lane junction as traffic waits for suitable gaps in the A614 traffic before joining. A key concern at this junction is the ability of minor-arm traffic to safely judge gaps when entering the A614 and to do so without undue delay.
 - **White Post Roundabout** - The junction requires carriageway upgrades to ensure the route is of a suitable standard to support the SRN and provide network resilience.
 - **Warren Hill Junction** - The unusual arrangement of this priority controlled gyratory junction creates a perception that the junction is unsafe. The junction is predicted to be a capacity restraint in future years.

- **Lowdham Roundabout** - The junction currently experiences significant journey delays (especially during the morning and evening peak periods) because of insufficient capacity to cater for current traffic demands and is considered to be a capacity restraint which has resulted in limits on nearby planning applications.
- **Kirk Hill Junction** - The junction currently experiences significant journey delays (especially during the morning and evening peaks) because of insufficient capacity to cater for current traffic demands.

2.2 Project Objectives

2.2.1 The Project is an important part of NCC's strategy to support growth and development in this part of Nottinghamshire. It would enable the MRN, Strategic Road Network (SRN) and local roads to operate more efficiently by reducing congestion, improving the reliability of journey times whilst also providing increased capacity at key junctions which would help facilitate economic growth in the area.

2.2.2 The objectives of the package of junction improvements are aligned closely with the objectives set out in the MRN programme to:

- **reduce congestion** - A number of intersections along the A614/A6097 corridor currently suffer from significant levels of congestion, particularly at peak travel periods;
- **support economic growth and housing delivery** - The Project would increase capacity along the corridor which in turn can accommodate new and additional trips arising from significant housing and employment developments that are to be constructed in future years;
- **support the SRN** - The Project would add resilience to the route which will support the SRN during major works or incidents on the M1, A1, and A46;
- **reducing journey time delays, particularly at peak periods** - Improving journey time reliability will improve economic efficiency for businesses and make the corridor as attractive as possible to visitors to the many tourist attractions located along the corridor; and
- **supporting all road users** - The Project would improve crossing facilities for pedestrians and cyclists.

2.3 Project Location

2.3.1 Geographically, the route sits between the A1(T) to the east and M1 to the west and forms a north-south route running from Nottingham in the south towards Worksop and Retford and beyond in the north. Positioned within a small settlement and rural landscape setting.

2.3.2 The A6097 provides a spur from the A614 to the A46 (a trunk road linking Leicester with Newark and Lincoln). Within the scope of the Project, the A614 is a two-way single carriageway, and the A6097 is a two-way single carriageway which has a short length of dual carriageway through Lowdham.

2.3.3 The Project is comprised of six individual Schemes that are located within two Local Authority areas. All Schemes are located within the NSDC area, with exception to Kirk Hill Junction, the most southern Scheme, which is located in the RBC area. An overview plan of the Scheme locations and Local Authority boundaries can be viewed on the Location Plan Figure 2-1 in Volume 2.

2.3.4 A description of each Scheme location is provided below (Schemes are described from north to south along the route).

Ollerton Roundabout

- 2.3.5 Ollerton Roundabout is located in Ollerton village in Nottinghamshire, approximately 12 km north-east of Mansfield and 26 km north of Nottingham. The national grid reference (NGR) for the centre of the junction is SK65096753. It is a six-arm roundabout with one arm being bus only. The junction facilitates local movements from Ollerton and local tourist attractions (The Major Oak etc.) as well as strategic trips accessing the Strategic Road Network (A1(T) via A614).
- 2.3.6 A McDonald's restaurant and a drive-through Costa Coffee are located to the immediate south of the junction. A Public House (The Alders) was constructed to the west of the junction in 2015. Two petrol stations are also positioned on either side of the A614 Old Rufford Road. Isolated housing is to the north-east of the junction and on Mansfield Road.
- 2.3.7 Within 200 m of Ollerton Roundabout there are several ecologically sensitive sites including Birklands West and Ollerton Corner SSSI, Birklands and Bilhaugh SAC and Sherwood Heath Local Nature Reserve (LNR) and Local Wildlife Site (LWS). There are also habitats included within the Sherwood Area Possible Potential Special Protection Area (ppSPA) within 200 m. Some of these habitats are adjacent to the existing junction.
- 2.3.8 There are footways along the roads leading into Ollerton Roundabout, with a bridleway (Ollerton and Boughton Bridleway No. 26 changing name at the Parish boundary to Edwinstowe Bridleway No. 24) leading north-west through Sherwood Heath LNR.

Mickledale Lane Junction

- 2.3.9 Mickledale Lane Junction is located approximately 500 m west of the village of Bilsthorpe in Nottinghamshire, approximately 9 km east of Mansfield and approximately 22 km to the north of Nottingham. The NGR for the centre of the junction is SK63756094. It is a priority crossroads with right-turn harbourages provided into each of the minor arms.
- 2.3.10 Four houses occupy the south-east corner of the junction, and a transport café (Limes Café) and house are present in the north-west quadrant. Other than these buildings, the junction is surrounded by agricultural land. Inkersall Lane is a narrow road leading westward from the junction to a small number of private properties and the former Rufford Colliery site. To the east, Mickledale Lane leads to the centre of Bilsthorpe village.
- 2.3.11 There are footways on both sides of the junction and a dropped crossing and refuge have been provided to assist crossing movements to the north of the junction. Inkersall Lane is a private lane which is not publicly maintained for motor vehicles. It does however have public bridleway rights over it (Rufford Bridleway No. 5).
- 2.3.12 Route Number 645 of the National Cycle Network lies 210 m to the north of the junction and is a traffic free route. The route follows the disused mineral line and terminates just south of Kirklington. A pair of bus stops (NS0624 and NS0782) are located on Mickledale Lane, close to the junction with the A614.

White Post Roundabout

- 2.3.13 White Post Roundabout is located just west of the village of Farnsfield in Nottinghamshire, approximately 9 km south-east of Mansfield and 16 km north of Nottingham. The NGR for the centre of the junction is SK62775707. The current layout is a four-arm standard roundabout with the A614 running north-south.

- 2.3.14 The Mansfield Road (West) leads to Rainworth and the town of Mansfield. The Mansfield Road (east) leads to the village of Farnsfield.
- 2.3.15 There are business and residential properties surrounding this junction on all sides. The Wheelgate Family Theme Park is situated 200 m away from the junction to the west. There is a Day Nursery and White Post Farm located to the north-east of the junction. A Public House (The White Post) is located to the south-east and a motor vehicle sales garage to the south-west.
- 2.3.16 Footways are available on each of the roads leading to the junction, and a pedestrian refuge (with dropped crossings) has been provided on the A614 north arm. There are two public footpaths either side of the A614 to the south of the junction (Farnsfield Footpath No. 18 and Footpath No. 19).
- 2.3.17 There is a pair of bus stops to the west of the junction on Mansfield Road near the Wheelgate Family Theme Park entrance (NS0249 and NS0544). There is also a pair of bus stops to the east of the junction on Mansfield Road near the entrance to the White Post Public House car park (NS0050 and NS0051).

Warren Hill Junction

- 2.3.18 Warren Hill Junction is located just south of the village of Farnsfield in Nottinghamshire, approximately 10 km south-east of Mansfield and 14 km north of Nottingham. The NGR for the centre of the junction is SK62325511.
- 2.3.19 This is a priority controlled gyratory junction where traffic on the A6097 gives way to traffic travelling north/south on the A614. The junction layout is unusual in that traffic from the A6097 (routing north) merges onto the A614 by entering the mainstream on the passenger side (rather than the normal driver's side). This unusual arrangement creates a perception that the junction is unsafe. The junction is predicted to be a capacity restraint in future years.
- 2.3.20 A caravan sales site is located to the immediate north of the junction, though the rest of the junction is surrounded by agricultural land. No provision for walkers, cyclists or horse riders has been made at this junction.
- 2.3.21 To the north of the junction a Byway Open to All Traffic (Oxton BOAT No. 11 – Rob Lane) joins the A614. This public right of way meanders through to Greaves Lane with various bridleways linking to it.

Lowdham Roundabout

- 2.3.22 Lowdham Roundabout is located in Lowdham village in Nottinghamshire, approximately 2 km north of the village of Gunthorpe and 9 km north-east of Nottingham. The NGR for the centre of the junction is SK67034608. It is a four-arm standard roundabout with the dual-carriageways of the A6097 entering the junction from both the north-west and south-east.
- 2.3.23 Residential dwellings have been constructed to the east and south of the junction along the A612 and a cricket pitch is located to the north of the junction. To the north-west, the junction is bordered by agricultural land.
- 2.3.24 Footpaths have been provided around the junction and splitter islands are available to assist pedestrians crossing. There is a PROW footpath (Lowdham FP2) which starts approximately 100 m to the south of the junction between property numbers 2 and 4 Nottingham Road.

Kirk Hill Junction

- 2.3.25 Kirk Hill Junction is located just south of East Bridgford, approximately 10 km east of Nottingham. The NGR for the centre of the junction is SK68914276. The existing Kirk Hill Junction is a signalised four-arm traffic junction. The A6097 Bridgford Street runs in a north-west to south-east direction. Kirk Hill (the road) joins the A6097 from the north, providing access to East Bridgford village. East Bridgford Road provides access to Newton village to the south. Both A6097 approaches are characterised by two lanes, one of which is a dedicated right turn lane, with the other used for ahead and left movements. Both Kirk Hill and East Bridgford Road are single lane approaches.
- 2.3.26 The junction currently experiences significant journey delays (especially during the morning and evening peaks) because of insufficient capacity to cater for current traffic demands. An Experimental Road Traffic Order (ETRO) at Trent Lane, East Bridgford, has increased through-traffic at this junction.
- 2.3.27 The junction is in a rural location, predominantly bordered by agricultural land. Residential dwellings are located in an area of land between the A6097 and Kirk Hill.
- 2.3.28 A narrow footway runs east-west along the northern side of the A6097. At the junction with Kirk Hill, the footpath diverts from the A6097 and continues along Kirk Hill into the village of East Bridgford. There is no crossing provision for walkers, cyclists, or horse riders at the junction currently.
- 2.3.29 Public bridleway East Bridgford Bridleway No. 28 runs parallel with the A6097, on the north-eastern side of the A6097. It extends north-west to Trent Lane and south-east to further public bridleways parallel with the A46(T). The recorded definitive line of this bridleway is not useable on the ground in the vicinity of the Kirk Hill junction. It is obstructed by dense vegetation and a steep unmade gradient. Instead, users navigate along a cut-through path to the bend on Kirk Hill before joining the narrow footway to the junction. This cut-through is neither recorded as a public right of way nor adopted highway but is accepted by the public as an alternative route to the obstructed definitive line of East Bridgford Bridleway No. 28.
- 2.3.30 In addition to the above, there are further public rights of way in the vicinity of the junction: East Bridgford Footpath No. 27 diverges from the bridleway near the Kirk Hill junction before passing over a small copse and out into the fields beyond; and Shelford Footpath No. 9 meets the A6097 approximately 220 m north-west of the junction.
- 2.3.31 A local toll ride arrangement is in place for equestrians in the area. Riders can pay an annual fee to access a network of routes over private land. One of the entrances to this network is located on the north-west side of East Bridgford Road, very close to its junction with Kirk Hill. Users of this toll ride network account for many of the equestrian movements around the Kirk Hill Junction.

2.4 Project Description

- 2.4.1 The Project comprises a package of improvements to six junctions along the route. These vary in scale as noted below (Schemes are described from north to south along the route).
- 2.4.2 Significant works including land-take beyond the current highway boundary are required for four Schemes, these are summarised below with further detailed description for each Scheme provided in Volumes 1A to 1D.

- 2.4.3 The Scheme layout and red line planning boundary for each of the six Schemes can be viewed on the general arrangement drawings provided in Appendix 2-1 of Volume 3. The red line planning boundary encompasses the full extent of all highway improvement works, including areas of changes to existing signage, new signage and new lighting.
- 2.4.4 Design and related drawings are provided for Ollerton Roundabout, Mickledale Lane Junction, Lowdham Roundabout and Kirk Hill Junction as follows:
- Site clearance drawings can be viewed in Appendix 2-1 within Volumes 3A to 3D.
 - Landscape design drawings can be viewed in Appendix 2-2 in Volumes 3A to 3D.
 - The Land Affected plans, showing temporary and permanent land requirements can be found in Appendix 2-3 in Volumes 3A to 3D.
 - Drainage design drawings can be viewed in Appendix 2-2 of Volume 3.

Ollerton Roundabout

- 2.4.5 It is proposed to enlarge the existing Ollerton Roundabout. The junction currently has six approaches, and this would be reduced to five by removing the bus-only arm Newark Road, which would realign to join the A616 Ollerton Road arm.
- 2.4.6 The Inscribed Circle Diameter (ICD) of the roundabout would be increased from 37.5 m to 60 m. Approaches from all directions would be widened to provide two entry lanes onto the roundabout.
- 2.4.7 Changes to speed limits are proposed with the speed limit at the junction reduced from national speed limit to 40 mph at the roundabout and on all approaches.
- 2.4.8 Toucan crossing points (a crossing with signal controls) for both pedestrians and cyclists would be provided on the A6075 Mansfield Road and the A614 Old Rufford Road.
- 2.4.9 The area of land within the red line boundary is approximately 5.3 ha. Permanent land take beyond the highway boundary would be required.

Mickledale Lane Junction

- 2.4.10 It is proposed to construct a new three-arm roundabout on the A614 to the south of the existing junction. A new link road would connect the A614 and Mickledale Lane by passing through a field to the south-east of the existing junction. The new link road would tie into Mickledale Lane via a second three-arm mini-roundabout.
- 2.4.11 The existing Mickledale Lane crossroads would be amended to close off access for vehicles to/ from the A614 onto Mickledale Lane. Mickledale Lane would become a cul-de-sac accessed from the east, from the new link road. New access would be provided off the new link road into Strawsons Ltd premises to the east.
- 2.4.12 The A614 roundabout junction would be subject to a 50 mph speed limit, and the link road would be subject to a 30 mph speed limit.
- 2.4.13 The area of land within the red line boundary is approximately 8.6 ha. Permanent land take beyond the highway boundary would be required.

White Post Roundabout

- 2.4.14 It is proposed to carry out small-scale road safety and maintenance works at White Post Roundabout. This would involve localised carriageway repairs and the provision of high friction surfacing on the approaches to the junction. A review of the existing street lighting provision will guide any future additional lighting or upgrades required.
- 2.4.15 The area of land within the red line boundary is approximately 1.7 ha. No land take beyond the highway boundary is required.

Warren Hill Junction

- 2.4.16 It is proposed to simplify this junction by providing an extended merge lane, thereby removing the requirement for north-bound drivers on the A6097 to give way to vehicles on the A614 to the left; an unnatural manoeuvre to give way to the left in a right-hand drive vehicle. This would require a small amount of carriageway reconstruction along with new white lining. Revised and upgraded lighting and signage would be provided to inform drivers of the new road layout.
- 2.4.17 The area of land within the red line boundary is approximately 2.4 ha. No land take beyond the highway boundary is required.

Lowdham Roundabout

- 2.4.18 It is proposed that an enlarged four-arm elliptical roundabout be constructed to replace the existing roundabout. This would have a two-lane circulatory carriageway and include a third left turn filter lane on the A612 Nottingham Road (eastbound) approach to the junction. A new access road would be provided from the A612 Nottingham Road to access the four properties on the south side of the road, closest to the roundabout.
- 2.4.19 Toucan crossing points for both pedestrians and cyclists would be provided on both carriageways of the A6097 Epperstone Bypass, north-west of the roundabout. These crossings would be linked by shared-use footway/cycleways.
- 2.4.20 It is proposed that the speed limit at the roundabout would be reduced from 40 mph to 30 mph. The 30 mph speed limit would also extend approximately 140 m from the junction on the north western leg of the A6097 and approximately 100 m from the junction on the south-western leg of the A612.
- 2.4.21 The area of land within the red line boundary is approximately 3.1 ha. Permanent land take beyond the highway boundary would be required.

Kirk Hill Junction

- 2.4.22 It is proposed to carry out carriageway widening works to provide two straight ahead lanes in each direction on the A6097 and separate right turn lanes into Kirk Hill and East Bridgford Road. It is further proposed to carry out localised widening on Kirk Hill to facilitate improved negotiation of left turns into the road by large vehicles. These changes would require upgrades and improvements to the traffic signals at the junctions.
- 2.4.23 East Bridgford Bridleway No. 28 would be diverted around the north side of Kirk Hill, crossing at the bend and linking through to the cut-through path which is currently used as an unofficial diversion route.
- 2.4.24 A new Pegasus crossing would be provided 100 m east of the junction to facilitate the safe movement of equestrians across the A6097. This crossing would link into the public bridleway on the northern side and a new surfaced path with fencing

would be created on the southern verge of the A6097 to link the route to East Bridgford Road.

- 2.4.25 The Scheme would include a reduction in the speed limit from de-restricted to 50 mph beyond the existing 40 mph terminal point around 930 m north-west of the Kirk Hill to the junction with the A46 around 1.1 km south-east of the Kirk Hill Junction. This would make the speed limit consistent with the rest of the A6097 and A614 corridors.
- 2.4.26 The area of land within the red line boundary is approximately 7.4 ha. Permanent land take beyond the highway boundary would be required.

2.5 Approach to Delivery of Biodiversity Net Gain

- 2.5.1 The Project has sought to deliver biodiversity improvements through the provision of landscape planting alongside each Scheme.
- 2.5.2 The Project provides a baseline biodiversity value equal to:
- 39.88 Habitat Units;
 - 19.77 Hedgerow Units; and
 - 2.51 River Units.
- 2.5.3 Post development, across the Project the following biodiversity values are realised:
- 47.09 Habitat Units;
 - 33.96 Hedgerow Units; and
 - 4.20 River Units.
- 2.5.4 This results in a 18.07% net gain for habitat units, a 71.75% net gain in hedgerow units, and a 67.14% net gain in river units.
- 2.5.5 The net gain is provided through the provision of new grassland, scrub, hedgerows, ditch and woodland habitat or through the enhancement of retained habitats. The replacement of lost habitat is 'like-for-like; or better across the extent of the Project, which satisfies the trading rules set within the metric for broad habitat types.

2.6 Construction, Operation and Long-Term Management

Construction Areas and Compounds

- 2.6.1 The Schemes' red line planning boundaries are as shown on the general arrangement drawings located in Appendix 2-1 in Volume 3. These allow for all temporary working and storage areas, material stockpiles, and provision for site compounds (as required), for the construction of each Scheme.
- 2.6.2 There may also be a need to use the existing Bilsthorpe Road Maintenance Compound for storage during the construction of the Schemes, particularly for Mickledale Lane Junction, White Post Roundabout and Warren Hill Junction.

Construction Programme

- 2.6.3 Construction start dates and opening years for each Scheme can be viewed in Table 2-. Construction would be undertaken over an approximate 40-month timeframe, starting in Spring 2023 and completing in early Summer 2026. Individual Scheme construction start and opening dates are staggered over this period, as displayed in Table 2-1.

2.6.4 This staggered approach is intended to avoid significant disruption to traffic during construction. It would not be practical or feasible to deliver improvements at all of the junctions along the same corridor, all at the same time. As noted in the Outline Business Case (OBC) (NCC, 2020), the construction phasing proposed considers the implication on the wider network management and duties under the Traffic Management Act 2004 to co-ordinate all highway works and minimise disruption.

Table 2-1: Scheme Anticipated Construction Start Dates and Opening Years

Scheme Name	Construction Start Date
Ollerton Roundabout	Autumn 2023 (for approximately 87 weeks)
Mickledale Lane Junction	Winter 2024/2025 (for approximately 54 weeks)
White Post Junction	Summer 2023 (for up to 4 weeks)
Warren Hill Junction	Summer 2023 (for approximately 4 weeks)
Kirk Hill Junction	Autumn 2023 (for approximately 38 weeks)
Lowdham Roundabout	Summer/Autumn 2024 (for approximately 36 weeks)

2.6.5 Specific descriptions for the construction activities for Ollerton Roundabout, Mickledale Lane Junction, Lowdham Roundabout and Kirk Hill Junction can be found in Volumes 1A to 1D.

2.6.6 Construction activities at White Post include:

- high friction surfacing to be renewed on all arms of the junction;
- installation a revised lighting arrangement; and
- minor signing improvements.

2.6.7 Construction activities at Warren Hill include:

- signing improvements and changes to reflect the proposed banned movement;
- carriageway lining; and
- small scale civils work to address kerb alignment and to physically prevent the banned movement.

Operation and Long-Term Management

2.6.8 Operation and long-term management of the Project would remain the responsibility of NCC as the local highway authority. The maintenance of landscape planting would be the responsibility of NCC.

3. ASSESSMENT OF ALTERNATIVES

3.1 Assessment Methodology

- 3.1.1 The EIA process provides an opportunity to consider alternative development options with their respective environmental effects before a final decision is taken on the design. In accordance with the EIA Regulations and the Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (Highways England, 2020a) the ES describes alternatives that were considered.

3.2 Reasonable Alternatives Studied

Non-Car Options

- 3.2.1 Early discussions explored potential public transport solutions to address the issues along the A614/A6097 as shown in Table 3-1.
- 3.2.2 The A614 is served by the Sherwood Arrow service which has an hourly frequency from Ollerton to Nottingham. The route passes through Redhill, Farnsfield, Bilsthorpe, Rufford Country Park, Sherwood Forest and Ollerton. The route takes approximately 65 minutes to travel from Ollerton to Nottingham in the AM peak and 77 minutes in the PM peak. The journey times in the other direction (Nottingham to Ollerton) are 71 minutes in the AM peak and 67 minutes in the PM peak.
- 3.2.3 Increasing the frequency of the service by subsidising the route during the peak time periods was found unlikely to result in any noticeable shift in modal share because the journey length would still not compare favourably with car travel.
- 3.2.4 A more direct express service (say from Ollerton to Nottingham only) was also dismissed because the existing service is mainly used by passengers to get to the other villages along the corridor.
- 3.2.5 NCC has a safeguarded bus-based park and ride scheme at the A60/ A614 Leapool roundabout, subject to funding. Whilst this scheme would undoubtedly be used by motorists travelling along the A614, the benefits are only expected to be felt within Nottingham itself. A successful park and ride scheme at Leapool could reduce traffic flows on routes approaching the City Centre but would not make any difference to vehicular flows on the A614.
- 3.2.6 The overall conclusion at this stage was that the provision of standalone non-car options would be unlikely to deliver any meaningful benefit to the A614/A6097 corridor and provide the desired Project aims. However, improvements to walking and cycling facilities at individual junctions on the corridor were worth further consideration once a junction package had been identified.

Table 3-1: Non-Car Alternatives Considered

Potential Measure	Assessment	Conclusion
Improvements to the existing bus network (increase frequency, express service, bus priority at junctions etc).	This is unlikely to have any impact on the road network in terms of modal shift. Limited numbers travelling from Ollerton to Nottingham and vice versa.	DISMISS.
Improvements to Rail System (Dukeries Line)	Not a viable short-term option; this is a long-term opportunity.	DISMISS. However, has the potential to add resilience if and when constructed in the long term (2030).
Investment in cycling and walking infrastructure	Limited local impact anticipated. Scheme area too remote and rural to make any difference to modal shift.	DISMISS. However potential to improve facilities at individual junctions should be considered.

Long List Highways Intervention Options

3.2.7 An early options development exercise was undertaken that produced a long list of twelve potential interventions:

- **Intervention 1** – Continuation of Dual Carriageway from A6097 Epperstone Bypass to Ollerton roundabout.
- **Intervention 2** - Ollerton roundabout capacity improvement
- **Intervention 3** - Ollerton Bypass
- **Intervention 4** – Rose Cottage (Centre Parcs) Capacity Improvement
- **Intervention 5** – Deerdale Lane, Bilsthorpe – Junction upgrade
- **Intervention 6** – Mickledale Lane, Bilsthorpe – Junction upgrade
- **Intervention 7** – White Post roundabout – Capacity Improvement
- **Intervention 8** – Warren Hill – Junction upgrade
- **Intervention 9** – Ton Lane/Epperstone Bypass – Capacity Improvement
- **Intervention 10** – Lowdham roundabout – Capacity Improvement
- **Intervention 11** – Gunthorpe Bridge – dual carriageway
- **Intervention 12** – Kirk Hill, East Bridgford – Capacity Improvement

3.2.8 These intervention options were initially combined into a total of four packages as follows and shown in Table 3-2:

- **Package 1:** Dual carriageway from Epperstone Bypass to Ollerton and junction upgrades at all junctions (interventions 2 and 4 to 12).
- **Package 2:** Ollerton Bypass only.
- **Package 3:** Upgrade between Ollerton and Lowdham roundabouts only.
- **Package 4:** Package 3 but without Rose Cottage and Ton Lane junctions.

Table 3-2: Long List Intervention Packages

	Interventions											
	1	2	3	4	5	6	7	8	9	10	11	12
Package 1	■	■	□	■	■	■	■	■	■	■	■	■
Package 2	□	□	■	□	□	□	□	□	□	□	□	□
Package 3	□	■	□	■	■	■	■	■	■	■	□	□
Package 4	□	■	□	□	■	■	■	■	□	■	□	□

Decision and Comparison of Environmental Effects

3.2.9 Package 4 was selected as the preferred option. This package was felt to satisfy the project objectives whilst delivering a positive benefit to cost ratio. This package also was anticipated to result in less substantial environmental effects as a result of it containing fewer major capacity interventions (e.g. bypasses and widening schemes).

Addition of Intervention 12: Kirk Hill Junction

3.2.10 The Kirk Hill junction (Intervention 12) was originally omitted from consideration because there were already proposed Section 278 works scheduled to improve the junction as part of the RAF Newton development site. The subsequent analysis at this junction indicated that the proposal put forward by the developer was not suitable and would not provide the level of capacity improvements required to meet the forecast traffic demand from the development site and growth. The existing problems at this junction and need for an improvement scheme were reinforced by comments made at the Lowdham public consultation events by regular users of the junction in August 2019.

3.2.11 It was decided that a more significant junction upgrade was required at Kirk Hill and that this would help deliver the Scheme objectives. An improvement to the Kirk Hill traffic signal-controlled junction was subsequently added to the package and this became package 5 (Table 3-3).

Decision and Comparison of Environmental Effects

3.2.12 When compared to the original four packages, Package 5 was predicted to result in similar environmental effects to Package 4, whilst delivering improved economic benefits as a result of the capacity improvements at Kirk Hill.

Table 3-3: Package 5: Package 4 with the inclusion of Intervention 12 Kirk Hill

	Interventions											
	1	2	3	4	5	6	7	8	9	10	11	12
Package 5	□	■	□	□	■	■	■	■	□	■	□	■

Removal of Intervention 5: Deerdale Lane

3.2.13 After a further round of scheme design and costing it became evident, that following the return of significant utility diversion cost estimates for the A614 Deerdale Lane junction in October 2020, that the Deerdale Lane junction improvement scheme would be disproportionately expensive to construct and the large increase in costs would have had a severe detrimental impact on the Benefit Cost Ratio for the overall A614/A6097 Project. As a result, the proposed Deerdale Lane junction improvement scheme was dropped from the package of measures to improve the corridor, resulting in Package 6 (Table 3-4).

Decision and Comparison of Environmental Effects

3.2.14 Once the economic benefits of the packages was re-calculated, Package 4 and Package 6 were considered the only packages financially affordable. They were both predicted to result in similar levels of environmental effects. However, Package 6 was considered to provide the improved economic benefits and was therefore chosen as the preferred option.

Table 3-4: Package 6: Package 5 minus Intervention 5: Deerdale Lane

	Interventions											
	1	2	3	4	5	6	7	8	9	10	11	12
Package 6												

Alternative Highways Solutions

3.2.15 Consideration was also given to low cost demand management and traffic management solutions such as speed limit changes to the A614/A6097 corridor. There was potential scope to increase and decrease the speed limit along the route from 50 mph.

- **Package 7** – Increase speed limit on A614/A6097 to 60 mph.
- **Package 8** – Reduce speed limit on A614/A6097 to 40 mph.

Decision and Comparison of Environmental Effects

3.2.16 These options were predicted to result in very few environmental effects, as there were no major highways interventions. However, they were also not considered to meet the project objectives, fit with regional strategies, would be less acceptable to stakeholders and resulted in less preferable economic benefits.

Long List Sifting Conclusion

3.2.17 The combinations were entered into the DfT Early Assessment and Sifting Tool (EAST) (DfT, 2017a) to help inform the original business case that was submitted to the DfT in May 2019. EAST is a decision support tool provided by the DfT which can quickly summarise and present evidence on options in a clear and consistent format.

3.2.18 On completion of the EAST sifting, **Package 6** was selected as the preferred package as it was found to meet the Project objectives, fit with local and regional transport strategies, have relatively more acceptable and mitigatable impacts in comparison to other packages, was more acceptable to local stakeholders and provided good economic benefits. Package 6 was also predicted to result in fewer environmental effects.

3.3 Scheme Design Development

- 3.3.1 After the completion of the long list sifting, the options noted in Table 3-5 were carried forward for further consideration.
- 3.3.2 Since the initial options assessment process, a new option was identified for Mickledale Lane Junction Option 2 which was not part of the early sifting, but is noted in Table 3-5 below.

Table 3-5: Alternative Scheme Design Options

Scheme	Option Name	Design Description	Reasons for Decision and Preferred Option	Comparison of Environmental Effects
Ollerton Roundabout Junction	Option 1c	An enlarged conventional roundabout; it proposes five arms, with the bus-only link road realigned onto the A616 Ollerton Road arm.	Both Option 1c and 1d generate significant journey time benefits over the assessment period, however Option 1d results in greater environmental effects. The preferred option is Option 1c, to retain a standard roundabout layout. The current proposals are considered to have the minimal possible impact to this designated site.	Option 1d has a larger overall footprint resulting in a greater negative impact on a number of environmental areas including ecology, landscape, air quality and noise. The traffic signal-controlled junction would have a greater impact on the local environment, requiring more land take from land to the north-west of the junction therefore increasing the impact of the improvements on the Birklands West and Ollerton Corner SSSI.
	Option 1d	Use of traffic signals on four of the arms, as well as three sets of traffic signals. The bus-only link road to be diverted onto the A616 Ollerton Road to allow the junction to work as a five-arm signalised junction.		
Mickledale Lane Junction	Option 3a	Signalisation of the junction with two entry lanes southbound and only one entry lane northbound.	There is very little difference in land take between Options 3a and 3b, but 3b provided significantly more traffic capacity and so Option 3a was discounted. Option 3c would have required the largest area of third-party land which would not have been publicly acceptable and so was dismissed on those grounds.	Option 3c would result in the largest loss of third-party land, including agricultural and residential property. Option 2 (the preferred option) requires additional third-party land in comparison to Options 1, 3a and 3b, including the loss of additional agricultural soils and the potential to result in new landscape and visual effects compared to Option 1. Option 1 would have required the loss of part of the Limes Café land to provide access and allow for localised carriageway widening. However this would have resulted in the smallest land take compared to the other options.
	Option 3b (referred to as Mickledale Lane Option 1 in the Scoping Report)	Expanded Option 3a by including two entry lanes for both A614 approaches.		
	Option 3c	Construction of a conventional four-arm roundabout.	After safety issues were identified associated with access and egress of Heavy Goods Vehicles (HGVs) at the Limes Café, the original junction improvements at Mickledale Lane were superseded by a conventional	
	Mickledale Lane "Option 2"	Construction of a new three-arm roundabout on the A614 to the south of the existing junction, with a new link		

Scheme	Option Name	Design Description	Reasons for Decision and Preferred Option	Comparison of Environmental Effects
		road and mini-roundabout to link to Mickledale Lane east of the existing junction.	roundabout design which was consulted on in May 2021. This option was known as Option 2. Option 2 was taken forward to public consultation in May 2021 (see Section 1.7 of this report for more information), where support was gauged.	
White Post Junction	Option 4a	Widening of entry lanes on the A614 approaches creating capacity improvements.	Following careful consideration of the options to improve the traffic carrying capacity of this junction it became clear that the availability of land to permit a meaningful improvement scheme was limited due to development on all four corners of this junction. In which case it was decided that in order to ensure network resilience and to ensure that this junction continues to perform as effectively and as safely as possible that the junction would be improved in situ with Option 4d.	Options 4a, 4b and 4c are relatively larger options, resulting in more disruption during construction and land take for widening (Option 4a). Option 4d would result in very few temporary construction environmental effects and no operational environmental effects.
	Option 4b	Signalisation of all four arms of the junction.		
	Option 4c	Closing of the Mansfield Road arm (west) except for access so that the junction mainly functioned as a three-arm roundabout.		
	Option 4d	A road safety scheme involving anti-skid road surfacing and minor maintenance improvements.		
Warren Hill Junction	Option 5a	Construction of a three-arm signalised junction.	Option 5c was selected based on the need for less third party land and lower cost whilst simplifying the unusual and confusing layout.	Option 5c is consider the smallest, and least environmentally damaging option of the three considered at this junction. Options 5a and 5b would have resulted in larger land take and associated environmental effects.
	Option 5b	Enlarged conventional roundabout		
	Option 5c	Geometric improvements to replace the existing priority controlled gyratory where traffic on the A6097 gives way to traffic on the A614.		

Scheme	Option Name	Design Description	Reasons for Decision and Preferred Option	Comparison of Environmental Effects
Lowdham Roundabout	Option 6a	Construction of an enlarged four-arm conventional roundabout with two lane proposed circulatory carriageway.	Option 6c was chosen as the elliptical roundabout. Option 6c delivers significant journey time benefits against a traffic signalled option and has less environmental impact than the alternative conventional roundabout layout.	Option 6a would have required acquisition of land at the cricket pitch and recreational ground which is used as a flood water storage area. A number of trees, albeit identified as low quality, would also need to be removed. With Option 6c, there are no tree losses predicted. Option 6b would be lower intervention and less likely to result in any significant environmental effects.
	Option 6b	Signalisation of all four arms.		
	Option 6c	An elliptical roundabout with a third left turn filter lane incorporated on the A612 eastbound approach.		
Kirk Hill Junction	Option 7a	Localised widening of the A6097 junction, provision of two straight ahead lanes in both directions, traffic signal improvements, and localised widening on the Kirk Hill to facilitate easier negotiation of left turns into the side road.	Option 7a was chosen as this was considered to deliver the greatest benefit to aid smoother flow of traffic on the A6097 and improve safety for left turning vehicles with the least environmental impact.	Option 7b would result in larger environmental effects than Option 7a, which would largely be associated with the realignment of Kirk Hill beyond the immediate area of the junction.
	Option 7b	Localised widening of the A6097 junction approaches, provision of two straight ahead lanes in both directions, traffic signal improvements, a retaining structure on the A6097 northbound carriageway, realignment of Kirk Hill to bring it in line with current design standards, and to provide additional traffic capacity; and provision of a mini roundabout to		

Scheme	Option Name	Design Description	Reasons for Decision and Preferred Option	Comparison of Environmental Effects
		facilitate access to the old Kirk Hill which would be stopped up (with a turning head).		

3.4 Design Development Post-Scoping

3.4.1 Since the presentation of the Schemes within the Scoping Report, there has been some design development which has resulted in revisions to the red line boundary for planning. These are as follows:

- **Ollerton Roundabout** – The red line boundary has been adjusted as result of discussions with a directly affected resident to ensure safe access can be maintained to the property and adjacent fields. The boundary also includes the extent of lighting improvements that would be required in line with current design standards; the lighting extents are such due to the *five second rule* (for safe stopping distances) for approaches to conflict zones¹ (in this instance the roundabout) and are based on the proposed speed limit. The extents of proposed traffic signing amendments are also incorporated into the red line boundary including new, or replacement signage. Landscaping has also influenced the red line boundary, to ensure that mitigation and BNG requirements are addressed. In addition, changes have been made to the boundary to ensure a safe working area for construction of the Scheme.
- **Mickledale Lane Junction (Option 2, as the preferred option)** – A need to increase the size of the roundabout was identified as a result of more detailed junction capacity modelling. This has moved the roundabout towards the west, further into an agricultural field. In order to address the drainage requirements at this junction in line with the proposed strategy for surface water run-off, the red line has been altered to provide space for underground storage (attenuation) crates.
- **Lowdham Roundabout** - The red line boundary has been extended to include the extent of lighting improvements that would be required in line with current design standards; the lighting extents are such due to the *five second rule* (for safe stopping distances) for approaches to conflict zones (in this instance the roundabout) and are based on the proposed speed limit. The extents of proposed traffic signing amendments are also incorporated into the red line boundary including new, or replacement signage. The red line boundary was altered to accommodate permanent provision of attenuation ponds where landscaping has also influenced the red line boundary, to ensure that BNG and potential flood risk is addressed. In addition, changes have been made to the boundary to ensure a safe working area for construction of the Scheme.
- **Kirk Hill Junction** - The boundary has most notably been adjusted to accommodate the Pegasus crossing and associated diversion of BW 28 with provision of 5 m wide facility along Kirk Hill and earthworks to address level differences between the carriageway and adjacent field. The boundary also includes the extent of lighting improvements that would be required in line with current design standards; the lighting extents are such due to the *five second rule* (for safe stopping distances) for approaches to conflict zones (in this instance the Kirk Hill Junction) and are based on the proposed speed limit. Amendments to traffic signing are also included in the adjusted red line boundary, including new, or replacement signage. In addition, there have been some design changes made at Ollerton Roundabout, for example a reduction in the proposed lux level to reduce light spill for residents and nearby ecological receptors.

3.4.2 At Ollerton Roundabout, the Scheme lighting design has been adapted to avoid lighting impacts to roosting bats has been avoided. The proposed lighting scheme along the A614 north approach road has been modified to include 8.0 m lighting

¹ Conflict zones are areas where traffic, either motorised or pedestrian, converges from many directions.

columns and warm white LED luminaires with rear shield to reduce the lighting spill at Forest Side and to use a more 'bat friendly' light spectrum. Additionally, the lighting scheme will be dimmed by 50% from 10:00pm to 7:00am.

- 3.4.3 At Kirk Hill Junction, adjustments have been made to proposals in relation to a bridleway that runs parallel to the A6097 to provide a safer link along Kirk Hill and the addition of a Pegasus crossing.

4. ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1 Environmental Scoping

4.1.1 The Scoping Report was submitted to NCC. NCC reviewed and consulted on the Scoping Report and published a Scoping Opinion for each Scheme individually on the following dates:

- Ollerton Roundabout – 13th September 2021
- Mickledale Lane Junction – 8th November 2021
- White Post Roundabout – 9th December 2021
- Warren Hill Junction – 9th December 2021
- Lowdham Roundabout – 13th August 2021
- Kirk Hill Junction – 5th October 2021

4.1.2 The Scoping Opinion and the comments from consultees have been considered in undertaking the EIA and in preparing this ES. A table of the Scoping Opinion comments and consultee comments received, and responses to these are provided in Appendix 4-1 of Volume 3.

4.1.3 Environmental topics agreed to be scoped into the EIA varied by Scheme. Table 4-1 outlines the environmental topics (as per the DMRB) where a topic-specific assessment has been scoped in/out of the ES.

4.1.4 In addition to the topics identified in Table 4-1, an assessment of cumulative effects has been undertaken.

Table 4-1: Topics Scoped into the EIA for each Scheme

Scheme Name	Air Quality	Noise	Water Environment	Cultural Heritage	Landscape	Biodiversity	Geology and Soils	Climate
Ollerton Roundabout	In	In	In	In	In	In	In	In
Mickledale Lane junction	In	In	In	In	In	In	In	In
White Post Roundabout	Out	Out	Out	Out	Out	Out	Out	Out
Warren Hill Junction	Out	Out	Out	Out	Out	Out	Out	Out
Lowdham Roundabout	In	In	In	In	In	In	In	In
Kirk Hill Junction	In	In	Out	In	In	In	In	In

4.1.5 It should be noted that both the White Post Roundabout and Warren Hill Junction Schemes involve works that are relatively minor in nature and not typically considered to be EIA development. This type of maintenance and improvement work would typically be undertaken under the existing permitted development rights held by NCC as the local Highway Authority without the need to obtain consent through a formal planning application. The nature of these works is considered to be minor, and subject to general good practice during construction would be unlikely

to result in any significant effects as noted in the Scoping Report. As noted in Table 4-1, all topics were scoped out the EIA for these Schemes. A summary of the scoping assessments for White Post Roundabout and Warren Hill Junction can be found in Appendices 4-6 and 4-7 respectively, within Volume 3.

4.1.6 Where assessment has been undertaken in accordance with the Scoping Opinion, the relevant ES section is provided; where an alternative approach has been taken, it is noted where this has been agreed with NCC Planning. Each of the topic assessment chapters reported in Section Volume 1A to 1D notes specific comments from consultees and how these were taken into account within the assessment.

4.1.7 The following topics were agreed to be scoped out of the ES for all Schemes and the Project as a whole:

- **Material Assets and Waste.** This was agreed to be scoped out due to the nature and relatively small scale of the works proposed. It was concluded that the low quantities of materials and waste would be required/ generated and would consequently have a low likelihood of significant effects on the environment.
- **Population and Health.** The Scoping Report noted that population and health related impacts were unlikely with all the Schemes, with the exception being Mickledale Option 1. As detailed in Chapter 3: Alternatives Mickledale Lane Option 2 has been taken forward as the preferred solution. In response to this decision, the requirement for the assessment of Population and Health is not needed as Option 2 does not result in the loss of land at the Limes Café business. Overall, any impacts of the Project anticipated during construction are likely to be small scale and temporary and there would be limited potential for permanent significant effects in relation to land use and accessibility.
- **Demolition/ decommissioning.** It is considered highly unlikely that the Project would be demolished/ decommissioned after its design life as the road is an integral part of the infrastructure in the area. In the unlikely event of Scheme demolition/ decommission, this would be part of the relevant statutory process at that time, including EIA as appropriate.
- **Heat and Radiation.** During the project construction phase, emissions of heat would be limited to heat generated on a temporary basis by construction equipment typically associated with the ground works and road construction projects. During the operation phase no heat emissions are anticipated.
- **Major Accidents and Disasters.** The Schemes are similar to the existing road infrastructure in development terms, therefore it is considered that the associated risk of events such as major accidents and disasters will not lead to new significant environmental effects.
- **Transboundary Effects.** Regarding likely significant effects on the environment of another European Economic Area (EEA) Member State, it is considered that the Project:
 - would be implemented at a considerable distance from the nearest EEA States (Ireland and France).
 - any combined environmental effects with other development projects would not extend beyond the adopted assessment study area(s) within England; and
 - could give rise to increased greenhouse gas (GHG) emissions, but would not be of a sufficient order to significantly contribute to global climate change (and thereby affect other EEA States).

4.2 Changes to the Schemes

- 4.2.1 Since submission of the Scoping Report, the Scoping Boundaries shown have been revised to become the red line planning boundaries. The draft red line planning boundaries for Ollerton Roundabout, Mickledale Lane Junction, Lowdham Roundabout and Kirk Hill Junction have increased following changes to the Scheme designs. The reasons for changes to the red line boundaries for planning are outlined in Chapter 3, Section 3.3. These mainly relate to provision of areas within the existing roadside verges to provide lighting and signage associated with the improvements. In all cases the assessment methodologies for the topics covered in the ES have been reviewed and no changes to the scope or methodologies has been required.
- 4.2.2 The red line planning boundaries for White Post Roundabout and Warren Hill Junction remain the same as shown within the Scoping Report.

4.3 Assessment Boundaries

- 4.3.1 For Mickledale Lane Junction and Lowdham Roundabout, the extent of the full red line planning boundary has been used to inform the study area for the assessments. The red line planning boundary encompasses the full extent of all the improvement works, new lighting and signage.
- 4.3.2 For Ollerton Roundabout and Kirk Hill Junction, lighting and signage extends further away from the main improvement works. In order to keep the EIA focussed on aspects that have the potential to result in significant environmental effects, alternative 'assessment boundaries' have been used for the assessment of some topics.
- 4.3.3 Therefore the two assessment boundaries used for the assessments for Ollerton Roundabout and Kirk Hill Junction are based on the following (these are shown on Figures 4-1 (Comparison of Assessment Boundaries) within Volume 2A and 2D respectively):
- The full extent of highways improvement works (i.e. carriageway realignment, earthworks and resurfacing works), excluding new signage and lighting which extends away from the works within the existing highway verge area). This area has been considered within the assessments air quality, geology and soils, noise and road drainage and the water environment. This area is shown as Boundary A on Figures 4-1 in Volumes 2A and 2D).
 - The full extent of highways improvement works as described above, plus the extent of new proposed lighting. The biodiversity and landscape assessment have considered this area. These assessments have not considered remote areas of new signage where these are providing replacement or single additional signs within the existing highway verge remote from the main improvement works. This area is shown as Boundary B on Figures 4-1 in Volumes 2A and 2D).

4.4 Surveys and Predictive Techniques and Methods

- 4.4.1 The scopes of the environmental assessments in this ES reflect the approaches set out in the Scoping Report. The assessments included in this ES have been carried out based on desk studies using publicly available information, site surveys and modelling.
- 4.4.2 Site surveys were carried out between the months of June and July 2021 to inform the assessments of the potential impacts on heritage and the water environment.

Surveys in relation to biodiversity have been undertaken between 2019 up to 2021. Site surveys in relation to landscape and visual receptors were undertaken between January to November 2021.

- 4.4.3 The study area and assessments of environmental effects have been undertaken in accordance with the DMRB LA 104 Environmental Assessment and Monitoring Revision 1 (Highways England, 2020a), other relevant DMRB guidance documents and other published guidance as applicable.
- 4.4.4 The DMRB is a series of technical documents produced by Highways England (now known as National Highways) that provide standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways, in the United Kingdom.
- 4.4.5 DMRB LA 104 sets out the requirements for environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects. It establishes criteria for assignment of value (sensitivity) to receptors of impacts, categories and descriptions of magnitude of impacts, and the resultant significance of effects of impacts to receptors.
- 4.4.6 Topic specific assessment methodologies and criteria are described within the relevant topic Chapters found in Volumes 1A to 1D of this ES.
- 4.4.7 The topic assessments characterise and establish the potential significance of effects, taking into account the existing environmental baseline conditions and the proposed scheme designs. The value of the receptors and magnitude of the potential impacts are identified before the implementation of mitigation measures. Figures relating to baseline information for each Scheme can be viewed in Volumes 2A to 2D.
- 4.4.8 The individual Scheme red line planning boundaries can be viewed on the general arrangement drawings found in Appendix 2-1 in Volume 3. The permanent land take is shown within the revised highway boundary area.
- 4.4.9 Details of modelling and site surveys undertaken to inform the assessments within this ES are summarised in Table 4-2 below.

Table 4-2: Summary of Assessments and Site Surveys Undertaken to Inform the ES

Environmental Summary of assessment and survey work undertaken topic

	Construction	Operation
Air Quality	A qualitative assessment of construction dust.	A quantitative assessment of operational traffic emissions has been undertaken. Air quality modelling has been undertaken.
Cultural Heritage	A qualitative assessment of the impacts on cultural heritage has been undertaken. A site walkover survey has been carried out to inform the assessment.	
Landscape and Visual	A qualitative assessment of landscape and visual impacts has been undertaken. A Zone of Theoretical Visibility (ZTV) has been produced, which illustrates locations that would have potential visibility of the schemes. A site survey has been carried out for each Scheme to inform the assessment.	

Environmental Summary of assessment and survey work undertaken topic

	Construction	Operation
Biodiversity	<p>A qualitative assessment of the impacts of each Scheme on biodiversity has been undertaken.</p> <p>Various ecology surveys have been undertaken for each scheme as required and include Phase 1 habitat surveys, badger surveys, reptile surveys, bat roost/ habitat potential surveys, and great crested newt habitat suitability index assessments and eDNA surveys.</p> <p>A biodiversity metric assessment has been completed and can be found in Appendix 4-2 of Volume 3.</p> <p>The shadow Habitats Regulations Assessment report can be found in Appendix 4-4 of Volume 3.</p>	
Geology and Soils	<p>A qualitative assessment of the impacts of the Schemes on Geology and Soils has been undertaken.</p> <p>Soil surveys were undertaken to inform the value and Agricultural Land Classification.</p> <p>Some Ground Investigation work has also been undertaken.</p>	
Noise	<p>A qualitative assessment of construction noise and vibration was completed.</p>	<p>A quantitative assessment of operational related traffic noise has been undertaken. Noise modelling has been undertaken.</p>
Road Drainage and the Water Environment	<p>A qualitative assessment of the impacts of the Schemes on road drainage and the water environment has been undertaken. A Highways England Water Risk Assessment Tool (HEWRAT) assessment has been completed.</p> <p>A site survey has been undertaken.</p> <p>A Flood Risk Assessment (FRA) has been prepared for the Schemes. The FRA can be found in Appendix 4-3 of Volume 3.</p>	
Climate	<p>A quantitative assessment of construction phase GHG emissions, including embedded GHG in materials has been undertaken.</p>	<p>A quantitative assessment of operational GHG emissions was scoped out of the EIA.</p>
	<p>A qualitative assessment of the vulnerability of the Scheme to climate change in construction and operation has been undertaken.</p>	

4.5 General Assessment Assumptions and Limitations

Baseline Information and Design

- 4.5.1 The scope of assessment described in this ES is based on information available at the time of preparation. The assessment has been undertaken using the third party and publicly available information, along with field survey work and data collection and modelling work as noted in Table 4-2 and described further in Volumes 1A to 1D. Where required, access to non-public land has been sought for the field survey

work undertaken. Some areas were inaccessible for survey as noted within Volumes 1A to 1D.

- 4.5.2 This ES has been prepared using the design drawings and red line boundaries of the extent of development for each Scheme, as can be found in Appendix 2-1 of Volume 3 and Appendix 2-3 of Volumes 3A to 3D.

Traffic Modelling

- 4.5.3 As detailed in this ES, traffic modelling has been used to inform the air quality, noise and vibration assessments, as well as the road drainage and water environment assessment undertaken using the HEWRAT. Future year traffic forecasts used in the assessment were derived using a fixed-trip approach based on observed junction counts, National Trip End Model growth factors and known development sites, as described in the Transport Assessment (AECOM, 2021).

- 4.5.4 To suitably forecast the future traffic on the network, traffic generated by the development of new housing and employment sites on, or nearby, the corridor was included in the future year traffic forecasts. The following committed developments (deemed to be near certain, or more than likely) were included in the traffic forecasts:

- Newark & Sherwood District Council:
- Land north of Petersmith Drive;
- Thoresby Colliery;
- Land East of Eakring Road (Bilsthorpe Village);
- Kirklington Road (Bilsthorpe Village); and
- Oldbridge Way (Bilsthorpe Village);
- RBC:
- Land at the former RAF Newton;
- Chapel lane, Bingham;
- GBC:
- Park Road, Calverton;
- Land at Teal Close; and
- Land at Chase Farm (Former Gedling Colliery).

- 4.5.5 The Thoresby Colliery and Teal Close developments are both constrained by planning conditions limiting development until capacity improvements to Ollerton Roundabout (in respect of Thoresby Colliery - limited to 50 dwellings and 8,094 m² employment development) and Lowdham Roundabout (in respect of Teal Close - limited to 325 dwellings) occur.

- 4.5.6 The future year traffic flows used to support the ES, incorporates these developments on the basis that these developments are released from constraints following upgrade to the respective junctions. Given the planning conditions limit the quantum of development ahead of the highway capacity improvements, the consequential increase of traffic demand from the Thoresby Colliery and Teal Close sites are not reflected in the Project opening year 2023. The sites are assumed to be fully built out by the design year of 2037. The use of the full potential future year demand has been used to ensure a robust assessment of future year impacts.

- 4.5.7 It should be noted that whilst an opening year of 2023 was used for the purposes of assessment, the whole Project would not be open to traffic at this point. This is considered to be a worst-case assumption for the purposes of the assessment within this ES. Air quality is forecast to improve over time as a result of vehicle technology improvements, therefore 2023 would be a reasonable worst-case year for the operational air quality assessment. In terms of the operational noise assessment, a future year is included in the assessment (2027) to consider any worsening that background traffic growth would give rise to.

Future Baseline

- 4.5.8 In order to identify the effects of the Scheme on environmental features, it is important to understand the baseline at the year of construction commencement and at the year the Scheme becomes operational (i.e. the future baseline). The baseline conditions for these years may be different to the current conditions and such changes could alter the sensitivity of existing environmental receptors, as well as introduce new sensitive receptors. As the anticipated start of construction for the Project commences in 2023, the opening year has been forecast for 2023 and design year is 2037, there is some limitation in the forecasting of the future baseline situation within the topic chapters in Volumes 1A to 1D.
- 4.5.9 As outlined in Chapter 2: The Scheme, detailed information on the Scheme construction programme, construction activities and equipment or full details of material and waste quantities has not been available at the time of preparing this ES. Where such data is not available, assumptions have been made and stated in the ES. The climate assessments have used site clearance volumes as outlined in the draft Bills of Quantities and consultation with the Via design team. Areas of anticipated site clearance discussed in the landscape and visual and biodiversity assessments have been based on the site clearance drawing provided in Appendix 2-1 of Volumes 3A to 3D.
- 4.5.10 Assumptions and limitations specific to each individual assessment (and the cumulative assessment) are set out in the topic assessment chapters within Volumes 1A to 1D.
- 4.5.11 It is assumed that prior to construction of each Scheme, the Principal Contractor would produce a Construction Environmental Management Plan (CEMP). The CEMP would include design, construction and operational mitigation measures, which will be defined in part by the requirements which have arisen from the technical assessments presented in this ES, in addition to the implementation of industry standard practice and control measures for environmental impacts arising during construction.

4.6 Significance Criteria

- 4.6.1 The environmental assessment for each Scheme has been undertaken by establishing the baseline conditions in and around the area of the Scheme. Consideration has been given to the potential effects that may arise during the construction, and once the Scheme is complete and operational.
- 4.6.2 Impacts of the Scheme can be positive or negative; direct or indirect; permanent or temporary; short term or long term, and/or cumulative. Direct impacts are those that are directly attributable to the Scheme. Indirect impacts result indirectly as a consequence of the Scheme. For example, the impact of vegetation removal could have a temporary, short-term, direct impact on the visual amenity of residents surrounding the junctions.

- 4.6.3 The significance of effects has been determined in accordance with the appropriate section of the DMRB. DMRB LA 104 sets out the general principles and criteria for determining significant effects. This is a function of the receptor or resource environmental values (or sensitivity) and the magnitude of Project impact (change).
- 4.6.4 DMRB LA 104 states that the assessment of the significance of environmental effects shall cover the following factors:
- the receptors/resources (natural and human) which would be affected and the pathways for such effects;
 - the geographic importance, sensitivity or value of receptors/resources;
 - the duration (long or short term); permanence (permanent or temporary) and changes in significance (increase or decrease);
 - reversibility - e.g. is the change reversible or irreversible, permanent or temporary;
 - environmental and health standards (e.g. local air quality standards) being threatened; and
 - feasibility and mechanisms for delivering mitigating measures, e.g. Is there evidence of the ability to legally deliver the environmental assumptions which are the basis for the assessment?
- 4.6.5 The significance of an effect is assigned with embedded mitigation and good practice mitigation assumed to be in place. The overall significance of an effect is calculated by use of the matrix presented in Table 4-3. Where there are two significance levels (e.g. large/ very large), the significance would then be determined based on professional judgement, taking account of the factors described above.
- 4.6.6 Effects are considered significant if they are of very large or large significance. Generally, effects of moderate significance are also considered to be significant, however, NOTE 2 (page 14 of DMRB LA 104) states that *“the approach to assigning significance of effect relies on reasoned argument, the professional judgement of competent experts and using effective consultation to ensure the advice and views of relevant stakeholders are taken into account”*. Therefore, there may be cases where moderate effects are not considered significant, or where slight or moderate effects are considered significant, based on reasoned professional judgement.
- 4.6.7 Slight and neutral effects are not considered to be significant; however, such effects can be important considerations in the context of influencing and improving the design of a proposed scheme. A ‘no change’ magnitude of impact would always result in a neutral effect.
- 4.6.8 The methodology used to identify receptors and their value, the magnitude of impact and level of significance is set out in the Scheme-specific assessments within Volumes 1A to 1D. Where appropriate, the topic specific criteria have been adopted from institute guidelines or best practice. For some topics, predicted effects may be compared with quantitative thresholds and scales in determining effect significance.

Table 4-3: Significance Matrix (reproduced from DMRB LA 104)

		Magnitude of impact (degree of change)			
Environmental value (sensitivity)	No change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or large	Large or very large	Very large
High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

4.6.9 It should be noted that the assessments for air quality, biodiversity and climate do not utilise the matrix approach above. Where this approach differs, it is due to industry guidance and/or DMRB guidance. The assessment methodology for these disciplines is described in each topic chapter in the Scheme-specific Volumes 1A to 1D.

5. AIR QUALITY

5.1 Introduction

- 5.1.1 This chapter provides the overview of effects on air quality that are anticipated as a result of the Project when considering all Schemes in-combination.
- 5.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 5.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 5.9 of this chapter.
- 5.1.4 The assessment for air quality was undertaken in accordance with DMRB LA 105 Air Quality (Highways England, 2019a).
- 5.1.5 This chapter provides a study of the potential cumulative local air quality effects associated with the Project.
- 5.1.6 The Project has the potential to affect air quality during both the construction and operational phases. During the construction phase, potential effects may arise from nuisance dust as well as health effects associated with particulate matter. During the operational phase potential air quality effects would be associated with vehicle exhaust emissions and the impact on pollutant concentrations (nitrogen dioxide (NO₂) and particulate matter (PM₁₀)) at sensitive receptors.

5.2 Legislative and Policy Framework

- 5.2.1 The legislation and policies that are of most relevance to the air quality assessment, have informed the identification of receptors and resources and their sensitivity, the assessment methodology, the potential for significant environmental effects and required mitigation are noted below.

National Legislation

- 5.2.2 European air quality legislation is provided within the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC ('The Air Quality Directive') (European Parliament and Council of the European Union, 2008), which is transcribed into UK legislation by the Air Quality Standards (Amended) Regulations 2016 (HMSO, 2016a).
- 5.2.3 The Air Quality Strategy (AQS) sets out Air Quality Objectives (AQOs) for key pollutants, as a tool to help local authorities manage local air quality improvements. The Department for Environment, Food and Rural Affairs (Defra) Clean Air Strategy is the current revision of the AQS (Defra, 2019), published in January 2019.
- 5.2.4 The assessment considers the potential for the Project to affect the achievement of AQOs.

National Planning Policy and Guidance

- 5.2.5 The NPPF was updated in 2021 (MHCLG, 2021), within which air quality is considered in paragraphs 105, 174 and 186. Paragraph 186 states that:

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

- 5.2.6 The national PPG for air quality (MHCLG, 2019b), revised in November 2019, provides a summary of the air quality issues set out in the NPPF and notes that:

“Where air quality is a relevant consideration the local planning authority may need to establish:

- the ‘baseline’ local air quality, including what would happen to air quality in the absence of the development;*
- whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and;*
- whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.”*

- 5.2.7 The assessment has considered the potential for effects that would affect Air Quality Management Areas (AQMAs) and compliance with relevant limit values and AQOs as noted above.

Local Planning Policy and Guidance

- 5.2.8 NSDC adopted the Amended Core Strategy Development Plan Policies in March 2019 (NSDC, 2019). The document indicates the policies and site allocations against which developments within the District of Newark and Sherwood will be determined. With regards to air quality the document includes the following relevant policy:

Core Policy 12 Biodiversity and Green Infrastructure: “Work with partners to develop a strategic approach to managing Air Quality in the Sherwood Area, including through the development of a Supplementary Planning Document.”

- 5.2.9 As of December 2021, this document has not yet been published.
- 5.2.10 RBC adopted their Local Plan Part 2: Land and Planning Policies in October 2019 (RBC, 2019a). The document details a number of policies that must be met by new developments within the Borough, and Policy 41 outlines the air quality requirements that all proposals must meet.
- 5.2.11 It states:

1) “Planning permission will not be granted for development proposals that have the potential to adversely impact on air quality, unless measures to mitigate or offset their emissions and impacts have been incorporated.

2) In areas where air quality is a matter of concern, development proposals that are sensitive to poor air quality will be required to demonstrate that users or occupants will not be significantly affected by poor air quality, or that such impacts can be effectively mitigated.

3) Development proposals must not exacerbate air quality beyond acceptable levels, either through poor design or as a consequence of site selection.”

5.2.12 The Air Quality Strategy for Nottingham and Nottinghamshire 2020 – 2030 (Ashfield District Council et al., 2020), sets out the aims of all local authorities within Nottinghamshire to improve air quality with several policies relating to air quality. In Strategic Objective 2, the aims to reduce emissions related to transport are addressed by introducing the following measures:

- *“Effective management of the highways networks, including planned and unplanned disruption on the highways network caused by street works, incidents and other activities.*
- *Ensuring the regular exchange of information between transport planners, health and air quality colleagues relating to both air quality information and traffic information.”*

5.3 Consultation

5.3.1 In September 2020, NSDC’s Environmental Health Technical Officer (EHTO) and RBC’s Environmental Health Officer (EHO) were consulted with regards to the proposed air quality assessment methodology, and more specifically the use of one monitoring site to verify the model for all Schemes. Communication was via email between AECOM’s air quality specialist and NSDC’s EHTO and RBC’s EHO, sent 9th September 2020. NSDC’s EHTO replied on 10th September and agreed with the approach. RBC’s EHO replied on 14th September and agreed with the approach.

5.3.2 A summary of the air quality related responses from the Scoping Opinion is included in Table 5-1.

Table 5-1 Scoping Response Summary – Air Quality

Stakeholder	Comment made	Response and where addressed in the ES
Natural England	<p>The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk). Further information on air pollution modelling and assessment can be found on the Environment Agency website.</p>	<p>The assessment has taken into account the risks of air pollution as reported in Section 5.7 of this chapter. The relevant information for designated habitats has been obtained from APIS.</p>
Nottinghamshire Wildlife Trust	<p>I note that only 1 actual monitoring location will be used to field test the modelling, at Ollerton Roundabout, but given the potential impacts on the SAC and ppSPA, NWT would expect to see further monitoring undertaken in a key protected habitats site such as the SAC or a heathland SSSI, to ensure that the modelling is correct for the areas of potential greatest irreversible habitat impact. This is because emissions modelling was incorrect for several years in using a predicted falling baseline of NO_x that did not occur in reality, and this information is therefore crucial in such a sensitive area to the impacts of NO₂ and N. The results should be closely monitored, with a plan in place for how it could be rectified if a problem is shown to have arisen.</p> <p>The latest APIS data on critical load for N deposition of 7.9 kg N ha⁻¹ a⁻¹ for acid grassland 8.8 kg N ha⁻¹ a⁻¹ for heathland should be used.</p>	<p>As noted in Section 5.8, the impacts of dust on the SSSIs and LWS in close proximity to the Ollerton Roundabout would be monitored during construction. The CEMP would include a plan to rectify any issues this highlights.</p> <p>As noted in Section 5.8, monitoring would be undertaken once the Scheme is open to traffic. If the additional monitoring indicates that the impacts are significant then a plan would be put in place to rectify this.</p> <p>There are not expected to be any designated sites at risk during construction or operation with Mickledale Lane Junction, Lowdham Roundabout or Kirk Hill Junction; therefore no monitoring is proposed for these Schemes.</p> <p>The relevant information for the specific designated habitats has been obtained from APIS.</p>

5.4 Assessment Methodology

Baseline Conditions

5.4.1 The air quality baseline conditions were determined with reference to the following sources of information:

- NSDC 2020 Air Quality Annual Status Report (ASR) (NSDC, 2020);
- RBC 2020 Air Quality ASR (RBC, 2020);
- Defra's 2018-based background concentration maps (2017a);
- Defra's 2020 Pollution Climate Mapping (PCM) Model (Defra, 2020b);
- Ordnance Survey (OS) Mastermap (Ordnance Survey, 2020a), OS Address Base Plus (Ordnance Survey, 2020b), and Google Earth (Google, 2020) mapping and imagery were used to identify receptor point locations;
- the Air Pollution Information Service (APIS) (UK Centre for Ecology and Hydrology, 2021) for habitat types, background nitrogen deposition rates for sites and site specific critical loads;
- the insight mapping website (Nottingham City Council, 2020) for designated habitats within the study area; and
- consultation with the competent expert for biodiversity in relation to the assessment for designated sites (See Appendix 1-2 of Volume 3).

Study Area

Construction Phase

- 5.4.2 The study area for the construction dust assessment for the Project is defined as the area within 200 m of dust-generating activities.
- 5.4.3 The assessment boundary for each Scheme has been chosen as a proxy for the area within which dust-generating activities would occur. This is a conservative assumption as dust generating activities are unlikely to occur right at the site boundary.
- 5.4.4 Consideration of the potential effects from construction traffic has been scoped out of the assessment. As set out in DMRB LA 105, the impact of traffic generated by construction activities shall be assessed where construction activities are programmed to last for more than two years. If the construction activities would last for less than 2 years it is unlikely that the construction activities would constitute a significant air quality effect or impinge on the UK's reported ability to comply with the Air Quality Directive given the short term duration of the construction activities as opposed to the long term operation of the Project.
- 5.4.5 As noted in Table 2-1 of Chapter 2: The Project, the programme for each Scheme covers a period less than two years, while the full Project programme expected to cover a period of approximately three years. However, as the Schemes are distanced from each other by at least 2 km, consideration of the potential air quality effects associated with construction vehicle emissions has been scoped out for all Schemes and the Project.

Operational Phase

- 5.4.6 The following screening criteria for the changes in traffic between the Do Minimum (DM) scenario (without the Project) and the Do Something (DS) scenario (with the

Project) in the opening year of 2023 were applied to determine the study area for the local air quality assessment for the operation of the Project (see Section 4.5 of this report for further information regarding the opening year and traffic modelling):

- road alignment will change by 5 m or more;
- annual average daily traffic (AADT) flows will change by 1,000 or more;
- heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- there will be a change in speed band.

5.4.7 The roads which trigger these criteria make up the Affected Road Network (ARN) for the local air quality assessment of the operation of the Project.

5.4.8 The resultant study area is within the local authority areas of NSDC and RBC (see Figures 5-1 within Volumes 2A to 2D).

5.4.9 Further detail regarding the Scheme specific study areas can be viewed in Section 5.4 of Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout Junction and Volume 1D Kirk Hill Junction.

Methodology

5.4.10 The methodology for the air quality assessment follows the guidance set out within the DMRB LA 105. The assessment includes the following elements:

- construction dust assessment to identify areas that could be affected by construction-phase activities;
- local air quality assessment for the construction of the Project for public exposure and designated habitats;
- local air quality assessment for the operation of the Project for public exposure and designated habitats; and
- compliance risk assessment for NO₂.

5.4.11 The overall aim of the assessment of the elements listed above is to identify potential likely significant air quality effects and the effect of the Project on the UK's ability to comply with the Air Quality Directive.

5.4.12 Key methodology documents of relevance to the air quality assessment are as follows:

- DMRB LA 105; and
- Defra (2021), Air Quality Management Technical Guidance (TG16) (LAQM.TG(16)).

5.4.13 Further detail regarding the Scheme specific assessment methodology can be viewed in Section 5.4 of Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

5.4.14 Model inputs are described within Appendix 5-1 of Volume 3.

5.5 Baseline Conditions

5.5.1 The air quality across the Project study area is considered to be good, with concentrations of NO₂ and PM₁₀ below the AQOs:

- NSDC undertakes monitoring at one location in the Project study area at Big Fish Roundabout, Ollerton (now a Costa Coffee). Annual mean NO₂

concentrations at this location have remained below the AQO since 2016 (NSDC, 2020). This is the only monitoring location in the study area.

- Background concentrations have been sourced from Defra's 2018-based background maps for the study area for NO₂ and PM₁₀ (Defra, 2020a). Background concentrations are predicted to be below the AQOs in Project study area.

5.5.2 Further detail regarding the Scheme specific baseline conditions can be viewed in Section 5.5 of Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

5.6 Design and Mitigation

5.6.1 The Project has been designed as far as possible, to avoid and minimise impacts and effects on air quality through the process of design development and embedded mitigation as described in Chapter 3: Assessment of Alternatives.

5.6.2 The Project designs aim to reduce congestion at the junctions which would reduce the risk of air quality impacts at receptors where the road alignment remains unchanged.

5.7 Project-Wide Likely Significant Cumulative Effects

Construction

5.7.1 The Project has the potential to affect air quality during construction, in the following ways:

- by increased emissions of dust during construction of the Project from dust-generating activities on site;
- by emissions associated with non-road mobile machinery (NRMM) undertaking construction works; and
- by changes in vehicle activity (flows, speeds and composition) during construction, as a result of temporary traffic management measures and/or additional vehicles travelling to and from the construction site transporting materials, plant and labour.

5.7.2 The types of activities with the potential to generate dust during the construction phase include:

- installation and use of the construction compound, including material storage areas and worksites;
- movement of vehicles;
- earthworks;
- vegetation clearance and soil removal;
- removal of existing infrastructure; and
- infrastructure construction activities.

5.7.3 There is the potential for adverse dust effects during the construction of the Project, although any effects would be temporary (i.e. during the period of the construction works only) and could be suitably minimised by the application of industry standard mitigation measures within the CEMP.

5.7.4 For each of the Schemes there are a number of sensitive receptors located within 200 m of the assessment boundary. The potential dust risk is considered to be

'small' for each of the Schemes as they are small junction improvements. The sensitivity to potential dust effects is considered to be 'High' for receptors located within 50 m of the construction activity and 'Low' for receptors located between 50 m and 200 m.

- 5.7.5 The Schemes are located more than 200 m apart and therefore no receptors will be sensitive to potential dust effects from more than one Scheme. As such the potential dust effects for each scheme remain as described in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.
- 5.7.6 Across the Project, the conclusion of the construction dust assessment is that there are no likely significant air quality effects for human health or designated habitats during the construction of the Project with appropriate best practice mitigation measures within the CEMP.

Operation

- 5.7.7 The Project has the potential to affect air quality during operation (positively or negatively), in the following ways:
- by changes in vehicle activity (flows, speeds and composition) as a result of the Project in proximity to air quality sensitive receptors; and
 - by changes in the separation distances between road sources of emissions and air quality sensitive receptors.
- 5.7.8 No receptors are located within 200 m of the ARN for more than one Scheme and therefore there are no potential cumulative air quality effects and effects on receptors are as described in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.
- 5.7.9 Across the Project, the conclusion of the operational local air quality assessments for all Schemes is that there is no likely significant air quality effect for human health or for designated habitats during the operation of the Project.

5.8 Additional Mitigation and Monitoring

- 5.8.1 The Project would be subject to measures and procedures as defined within the CEMP for each Scheme. These would include a range of Best Practicable Means (BPM) associated with mitigating potential environmental impacts. A CEMP would be developed by the selected Principal Contractor and implemented for the duration of each Scheme construction phase.
- 5.8.2 The CEMP would include a range of industry standard good practice construction phase dust mitigation measures required during all works undertaken based on the level of construction dust risk at sensitive receptors.
- 5.8.3 NWT has requested, with respect to the Ollerton Scheme, that further monitoring is undertaken in key protected habitat sites such as heathland SSSI to ensure that the modelling is correct for the area of potential greatest irreversible habitat impact. In addition, NWT has requested that the impacts of dust on the SSSI and LWS in close proximity to the junctions should be closely monitored, with a plan in place for how it could be rectified if a problem is shown to have arisen. This will be included in the CEMP for the Ollerton Scheme.

5.9 Summary of Project-Wide Significant Residual Effects

- 5.9.1 The residual effect of the Project is considered to be 'not significant' for air quality for both the construction and operational phases. The residual effects that are not significant remain as reported within the individual assessments within Volumes 1A to 1D.

6. CULTURAL HERITAGE

6.1 Introduction

- 6.1.1 This chapter provides the overview of effects on cultural heritage that are anticipated as a result of the Project when considering all Schemes in-combination.
- 6.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 6.1.3 Where the combined effects of the Schemes would result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 6.9 of this chapter.
- 6.1.4 Note that planning policy considers the ‘significance’ of heritage assets in terms of their value. To avoid confusion with the significance of effects, the term ‘value’ has been used in this chapter.
- 6.1.5 The assessment for cultural heritage was undertaken in accordance with DMRB LA 106 Cultural Heritage Assessment (Highways England, 2020b).

6.2 Legislative and Policy Framework

National Legislation

- 6.2.1 The legislation and policies that are of most relevance to the heritage assessment, have informed the identification of receptors and resources and their value, the assessment methodology, the potential for significant environmental effects and required mitigation are noted below.

Planning (Listed Building and Conservation Areas) Act 1990

- 6.2.2 The Planning (Listed Building and Conservation Areas) Act 1990 (herein referred to as ‘the Act’) (Her Majesty’s Stationery Officer (HMSO), 1990) sets out the principal statutory provisions which must be considered in the determination of any application affecting either listed buildings or conservation areas.
- 6.2.3 Section 66 of the Act states that in considering whether to grant planning permission for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses. By virtue of Section 1(5) of the Act, a listed building includes any object or structure within its curtilage.
- 6.2.4 Section 72 of the Act states that with respect to buildings or land within a conservation area, special attention should be paid to the desirability of preserving or enhancing the character or appearance of that area.

Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983 and 2002)

- 6.2.5 The Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983 and 2002) imposes a requirement for Scheduled Monument Consent for any works of demolition, repair, and alteration that might affect a Scheduled Monument.

National Planning Policy and Guidance

National Planning Policy Framework

- 6.2.6 At a national level, the UK Government published the NPPF in 2012. The NPPF supersedes previous National Planning Policy Guidance (PPGs) and Planning Policy Statements (PPSs). The NPPF summarises in a single document the Government planning policies for England, and how these are expected to be applied. The NPPF was updated in July 2021, superseding the previous version published in March 2012 and revised in July 2018 and February 2019.
- 6.2.7 Section 16 of the NPPF deals specifically with the historic environment. Where changes are proposed, the NPPF sets out a clear framework to ensure that heritage assets are conserved, and where appropriate enhanced, in a manner that is consistent with their value.
- 6.2.8 The NPPF sets out the importance of being able to assess the value of heritage assets that may be affected by a development. Significance (heritage value) is defined in Annex 2 as being the “value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic”. Significance (heritage value) is not only derived from an asset’s physical presence, but also from its setting. The setting of a heritage asset is defined in Annex 2 as, “the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve”.
- 6.2.9 Paragraph 194 of the NPPF states that in determining applications, local planning authorities should require an applicant to describe heritage value of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets’ importance and no more than is sufficient to understand the potential impact of the proposal on their value. Similarly, paragraph 195 includes a requirement on local planning authorities, having assessed the particular value of any heritage asset that may be affected by a proposal, to take this into account when considering the impact of a proposal on a heritage asset.
- 6.2.10 In determining planning applications, local planning authorities should take account of the following points:
- the desirability of sustaining and enhancing the value of heritage assets and putting them to viable uses consistent with their conservation;
 - the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality;
 - the desirability of new development making a positive contribution to local character and distinctiveness (paragraph 197); and
 - opportunities to draw on the contribution made by the historic environment to the character of a place.
- 6.2.11 Paragraphs 199 to 203 of the NPPF introduce the concept that heritage assets can be harmed or lost through alteration, destruction or development within their setting. This harm ranges from less than substantial through to substantial. With regard to designated assets, paragraph 199 states that great weight should be placed on its conservation, irrespective of whether any potential harm is considered to be substantial or less than substantial. The paragraph goes further to say that the more important the asset, the greater the weight should be on its conservation. In paragraph 200, a distinction is made in respect of those assets of the highest value (e.g. scheduled monuments, Grade I and Grade II* listed buildings) where substantial harm to or loss should be wholly exceptional.

- 6.2.12 Paragraph 201 states that in instances where development would cause substantial harm to or total loss of heritage value of a designated asset, consent should be refused unless it can be demonstrated that it is necessary to achieve substantial public benefits that outweigh that harm or loss. Paragraph 202 says in instances where development would cause less than substantial harm to the heritage value of a designated asset, the harm should be weighed against the public benefits of the proposal to provide a balanced judgement.
- 6.2.13 With regard to non-designated assets, paragraph 203 states that the effect of the application on the heritage value of the asset should be taken into account in determining the application. A balanced judgement will be required having regard to the scale of any harm or loss and the heritage value of the heritage asset.

Local Planning Policy and Guidance

Amended Core Strategy for Newark and Sherwood District Council, adopted 2019

- 6.2.14 There is one policy relating to cultural heritage, Core Policy 14: Historic Environment. This policy sets out the commitment to protect heritage assets. Any developments “*where adverse impact is identified, there should be a clear and convincing justification, including where appropriate a demonstration of clear public benefits*”.

Rushcliffe Local Plan Core Strategy

- 6.2.15 There is one policy relating to cultural heritage within this plan, Policy 11: Historic Environment, which sets out the consideration of conserving heritage assets to be applied for proposals and initiatives.

Other Relevant Policy, Standards and Guidance

Planning Practice Guidance

- 6.2.16 The national PPG (MHCLG, 2019b) provides further advice and expands on the guidance and policy outlined in the NPPF (MHCLG, 2021).
- 6.2.17 The heritage value of heritage assets and their importance in decision taking is explored in Paragraph 009 of the PPG which states that heritage assets may be affected by direct physical change or by change in their setting. Being able to properly assess the nature, extent and importance of the value of a heritage asset and the contribution of its setting is very important to understanding the potential impact and acceptability of development proposals (Paragraph 009; Reference ID: 18a-009-20140306; last updated 23rd July 2019).
- 6.2.18 The setting of a heritage asset is also of importance and a thorough assessment of the impact on setting needs to take into account and be proportionate to the heritage value of the heritage asset under consideration. The degree to which the proposed changes enhance or detract from that value must also be considered. The extent and importance of setting is often expressed by reference to visual considerations. Although views of or from an asset will play an important part, the way in which an asset is experienced in its setting is also influenced by other environmental factors such as noise, dust and vibration from other land uses in the vicinity and by our understanding of the historic relationship between places.
- 6.2.19 Paragraph 013 of the PPG recognises that the contribution that setting makes to the value of the heritage asset does not depend on there being a public right or the ability to experience that setting. When assessing any application for development which may affect the setting of a heritage asset, local planning authorities may need

to consider the implications of cumulative change (Paragraph 013; Reference ID: 18a-013-20140306; last updated 23rd July 2019).

- 6.2.20 Paragraph 018 of the PPG discusses how to assess if there is substantial harm. It states that what matters in assessing if a proposal causes substantial harm is the impact of the value of the heritage asset. Ultimately, whether a proposal causes substantial harm will be a judgement for the decision taker. However, it acknowledges that substantial harm is a high test so may not arise in many cases. A key consideration when assessing whether there is an adverse impact on a listed building is whether the adverse impact seriously affects a key element of its special architectural or historic interest. It is the degree of harm to the asset's heritage value rather than the scale of the development that is to be assessed (Paragraph: 018 Reference ID: 18a-018-20190723; last updated 23rd July 2019).

Historic England Good Practice Advice Notes

- 6.2.21 Historic England has published a series of Good Practice Advice (GPA) notes of which those of most relevance to this appraisal are GPA2 - Managing Significance in Decision-taking (March 2015) (Historic England, 2015), GPA3 (2nd ed.) - The Setting of Heritage Assets (December 2017) (Historic England, 2017) and Advice Note 12 - Statements of Heritage Significance: Analysing Significance in Heritage Assets (October 2019) (Historic England, 2019).
- 6.2.22 GPA2 (Historic England, 2015) emphasises the importance of having a knowledge and understanding of the heritage value of heritage assets likely to be affected by the development and that the "first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance" (paragraph 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (paragraph 7).
- 6.2.23 GPA3 (Historic England, 2017) provides advice on the setting of heritage assets. Setting is as defined in the NPPF and comprises the surroundings in which a heritage asset is experienced. Elements of a setting can make positive or negative contributions to the value of an asset and affect the ways in which it is experienced. Historic England states that setting does not have a boundary and what comprises an asset's setting may change as the asset and its surrounding evolve. Setting can be extensive and particularly in urban areas or extensive landscapes can overlap with other assets. The contribution of setting to the value of an asset is often expressed by reference to views and the GPA in paragraph 11 identifies those views such as those that were designed or those that were intended, that contribute to understanding the value of assets.
- 6.2.24 Advice Note 12 (Historic England, 2019) outlines a recommended approach to assessing the value of heritage assets in line with the requirements of NPPF. It includes a suggested reporting structure for a 'Statement of Heritage Significance', as well as guidance on creating a statement that is proportionate to the asset's heritage value and the potential degree of impact of a proposed development.
- 6.2.25 Advice Note 12 (Historic England, 2019) also offers an interpretation of the various forms of heritage interest that an asset can possess, based on the terms provided in the NPPF Glossary (MHCLG, 2021, Annex 2: Glossary) as follows:
- Archaeological Interest – there will be archaeological interest in a heritage asset if it holds, or has the potential to hold, evidence of past human activity worth of expert investigation at some point;
 - Architectural and Artistic Interest – these are interests in the design or general aesthetics of a place. They can arise from conscious design or fortuitously from

the way the heritage asset has evolved. More specifically, architectural interest in an interest in the art or science of the design, construction, craftsmanship and decoration or buildings and structures of all types. Artistic interest is an interest in other human creative skills, like sculpture; and

- Historic Interest – an interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.

6.3 Consultation

- 6.3.1 Consultation with NCC was undertaken on 1st April 2021 and possible mitigation was suggested for each junction. The minutes of the consultation are included in Appendix 6-1 of Volume 3. Consultation was also carried out with a Senior Practitioner of Historic Buildings from NCC on 6th January 2022 to discuss potential impacts and mitigation for built heritage assets. Specific responses to comments made can be found in Volumes 1A to 1D.
- 6.3.2 A summary of the cultural heritage related responses from the Scoping Opinion is included in Table 6-1.

Table 6-1 Scoping Response Summary – Cultural Heritage

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
NCC (Scoping Opinion) and NCC Archaeological and Building Conservation Team	All Schemes assessed in Volumes 1A to 1D	The setting of heritage assets, impacts and mitigation will need careful consideration. Particular regard should be given to the recommendations of Historic England.	The impact on heritage assets, including their setting, is considered in the assessments within Chapter 6: Cultural Heritage within Volumes 1A to 1D, with combined effects considered in this chapter.
		Harm to designated heritage assets (including their settings) is in some cases avoidable through carefully considered design. For instance, noise and light pollution can be considered at the design stage to ensure that they do not impact adversely on these heritage assets.	Likely significant effects have been considered on heritage assets, including additional lighting and impacts relating to noise as reported in the assessments within Chapter 6: Cultural Heritage within Volumes 1A to 1D, with combined effects considered in this chapter.
		Early consultation with the NCC building conservation section and conservation officers should take place before designs are fully developed to ensure that there is opportunity to avoid adverse impacts and, where possible, introduce suitable enhancements to the scheme that can demonstrably mitigate these.	Consultation was undertaken with the County Archaeologist during the preparation of the EIA, as minuted in Appendix 6-1 of Volume 3. As the Ollerton Roundabout is in close proximity to the edge of a conservation area, early input (November 2020) was sought from the NCC's Senior Practitioner Historic Buildings to inform design choices.
Ollerton Roundabout	Ollerton Hall is a grade II* listed building within view of the roundabout and as such this designated heritage asset will require careful consideration and response within the scheme submission. Ollerton Hall and other heritage assets should be set as receptors in the Landscape and Visual Impact Assessment (LVIA) to ensure that suitable evidence is provided in the EIA. Noise receptors should be treated similarly.	The impacts on the listed buildings and their setting, including Ollerton Hall, is considered in the assessment within Chapter 6: Cultural Heritage of Volume 1A. Ollerton Hall has been considered within this cultural heritage assessment and within the LVIA reported in Chapter 7: Landscape and Visual Effects of Volume 1A.	
Kirk Hill Junction	The scheme extends into the designated conservation area of East Bridgford village. The impacts on this designated heritage asset will be considerable and have potential to cause unacceptable levels of harm.	The impacts on the conservation area is considered in the assessment within Chapter 6: Cultural Heritage of Volume 1D.	

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
		<p>It is important to recognise that these designated heritage assets each have a 'setting' that contributes to their significance and could be impacted and potentially harmed by the proposals. There are several listed buildings within view of the junction and as such these will require careful consideration and response within the scheme submission. These heritage assets should be set as receptors in the LVIA to ensure that the evidence is suitable. Noise receptors should be treated similarly. RBC identify the importance of mature landscaping including trees and landscaping of the entrance to the village of East Bridgford and its Conservation Area which should be clearly acknowledged and considered in the preparation of the application submission.</p>	<p>The impact to the conservation area and listed buildings, including their setting, is considered in the assessment within Chapter 6: Cultural Heritage of Volume 1D. Listed buildings also form part of the LVIA reported in Chapter 7: Landscape and Visual of Volume 1A.</p>
	<p>Lowdham Roundabout</p>	<p>Lowdham War Memorial is the closest of all the assets and the backdrop and setting of this public monument includes the area of the junction. It will be imperative that the setting of this and the other HAs [heritage assets] in the vicinity are carefully considered. Harm to designated heritage assets (including their settings) is in some cases avoidable through carefully considered design. For instance, noise and light pollution can be considered at the design stage to ensure that they do not impact adversely on these heritage assets.</p>	<p>The impact to the Lowdham War Memorial is considered in the assessment within Chapter 6: Cultural Heritage of Volume 1C.</p>
<p>Historic England</p>	<p>All Schemes assessed in Volumes 1A to 1D</p>	<p>In line with the NPPF, we would expect the ES to contain a thorough assessment of the likely effects which the proposed development might have upon those elements which contribute to the significance of these assets.</p>	<p>This is included within the assessment in this chapter.</p>
		<p>We would expect the ES to proportionately consider the potential impacts on non-designated features of historic, architectural, archaeological or artistic interest.</p>	<p>Non-designated assets have been included within the assessment and effects on these are reported in this chapter.</p>
		<p>The assessment should also take account of the potential impact which associated activities (such as construction, servicing and maintenance and associated traffic) might have upon perceptions, understanding and appreciation of the heritage assets in the area.</p>	<p>Impacts from associated activities have been considered in Section 6.7 Assessment of Likely Significant Effects in this chapter.</p>
		<p>The assessment should also consider, where appropriate, the likelihood of alterations to drainage patterns that might lead to in situ decomposition or destruction of below ground archaeological remains and deposits and can also lead to subsidence of buildings and monuments.</p>	<p>Impacts from associated activities have been considered in Section 6.7 Assessment of Likely Significant Effects in this chapter.</p>

6.4 Assessment Methodology

Study Area

- 6.4.1 A study area of 500 m from the assessment boundary has been used for each junction in order to identify designated and non-designated heritage assets which may be affected by each of the Schemes.
- 6.4.2 Further detail regarding the scheme specific study areas can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 6.4.3 Guidance contained with the DMRB LA 106 and DMRB LA 104 has been applied in the assessment to identify the value of archaeological remains, historic buildings and historic landscapes and to identify and evaluate the impacts and effects that construction and operation of the Project would likely have on these assets.
- 6.4.4 Further detail regarding the scheme specific assessment methodology can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

6.5 Baseline Conditions

- 6.5.1 An archaeological map regression and aerial photography study was produced by Trent & Peak Archaeology for the project. The study report includes the Nottinghamshire Historic Environment Record (HER) data of the study area, aerial photographs, LiDAR and historic mapping (Trent & Peak Archaeology, 2021, Appendix 6-2 of Volume 3) and has been used to help inform the heritage baseline of this assessment.
- 6.5.2 A site visit was also conducted on 11th June 2021. The main purposes of the visit were:
- to visually inspect the area and assess the heritage assets, including their setting, that have the potential to be impacted by the Project;
 - to identify non-designated built heritage assets not identified during desk-based research; and
 - to record current land use, ground conditions and visible evidence of ground disturbance in order to assess how current and former land use may have affected the archaeological potential of the site.
- 6.5.3 Further detail regarding the scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

6.6 Design and Mitigation

- 6.6.1 Embedded mitigation and enhancement measures are described within Volumes 1A to 1D. The designs have taken into account the presence of heritage assets and avoid impacts where possible.
- 6.6.2 Further detail regarding the scheme specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

6.7 Project-Wide Likely Significant Cumulative Effects

- 6.7.1 There is no overlap in terms of the study areas used to assess each of the Schemes in isolation and none of the receptors are affected by multiple Schemes.
- 6.7.2 Therefore, there are no changes to the likely significant effects on heritage assets reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction when considering the Project as a whole.

6.8 Additional Mitigation and Monitoring

- 6.8.1 There is no requirement for any further additional mitigation, when considering the Project as a whole. The proposed mitigation for heritage in each Scheme can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

6.9 Summary of Project-Wide Significant Residual Effects

- 6.9.1 There are no likely significant residual effects on heritage associated with the Project after the implementation of mitigation for the individual Schemes. The residual effects that are not significant remain as reported within the individual assessments within Volumes 1A to 1D.

7. LANDSCAPE AND VISUAL

7.1 Introduction

- 7.1.1 This chapter provides the overview of landscape and visual effects that are anticipated as a result of the Project when considering all Schemes in-combination.
- 7.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 7.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 7.9 of this chapter.
- 7.1.4 The assessment for landscape and visual effects was undertaken in accordance with DMRB LA 107 Landscape and Visual Effects (Highways England, 2020c).

7.2 Legislative and Policy Framework

- 7.2.1 The legislation and policies that are of most relevance to the landscape and visual impact assessment (LVIA) have informed the identification of receptors and resources and their sensitivity; the assessment methodology; the potential for significant environmental effects; and required mitigation (including the landscape design).

Legislation

European Landscape Convention

- 7.2.2 The UK Government recognises the importance of landscapes and is a signatory to the European Landscape Convention (ELC) (Council for Europe, 2000) which sets out an internationally agreed definition of landscape and key actions that countries should follow. The ELC provides an integrated, holistic approach and international context for landscape, under the headline banner that “All Landscapes Matter”. The convention is a treaty between states (not an EU Directive) and seeks to influence governments’ decisions rather than direct them. It was signed by the UK Government in 2006 and came into effect in March 2007.

National Planning Policy and Guidance

National Planning Policy Framework

- 7.2.3 The NPPF (Ministry of Housing, Communities and Local Government (MCHLG) 2021) paragraphs 20, 130, 145, 146, 153, 174 and 176 are of relevance to the LVIA. The NPPF seeks to ensure that development is sympathetic to the landscape context and that valued landscapes are protected and where appropriate landscapes are enhanced.
- 7.2.4 The NPPF emphasises the importance of delivering good design by confirming that good design is a “*key aspect of sustainable development*” (paragraph 126). *The NPPF goes on to set out the need to plan positively for the achievement of high quality and inclusive design for all development*”. It states that developments should establish a strong sense of place, respond to local character and history, create

safe and accessible environments, and be visually attractive as a result of good architecture and landscaping. A number of overriding core planning principles are relevant to landscape including:

- always seek to secure high quality design and a good standard of amenity for all existing and future occupants of land and buildings;
- take account of the different roles and character of different areas; and
- contribute to conserving and enhancing the natural environment and reducing pollution.

- 7.2.5 Paragraph 130 recognises the need to ensure that developments are “*sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change*”.
- 7.2.6 Paragraph 131 notes that trees make an important contribution to the character and quality of urban environments and can also help mitigate and adapt to climate change. It also notes that decisions should ensure appropriate measures are in place to secure the long-term maintenance of newly planted trees, and that existing trees are retained wherever possible.
- 7.2.7 The NPPF also includes a number of policies relating to conserving and enhancing the natural environment relevant to landscape – this includes policies that ensure developments are “*sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change*” (paragraph 130).
- 7.2.8 Chapter 15: Conserving and Enhancing the Natural Environment recognises that the environment should be enhanced by:
- “*Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan)*;
 - *Recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland*”. (refer to paragraph 174 a) and b)).
- 7.2.9 Chapter 13: Protecting Green Belt land and paragraphs 137 to 151 relate to the protection of Green Belt land and inappropriate developments that are harmful to Green Belt. A discussion of proposed Scheme option effects upon Green Belt is provided in Section 7.11.

Local Planning Policy and Guidance

Newark and Sherwood District Council

- 7.2.10 NSDC adopted their Amended Core Strategy in March 2019 (NSDC, 2019). The document indicates the policies and site allocations against which developments within the District of Newark and Sherwood will be determined. With regards to the landscape and visual environment, the document includes the following relevant policies:
- Core Policy 13 (Landscape Character), which states that NSDC will “*work with partners and developers to secure new development which positively addresses the implications of relevant landscape Policy Zone(s) that is consistent with the landscape conservation and enhancement aims for the area(s) ensuring that*

landscapes, including valued landscapes, have been protected and enhanced";
and

- Policy ShAP 1 (Sherwood Area and Sherwood Forest Regional Park), which states that NSDC will *"work with its partners to maintain and enhance the ecological, heritage and landscape value of the Sherwood Area whilst promoting sustainable and appropriate leisure, tourism and economic regeneration"*.

7.2.11 The Kirk Hill Junction Scheme is located in the Green Belt. Green Belts are not a landscape designation, but perspective on the openness of the Green Belt can be influenced by visual effects. As such, the visual effects upon the openness of the green belt will be considered in the LVIA, in order to inform wider planning decisions.

7.2.12 NSDC spatial policies 4A (Extent of the Green Belt) and 4B (Green Belt Development) are therefore considered relevant. Spatial policy 4A states *"The extent of the Nottingham - Derby Green Belt which lies within Newark & Sherwood District as set out on the Policies Map, will remain unchanged following the earlier small scale review undertaken in 2012"*. Spatial policy 4B states *"Other development in the Green Belt not identified in this policy will be judged according to national Green Belt policy"*.

Rushcliffe Borough Council

7.2.13 RBC adopted their Local Plan Part 1: Core Strategy, which provides the strategic approach to development in the borough, in December 2014 (RBC, 2014). RBC adopted the Local Plan Part 2: Land and Planning Policies (RBC, 2019a) which includes non-strategic allocations and detailed planning policies, in October 2019. The following policies are considered relevant:

- RBC Local Plan Part 1 Policy 4 (Nottingham-Derby Green Belt), which states that *"The principle of the Nottingham Derby Green Belt within Rushcliffe will be retained and it will only be altered where it is demonstrated that exceptional circumstances exist"*;
- RBC Local Plan Part 1 Policy 16 (Green Infrastructure, Landscape, Parks and Open Space), which requires that landscape character is protected, conserved or enhanced where appropriate in line with the recommendations of the Greater Nottingham Landscape Character Assessment;
- RBC Local Plan Part 2 Policy 1 (Development Requirements), which states *"Planning permission for new development, changes of use, conversions or extensions will be granted provided that... there is no significant adverse effects on landscape character"*; and
- RBC Local Plan Part 2 Policy 21 (Green Belt and the Countryside), which states that applications for development in the Green Belt will be determined in accordance with the NPPF.

Gedling Borough Council

7.2.14 GBC's adopted local plan and policy documents include the Aligned Core Strategy (Part 1 Local Plan), the Local Planning Document (Part 2 Local Plan) and supplementary planning documents and guidance.

7.2.15 The GBC Aligned Core Strategy - Local Plan Part 1 (Broxtowe Borough Council, GBC and Nottingham City Council, adopted in 2014) document is aligned with the Greater Nottingham administrative areas of Broxtowe, Gedling and Nottingham City. The document sets out the strategic policy direction for future development in

Gedling Borough and is used to help decide planning applications and guide the location and design of development in the borough.

7.2.16 The Local Plan Part 1 is supported by the Local Planning Document (LPD) (Part 2 Local Plan), which was adopted in 2018. The two documents work together to shape future development in Gedling Borough by planning for new homes, jobs and infrastructure. These documents are used to help decide planning applications and guide the location and design of development within the borough. The following policies are considered relevant:

- GBC Local Plan Part 1 Policy 3 (The Green Belt) which, like RBC Local Plan Part 1 Policy 4 (Nottingham-Derby Green Belt), emphasises that the principle of the Nottingham Derby Green Belt will be retained;
- GBC Local Plan Part 1 Policy 16 (Green Infrastructure, Parks and Open Space), which largely replicated RBC Local Plan Part 1 Policy 16 (Green Infrastructure, Landscape, Parks and Open Space); and
- LPD (Part 2 Local Plan) Policy 19 (Landscape Character and Visual Impact), which states that “Planning permission will be granted where new development does not result in a significant adverse visual impact or significant adverse impact on the character of the landscape” and that “where practicable, development will be required to enhance the qualities of the landscape character type in which it is situated”.

7.3 Consultation

7.3.1 A summary of the landscape and visual effects related responses received in the Scoping Opinion is included in Table 7-1.

Table 7-1: Scoping Response Summary - Landscape

Stakeholder	Scheme	Stakeholder Comments	Scheme Response
Natural England	Ollerton Roundabout	Landscape and visual impacts Natural England would wish to see details of local landscape character areas mapped at a scale appropriate to the development site as well as any relevant management plans or strategies pertaining to the area. The EIA should include assessments of visual effects on the surrounding area and landscape together with any physical effects of the development, such as changes in topography.	Local landscape character has been mapped to support the Landscape and Visual assessment within this chapter. The Landscape and Visual assessment has considered visual effects and changes as a result of the Scheme.
Natural England	Ollerton Roundabout	The EIA should include a full assessment of the potential impacts of the development on local landscape character using landscape assessment methodologies. We encourage the use of Landscape Character Assessment (LCA), based on the good practice guidelines produced jointly by the Landscape Institute and Institute of Environmental Assessment in 2013. LCA provides a sound basis for guiding, informing and understanding the ability of any location to accommodate change and to make positive proposals for conserving, enhancing or regenerating character, as detailed proposals are developed.	
Natural England	Ollerton Roundabout	Natural England supports the publication Guidelines for LVIA, produced by the Landscape Institute and the Institute of Environmental Assessment and Management in 2013 (3rd edition). The methodology set out is almost universally used for LVIA. In order to foster high quality development that respects, maintains, or enhances, local landscape character and distinctiveness, Natural England encourages all new development to consider the character and distinctiveness of the area, with the siting and design of the Scheme reflecting local design characteristics and, wherever possible, using local materials. The EIA process should detail the measures to be taken to ensure the building design will be of a high standard, as well as detail of layout alternatives together with justification of the selected option in terms of landscape impact and benefit.	The LVIA methodology within Section 7.4 uses the Guidelines for Landscape and Visual Impact Assessment 3 rd Edition (Landscape Institute, 2013). The landscape design in Appendix 2-2 of Volume 3A is based on the local character of the Sherwood area.

Stakeholder	Scheme	Stakeholder Comments	Scheme Response
Natural England	Ollerton Roundabout	<p>Rights of Way, Access land, Coastal access and National Trails</p> <p>The EIA should consider potential impacts on access land, public open land, rights of way and coastal access routes in the vicinity of the development. Consideration should also be given to the potential impacts on the adjacent/nearby. National Trail. The National Trails website www.nationaltrail.co.uk provides information including contact details for the National Trail Officer. Appropriate mitigation measures should be incorporated for any adverse impacts. We also recommend reference to the relevant Right of Way Improvement Plans (ROWIP) to identify public rights of way within or adjacent to the proposed site that should be maintained or enhanced.</p>	<p>The assessment considers rights of way as identified in Section 7.5. There are no National Trails, areas of Access land or Coastal access within the study area.</p>
Natural England	Mickledale Lane Junction, Lowdham Roundabout	<p>Landscape and Visual Impacts The consideration of landscape impacts should reflect the approach set out in the Guidelines for LVIA (Landscape Institute and the Institute of Environmental Assessment and Management, 2013, 3rd edition), the Landscape Character Assessment Guidance for England and Scotland (Scottish Natural Heritage and The Countryside Agency, 2002) and good practice.</p>	<p>The LVIA methodology within Section 7.4 uses the Guidelines for Landscape and Visual Impact Assessment 3rd Edition (Landscape Institute, 2013).</p>
Natural England	Mickledale Lane Junction, Lowdham Roundabout	<p>Access and Recreation</p> <p>The ES should include a thorough assessment of the development's effects upon public rights of way and access to the countryside and its enjoyment through recreation. With this in mind and in addition to consideration of public rights of way, the landscape and visual effects on Open Access land, whether direct or indirect, should be included in the ES. Natural England would also expect to see consideration of opportunities for improved or new public access provision on the site, to include linking existing public rights of way and/or providing new circular routes and interpretation. We also recommend reference to relevant Right of Way Improvement Plans (ROWIP) to identify public rights of way within or adjacent to the proposed site that should be maintained or enhanced.</p>	<p>There is limited land affected, none of which is access or public open land. No National Trails have been noted as being present near to any of the Schemes being considered. As such, no significant effects were anticipated and therefore the EIA has not assessed the impacts on accessibility.</p> <p>However, the design has still taken these into account as noted within the descriptions of each Scheme (see Chapter 2: The Scheme).</p>

Stakeholder	Scheme	Stakeholder Comments	Scheme Response
RBC Planning	Kirk Hill Junction	It would appear that the various environmental constraints have been identified including heritage assets including various listed buildings and the East Bridgford Conservation Area in close proximity to the site. The importance of mature landscaping including trees and landscaping to the entrance to the village of East Bridgford and its Conservation Area should be clearly acknowledged and considered in the preparation of any scheme.	Visual effects are considered within this assessment.
			The existing vegetation, entrance to East Bridgford and the East Bridgford Conservation Area are considered within the assessment reported in this chapter.

7.4 Assessment Methodology

Study Area

- 7.4.1 A 2 km study area was initially defined at the Scoping stage, determined by desk-based reviews of landform and vegetation patterns, the generation of a Zone of Theoretical Visibility (ZTV) and fieldwork.
- 7.4.2 Following site surveys and reviews of the revised design, it was considered appropriate to reduce the study area to 750 m. The relatively small scale of each Scheme, combined with screening provided by a combination of existing landform and built form, are considered to negate the potential for significant landscape and visual effects beyond this range.
- 7.4.3 Further detail regarding the Scheme specific study areas can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 7.4.4 The assessments have been prepared with reference to DMRB LA 107 and, where appropriate, the Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3), (Landscape Institute, 2013). DMRB LA 107 indicates that assessment should identify likely significant landscape and visual effects.
- 7.4.5 The two components of LVIA are:
- assessment of landscape effects: assessing effects on the landscape as a resource in its own right; and
 - assessment of visual effects: assessing effects on specific views and on the general visual amenity experienced by people.
- 7.4.6 The methodology for the presentation of the Type 1 viewpoint photography and the Type 4 photomontages has been undertaken in accordance with Technical Guidance Note 06/19: Visual Representation of Development Proposals (Landscape Institute, 2019).
- 7.4.7 Further detail regarding the Scheme specific assessment methodology can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

7.5 Baseline Conditions

- 7.5.1 The baseline scenario for the assessment is the 'present-day' landscape character and features across the site and study area and the existing 'present day' visibility as recorded by the fieldwork. This landscape and visual baseline is described in the LVIA sections of each specific scheme chapter.
- 7.5.2 The landscape receptors were determined through reviewing published landscape character assessments and undertaking fieldwork to verify the published studies and identify local landscape character areas where relevant to add a further level of detail.
- 7.5.3 The visual receptors were also identified from a review of mapping, ZTVs, fieldwork from publicly accessible locations and professional judgement, to establish a set of representative viewpoints.

7.5.4 Further detail regarding the Scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

Design and Mitigation

7.5.5 The landscape design proposals are shown in Appendix 2-2 of Volumes 3A to 3D. The broad objectives of the landscape design, applicable to each junction are:

- mitigate unavoidable loss of landscape elements by the replication of characteristic features within the landscape design proposals;
- reduce or mitigate effects on landscape character and visual amenity by the use of planting and seeding to integrate the junction as far as possible, given the nature of the Scheme;
- to achieve and maximise biodiversity opportunities within land taken for the Scheme; and
- provide a long-term appropriate setting for the junction which is functional but also appropriate for the context.

7.5.6 The following elements have been included within the landscape design for each Scheme to achieve these objectives:

- use of species rich hedgerow of native trees and shrubs to establish new highway boundaries and integrate the junction into the landscape context;
- groups of individual and hedgerow trees acting as both a screen for the junction and to integrate it into the landscape;
- wildflower, heathland and some wetland areas (junction specific) to provide biodiversity value and extend the habitat range adjacent to the junction; and
- shrub planting or other landscape treatments for amenity value.

7.5.7 Further detail regarding the Scheme specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout, and Volume 1D Kirk Hill Junction.

7.6 Project-Wide Likely Significant Cumulative Effects

Construction

7.6.1 Effects on landscape character from the construction of Ollerton Roundabout are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (S PZ 15 River Maun Meadowlands with Plantations). Effects on viewers/visual amenity are a maximum of moderate adverse in construction at one location (Photoviewpoint 2: A614 travelling south, adjacent No. 3 Forest Corner), and slight or neutral based on an assessment of eight representative viewpoints.

7.6.2 Effects on landscape character from the construction of Mickledale Lane Junction are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (SH09 Old Clipstone Estate Farmlands (within Sherwood Estate Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of seven representative viewpoints.

7.6.3 Effects on landscape character from the construction of Kirk Hill junction are assessed as neutral at the regional scale and maximum slight adverse at the Policy

Zone scale (SN05 East Bridgford Escarpment Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of seven representative viewpoints.

- 7.6.4 Effects on landscape character from the construction of Lowdham Roundabout are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (PZ MN40 Epperstone Village Farmlands with Ancient Woodlands and PZ TW08 Gunthorpe and Hoveringham Village Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of six representative viewpoints.
- 7.6.5 Each of the junctions is geographically and visually separate with no identifiable inter-visibility between them due to distance and intervening landform and vegetation. The junctions occupy different landscape policy zones and none of the representative viewpoint locations would allow a viewer to see both junctions simultaneously.
- 7.6.6 Cumulative effects on landscape character at a regional scale, in construction would be neutral given the negligible scale and extent of loss of landscape elements and the nature of the junction modifications within the context of an existing highway. Similarly, construction would not impact on individual Policy Zones simultaneously and cumulative effects would not exceed those for the individual junctions, slight adverse in every case.
- 7.6.7 Visual effects can be cumulative as a result of viewing schemes in combination or sequentially. None of the Schemes would be viewed in combination with another. Cumulative effects on visual amenity therefore relate to the potential for a viewer to experience more than one junction in sequence – most likely by travelling along the A614 as a highway user and not in rapid sequence. It is unlikely that any other user category would experience multiple junctions in sequence. On that basis, the cumulative effects would relate to the least susceptible user group (highway users) and in construction would remain no greater than the individual slight adverse significance of effect identified for each junction.

Operation

- 7.6.8 Effects on landscape character from Ollerton Roundabout in operation of are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (S PZ 15 River Maun Meadowlands with Plantations). Effects on viewers/visual amenity are a maximum of slight adverse based on an assessment of eight representative viewpoints.
- 7.6.9 Effects on landscape character from Mickledale Lane Junction in operation are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (SH09 Old Clipstone Estate Farmlands (within Sherwood Estate Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of seven representative viewpoints.
- 7.6.10 Effects on landscape character from Kirk Hill junction in operation are assessed as neutral at the regional scale and maximum slight adverse at the Policy Zone scale (SN05 East Bridgford Escarpment Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of seven representative viewpoints.
- 7.6.11 Effects on landscape character from Lowdham Roundabout in operation are assessed as neutral at the regional scale and maximum slight adverse at the Policy

Zone scale (PZ MN40 Epperstone Village Farmlands with Ancient Woodlands and PZ TW08 Gunthorpe and Hoveringham Village Farmlands). Effects on viewers/visual amenity are a maximum of slight adverse, based on an assessment of six representative viewpoints.

- 7.6.12 As explained for construction, each of the junctions is geographically and visually separate with no identifiable inter-visibility between them due to distance and intervening landform and vegetation. The junctions occupy different landscape policy zones and none of the representative viewpoint locations would allow a viewer to see both junctions simultaneously.
- 7.6.13 Cumulative effects on landscape character at a regional scale, in operation would be neutral given the negligible scale and extent of loss of landscape elements and the nature of the junction modifications within the context of an existing highway.
- 7.6.14 Visual effects can be cumulative as a result of viewing schemes in combination or sequentially. None of the Schemes would be viewed in combination with another. Cumulative effects on visual amenity therefore relate to the potential for a viewer to experience more than one junction in sequence – most likely by travelling along the A614 as a highway user and not in rapid sequence. It is unlikely that any other user category would experience multiple junctions in sequence. On that basis, the cumulative effects would relate to the least susceptible user group (highway users) and remain no greater in operation than the individual slight adverse significance identified for each junction for that user group.

7.7 Additional Mitigation and Monitoring

- 7.7.1 Given the absence or likelihood of significant cumulative landscape or visual effects, no additional mitigation is considered to be required.

7.8 Summary of Project-Wide Significant Residual Effects

- 7.8.1 There would be no significant cumulative landscape or visual effects from the Schemes. The residual effects that are not significant remain as reported within the individual assessments within Volumes 1A to 1D.

8. BIODIVERSITY

8.1 Introduction

- 8.1.1 This chapter provides the overview of effects on biodiversity that are anticipated as a result of the Project when considering all Schemes in-combination.
- 8.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 8.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 8.9 of this chapter.
- 8.1.4 The assessment for biodiversity was undertaken in accordance with DMRB LA 108 Biodiversity (Highways England, 2020d).

8.2 Legislative and Policy Framework

- 8.2.1 The biodiversity assessment presented in this ES has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. A summary is provided below.

European Legislation

- 8.2.2 The Habitats Directive (93/43/EEC) (European Commission, 1992) provides for strict protection of species of Community interest listed in Annex IV(a) of the Directive ('European Protected Species').
- 8.2.3 Article 12 of the Habitat Directive set out the system of strict protected which Member States are required to adopt for animal species on Annex IV9A). Article 12(1)(b) prohibits *"deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration"*; Article 12(1)(d) prohibits: *"deterioration of destruction of breeding sites or resting places."*
- 8.2.4 Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') provides for the conservation and management of all wild bird species naturally occurring in the European Union, their nests, eggs and habitats.
- 8.2.5 Article 2 of the Birds Directive provides for the maintenance of population of wild birds: *"at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level."* Article 4(4) required that (outside protected sites) member states: *"should strive to avoid pollution or deterioration of habitats."*
- 8.2.6 The Habitats and Birds Directives are implemented in England and Wales by the Conservation of Habitats and Species Regulations 2017 (The 'Habitats Regulations') (HMSO, 2017a). Regulation 10 implements provision in Article 4 of the Birds Directive, requiring competent authorities to: *"use all reasonable endeavours to avoid any pollution or deterioration of habitats of wild birds."* Regulation 43 implements the system of strict protected applied to European Protected Species.

National Legislation

8.2.7 The following legislation is considered relevant to the Project:

- the conservation of Habitat and Species Regulations 2017 (as amended) (the Habitats Regulations);
- Wildlife and Countryside Act, 1981 (as amended) (HMSO, 1981);
- Countryside and Rights of Way (CROW) Act 2000 (HMSO, 2000);
- Natural Environment and Rural Communities (NERC) Act 2006 (HMSO, 2006) ;
- Protection of Badgers Act 1992 (HMSO, 1992); and
- the Hedgerows Regulations 1997 (HMSO, 1997).

National Planning Policy and Guidance

8.2.8 The policies relevant to this assessment from the following documents:

- the NPPF (MHCLG, 2021); and
- The Environment Act (2021).

8.2.9 The NPPF for England (2021) sets out a number of policies for conserving and enhancing the natural environment in Section 15. Of particular relevance are the following paragraphs:

- paragraph 174, which includes the need to minimise risks to biodiversity and promote net gain for biodiversity, where possible;
- paragraph 175, which states that site protection should be commensurate with their status, and take a strategic approach to maintaining and enhancing habitat networks.
- paragraph 180, which addresses the conservation and enhancement of biodiversity in planning applications;
- paragraph 182, which states that the presumption in favour of sustainable development does not apply when an Appropriate Assessment under the Habitats Regulations has determined there will be an adverse effect on the integrity of a habitats site; and
- paragraph 185, which includes policies to consider effects of pollution, including light pollution, on the natural environment.

8.2.10 The recently assented Environment Act 2021 sets out how the Government plans for protect and improve the natural world. Planning Authorities have a duty to implement the requirement for developers to deliver BNG on developments.

8.2.11 The Act makes it mandatory for developments (subject to some exemptions) to achieve at least a 10% net gain in value for biodiversity (where habitats and wildlife must be left in a measurably better state that before the development). Developers are required to submit a 'biodiversity net gain plan' with their planning applications and the local authority must be satisfied that this is secured through a planning obligation or conservation covenant for at least 30 years.

Local Planning Policy and Guidance

8.2.12 In 1994 the UK Government ratified the Convention on Biological Diversity (UN, 1992) and published the UK Biodiversity Action Plan (BAP). In 2012, the UK Post-2010 Biodiversity Framework (JNCC, 2010) was published which sets out the

objectives for biodiversity in the UK until 2020. The habitats and species listed in this framework are the same as those listed in the now defunct UK BAP, but are now referred to as Priority Habitats or Priority Species.

- 8.2.13 BAPs define actions and measures to meet the objectives defined in a strategy, and specify measurable targets. Accordingly, BAPs determine the broad habitats and species that are of value to the natural environment of the UK, and identify actions and projects that could be undertaken to help protect or enhance the national biodiversity. The UK BAP species correspond to the requirement of NERC 2006, and includes all species of principal importance.
- 8.2.14 Local Biodiversity Action Plans (LBAPs) are implemented through planning policy, identifying habitats and species of value or endangerment at the local, county, district or regional level. As such, LBAPs have no statutory status, but provide a framework for implementing conservation requirements. The Nottinghamshire LBAP (Nottinghamshire Biodiversity Action Group, 1998) is considered in this ES.
- 8.2.15 Newark and Sherwood Green Infrastructure Strategy (Newark and Sherwood District Council, 2010) is a local strategy which is part of the development of an overall green infrastructure network of greenspaces, landscape and natural elements which intersperse and connect settlements and surrounding areas. It also highlights the need to respond to the threats and challenges of climate change for communities and wildlife.
- 8.2.16 NSDC Local Plan: Amended Core Strategy 2019-2033 Chapter 5 (Newark and Sherwood District Council, 2019) details the core policies for the Natural and Built Environment. The core policy relevant to the biodiversity assessment is:
- Biodiversity and Green Infrastructure – the district council will seek to conserve and enhance the biodiversity and geological diversity of the District by working with partners to implement the aims and proposals of the Nottinghamshire Local Biodiversity Action Plan and the Green Infrastructure Strategy.
- 8.2.17 Rushcliffe Local Plan Part 2: Land and Planning Policies Chapter 12 (Rushcliffe Borough Council, 2019) details the policies for Green Infrastructure and the Natural Environment. These policies are:
- Policy 34 Green Infrastructure and Open Space Assets – protects areas of existing green infrastructure and open spaces from development which adversely affects them.
 - Policy 35 Green Infrastructure Network and Urban Fringe – identified strategic green corridors or local green corridors should ensure the primary functions of the network are maintained and enhanced. Opportunities to create additional green infrastructure assets should be taken, where appropriate. Developments within the urban fringe must, where appropriate, provide recreational opportunities, wildlife benefits and opportunities for pedestrian and cycle access to the wider countryside.
 - Policy 36 Designated Nature Conservation Sites – protection provided to nationally designated sites and locally designated sites to prevent development that is likely to cause an adverse effect to these sites, unless the benefits of the developments location clearly outweigh both the impacts that it is likely to have and any broader impacts on the network of sites.
 - Policy 37 Trees and Woodlands – Adverse impacts on mature trees must be avoided, mitigated, or replaced. Planning permission will not be granted for development which would adversely affect an area of ancient, semi-natural woodland or ancient or veteran trees, unless the need for the development

outweigh the loss of woodland / trees. Tree planting of additional trees should be included within new development using a wide range of species.

- Policy 38 Non-Designated Biodiversity Assets and the Wider Ecological Network – Developments are expected to preserve, restore or re-create priority habitat and the protection and recovery of priority species in order to achieve net gains in biodiversity. Developments that significantly affect a priority habitat or species should avoid, mitigate or as a last resort compensate any loss or effects. To preserve Rushcliffe's ecological network, development within biodiversity opportunity areas should retain valued habitat and corridors, and be designed to minimise disturbance to habitats and species. All development should seek to achieve net gains in biodiversity.

8.2.18 Rushcliffe Nature Conservation Strategy 2021-2025 (Rushcliffe Nature Conservation Strategy Implementation Group, 2021). This strategy set out to safeguard existing know sites of interest and also encourages the creation of new sites, while seeking to address the climate emergency and biodiversity crisis. The strategy also seeks to preserve the existing links between wildlife sites and to establish new links to allow the spread of wild native plants and animals.

8.3 Consultation

8.3.1 The EIA Scoping Report was submitted in June 2021 and the NCC Scoping Opinion was received July 2021; these documents are provided in Appendix 1-1 in Volume 3. A summary of the biodiversity related responses are included in Table 8-1, with individual responses provided to comments within 4-1 of Volume 3.

Table 8-1: Comments raised in Scoping Opinion

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
NCC (Scoping Opinion)	Mickledale Lane Junction and Ollerton Roundabout	Potential impacts to the Sherwood ppSPA should be undertaken as part of the HRA assessment.	A Shadow Habitats Regulations Assessment has been undertaken, considering the Schemes at Ollerton Roundabout, Mickledale Lane Junction, Warren Hill Junction and White Post Roundabout. See Appendix 4-4 of Volume 3. This includes consideration for the ppSPA.
NCC (Scoping Opinion)	All Schemes	Biodiversity Net Gain, funding and Management should be addressed in the submission	The Project has been developed with consideration for BNG requirements, and is predicted to achieve a net gain in all three metrics (see Appendix 4-3 of Volume 3). All net gain requirements will be within the revised highway boundary. Funding and management will be the responsibility for NCC.
NCC (Scoping Opinion)	All Schemes	Noise, lighting and disturbance change impacts on sensitive species (roosting and foraging bats and nesting birds) will need to be assessed.	The methodology for the assessment of the impact of artificial lighting and noise can be found in Section 8.4 of Volumes 1A-1D. Lux diagrams and noise contour plans are provided (see Figures 8-2, 8-3 and 8-4 in Volumes 2A-2D). Embedded and additional mitigation, and the assessment are reported in Sections 8.6 and 8.7 of Volumes 1A-1D.
NCC (Scoping Opinion)	Ollerton Roundabout	Bat surveys need to be undertaken and that the impact of artificial lighting and noise should be considered with the use of lux diagrams and noise contour plans, unless it can be demonstrated that there will be no significance changes to the noise and lighting environment as a result of the Scheme.	Lux plans did indicate a potential adverse effect for bats for one property at Forest Side. An additional Preliminary Bat Roost Assessment (Baker Consultants Ltd, 2021) has been undertaken to determine whether suitable roosting features were present to support bats. (see Appendix 8-2 in Volume 3A). Further detail on the mitigation and the assessment is reported in Section 8.6 and 8.7 in Volume 1A.
NCC (Scoping Opinion)	Ollerton Roundabout	Targeted bird survey should be undertaken unless sufficient data is available for other sources and/or it can be demonstrated that there will be no significant changes to the noise and lighting environment as a result of the roundabout improvement.	Additional data has been obtained from the NBGRC. The impacts to nightjar and woodlark have been assessed within Volume 1A Chapter 8: Biodiversity and within the Shadow Habitats Regulations Report (Appendix 4-4 of Volume 3).
NCC Ecology Natural Environment	All Schemes	The creation of habitat should be delivered at each location, as far as possible, for example through the planting of native	The design has sought to maximise habitat creation at each Scheme location as noted in the BNG Assessment (Baker Consultants Ltd, 2021a) located in Appendix 4-2 of Volume 3.

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
Manager and NCC (Scoping Opinion)		trees, shrubs and hedgerows and the seeding of native wildflower seed mixes.	The proposed landscape designs are specific to the character of the location.
NCC Ecology Natural Environment Manager	Ollerton Roundabout	Given the proximity of the Ollerton Roundabout to high-quality bat foraging habitat, bat activity surveys need to be undertaken at this location, and that the impact of artificial lighting and noise should be considered with the use of lux diagrams and noise contour plans, unless it can be demonstrated that there will be no significant changes to the noise and lighting environment.	The methodology for the assessment of the impact of artificial lighting and noise can be found in Section 8.4 of Volumes 1A-1D. Lux diagrams and noise contour plans are provided (see Figures 8-2, 8-3 and 8-4 in Volumes 2A-2D). Embedded and additional mitigation, and the assessment are reported in Sections 8.6 and 8.7 of Volumes 1A-1D. Lux plans did indicate a potential adverse effect for bats for one property at Forest Side. An additional Preliminary Bat Roost Assessment (Baker Consultants Ltd, 2021) has been undertaken to determine whether suitable roosting features were present to support bats. (see Appendix 8-2 in Volume 3A). Further detail on the mitigation and the assessment is reported in Section 8.6 and 8.7 in Volume 1A.
	All Schemes	It is noted that in some cases buildings adjacent to the proposed works areas were not surveyed as they lie outside the red line boundary—presumably because there will not be any direct impacts arising. Therefore, it will need to be demonstrated through the assessment process that there will not be significant indirect impacts on potential roost locations as a result of noise, lighting or general disturbance.	
	Ollerton Roundabout	It is recommended that targeted bird surveys are undertaken at this location, unless sufficient data is available from other sources, such as Birklands Ringing Group/NBGRC and/or that it can again be demonstrated that there will be no significant changes to the noise and lighting environment as a result of the roundabout improvements.	Additional data has been obtained from the NBGRC. The impacts to nightjar and woodlark have been assessed within Volume 1A Chapter 8: Biodiversity and within the Shadow Habitats Regulations Report (Appendix 4-4 of Volume 3).

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
NCC Ecology Natural Environment Manager	Ollerton Roundabout, Mickledale Lane Junction, White Post Roundabout and Warren Hill	Consideration of potential impacts on the ppSPA is undertaken as part of the HRA assessment White Post Roundabout and Warren Hill Junction are scoped out of the biodiversity assessment; however, given that both junctions lie within the 5km buffer zone for the ppSPA, and as such, should be scoped in for the purposes of the HRA.	A Shadow Habitats Regulations Assessment has been undertaken, considering the Schemes at Ollerton Roundabout, Mickledale Lane Junction, Warren Hill Junction and White Post Roundabout. See Appendix 4-4 of Volume 3. This includes consideration for the ppSPA.
Natural England	All Schemes	Natural England provided advice on the scope of the EIA and the HRA.	This advice has been followed within the EIA. Full responses can be found in Appendix 4-1 of Volume 3.
Nottinghamshire Wildlife Trust	All Schemes	No methodology is proposed for how the impacts of changes to noise, light and disturbance will be assessed. For example: Bat activity surveys will be required in order to be able to assess the predicted noise changes on bat foraging activity. The Noise chapter does not describe how the impacts of changes in noise will be assessed for sensitive species.	The methodology for the assessment of the impact of artificial lighting and noise can be found in Section 8.4 of Volumes 1A-1D. Lux diagrams and noise contour plans are provided (see Figures 8-2, 8-3 and 8-4 in Volumes 2A-2D). Embedded and additional mitigation, and the assessment are reported in Sections 8.6 and 8.7 of Volumes 1A-1D.
Nottinghamshire Wildlife Trust	All Schemes	There could be impacts of dust on some SSSIs and LWS in close proximity to the junctions, this should also be closely monitored, with a plan in place for how it could be rectified if a problem is shown to have arisen. It is essential that accurate modelling for changes in GHG emissions are undertaken in advance, and that NCC considers how they could be reduced through this Scheme.	The impacts of dust would be mitigated through BPM to be included within the CEMP. Dust monitoring adjacent to the Birklands West and Ollerton Corner SSSI would be undertaken during construction.

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
Nottinghamshire Wildlife Trust	Ollerton Roundabout	Further monitoring undertaken in a key protected habitats site such as the SAC or a heathland SSSI, to ensure that the modelling is correct for the areas of potential greatest irreversible habitat impact.	A programme of monitoring is proposed adjacent to the roadside closest to the Birklands West and Ollerton Corner SSSI in the opening year to ensure emissions predictions are accurate.
Nottinghamshire Wildlife Trust	Ollerton Roundabout, Mickledale Lane Junction	The ppSPA should be included in the HRA, and the likely in-combination effects should be assessed.	A Shadow Habitats Regulations Assessment has been undertaken, considering the Schemes at Ollerton Roundabout, Mickledale Lane Junction, Warren Hill Junction and White Post Roundabout. See Appendix 4-4 of Volume 3. This includes consideration for the ppSPA.
Nottinghamshire Wildlife Trust	All Schemes	Further surveys in the field are required as follows, to supplement those already undertaken for Phase 1 habitats, reptiles, HSI and eDNA:	
Nottinghamshire Wildlife Trust	All Schemes	Bats - survey of all possible structures that may support roosts, including both day time visual inspections and evening emergence surveys undertaken at the correct times of year by suitably licensed persons	An additional Preliminary Bat Roost Assessment (Baker Consultants Ltd, 2021) has been undertaken to determine whether suitable roosting features were present to support bats. (see Appendix 8-2 in Volume 3A). Further detail on the mitigation and the assessment is reported in Section 8.6 and 8.7. No direct or indirect impacts to suitable bat roosting locations are anticipated at Mickledale Lane Junction or Lowdham Roundabout. See Section 8.7 of Volumes 1B and 1C. Daytime visual inspections of any trees to be removed have been undertaken at Kirk Hill Junction. See Preliminary Ecological Appraisal (Via East Midlands, 2021) in Appendix 8-1 of Volume 3D.
Nottinghamshire Wildlife Trust	All Schemes	Badgers - surveys of the whole site and adjacent land (up to 250 m) for field signs and setts.	Assessment for Badgers undertaken on 20 th December 2019 as part of the extended Phase 1 habitat survey (Baker Consultants, 2020) (Appendix 4-5 of Volume 3) for Ollerton Roundabout and Mickledale Lane Junction, Additional badger surveys were undertaken in 2021 by Via East Midlands (see Appendix 8-1 of Volume 3D). Sub-optimal badger habitat is present within Scheme red-line boundary.

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
			Assessment for Badgers undertaken in September 2020 as part of the Phase 1 habitat survey (Via East Midlands, 2021).
Nottinghamshire Wildlife Trust	All Schemes	Birds - breeding bird surveys to standard methodologies for at least 100 m around the periphery of the sites, where there may be noise impacts.	There are likely to be negligible noise impacts as detailed within Section 8.7 of Volumes 1A-1D, therefore no breeding bird surveys have been undertaken.
Nottinghamshire Wildlife Trust	All Schemes	Water voles and other riparian mammals – Searches for water vole and other riparian mammal field signs to standard methodologies should be undertaken on any potentially affected watercourses.	There are no predicted impacts to watercourses within the assessment boundaries.
Nottinghamshire Wildlife Trust	All Schemes	Particular consideration should be given to the potential direct and indirect impacts of: <ul style="list-style-type: none"> ▪ Habitat loss or degradation ▪ Noise ▪ Hydrological/hydrogeological changes ▪ Dust, NO_x, GHG ▪ Vibration ▪ Disturbance to sensitive species 	Noted, refer to Section 8.7 of Volumes 1A-1D for the assessment considering these aspects where relevant.
Nottinghamshire Wildlife Trust	All Schemes	BNG calculation for the Scheme should be undertaken with the aim of delivering at least 20% BNG. There should be an assurance of long-term funding for management of the habitats, so that they can be retained in perpetuity.	A BNG metric assessment has been undertaken for the Project (as can be found in Appendix 4-2 of Volume 3). Post-development, the Project is expected to deliver an 18.07% gain in habitat units, a 71.75% gain in hedgerow units and a 67.14% gain in river units. All net gain requirements will be within the revised highway boundary. Funding and management will be the responsibility for NCC.

8.4 Assessment Methodology

Study Area

- 8.4.1 To define the total extent of the study area for ecological assessment, the Scheme has been reviewed in order to identify the spatial scale at which ecological features could be affected. In accordance with the DMRB LA 108 and the 'Guidelines for Ecological Impact Assessment in the UK and Ireland' issued by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018), the study area has been defined by determining a Zone of Influence (Zoi) encompassing all likely biophysical changes that would occur as a result of the Scheme. This includes direct effects and indirect effects.
- 8.4.2 Differing Zoi have been used to collate desk study data for designated sites and protected and/or notable habitat and species as follows:
- statutory and non-statutory designated sites within 2 km of each Scheme;
 - ancient woodlands and notable habitats (outside of designated sites) within 1 km of each Scheme;
 - protected and/or notable species recorded within 1km of each Scheme (unless stated otherwise); and
 - Internationally, nationally and locally designated sites of ecological conservation importance within 200 m of the affected road network (ARN).
- 8.4.3 Notable habitats and species are those considered as being of principal importance in England, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.
- 8.4.4 In accordance with DMRB LA 115 Habitat Regulations Assessment (Highways England, 2020g), desk study information has been collated for sites designated at an International/European level, including Special Protection Areas (SPAs), potential SPAs (pSPAs); Special Areas of Conservation (SACs), candidate or possible (cSAC/pSAC) sites and Ramsar sites (wetlands of international importance) using the following criteria:
- the European Site or its functionally linked land are located within 2 km from the Scheme;
 - the European Site is designated for bats and is located within 30 km of the Scheme;
 - the Scheme crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated part or wholly as a European Site;
 - there is potential for hydrological or hydrogeological linkages to a European Site that may require further assessment in accordance with DMRB LA 113 Road Drainage and the Water Environment (Highways England, 2020f); and/ or
 - there is the possibility that the affected road network will require assessment for effects on a European Site in accordance with DMRB LA 105.
- 8.4.5 Further detail regarding the scheme specific study areas can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 8.4.6 Guidance contained within the DMRB LA 108 and the 'Guidelines for Ecological Impact Assessment in the UK and Ireland' issued by the Chartered Institute of

Ecology and Environmental Management (CIEEM, 2018) have been applied in the combined biodiversity assessment to identify the value and significance of biodiversity receptors and to identify and evaluate the impacts and effect that the construction and operation of the Scheme would likely have on these receptors.

8.4.7 The guidance used during the preparation of the assessment includes:

- Guidelines for Ecological Impact Assessment in The UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM 2018);
- Guidelines of Ecological Report Writing (CIEEM, 2015);
- Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017);
- BS42020:2013 Biodiversity – Code of Practise for Planning and Development (British Standards Institute, 2013); and
- Protected species and development: advice for local planning authorities (GOV.UK, 2021).

8.4.8 Further detail regarding the scheme specific assessment methodology can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

8.5 Baseline Conditions

8.5.1 Baseline information associated with the project has been gathered between 2018 and 2021 and has informed the project design and assessment process. Baseline ecological conditions associated with the Scheme are described in Section 8.5 of Volumes 1A to 1D. A combination of desk study and field surveys has been used to adequately define baseline conditions for assessment purposes.

8.5.2 Baker Consultants Ltd was commissioned by Via to undertake the following works in relation to the Project, excluding the Kirk Hill Junction Scheme:

- a desk-based study using online data (MAGIC) and data from the Nottinghamshire Biological and Geological Records Centre (NBGRC) to identify designated sites of nature conservation importance, areas of priority habitat and records of protected and/ or notable species;
- a Phase 1 Habitat Survey undertaken in 2019/2020 to record the nature and extent of vegetation and habitats within and adjacent to the Project Schemes; and
- appraisals and targeted surveys for protected and/or notable flora and fauna.

8.5.3 Via has commenced the following works in relation to the Kirk Hill Junction Scheme to produce a Preliminary Ecological Appraisal:

- a desk-based study with local records centres and online databases to identify designated sites of nature conservation importance, areas of priority habitat and records of protected and/ or notable species;
- a Phase 1 Habitat Survey to record the nature and extent of vegetation and habitats within and adjacent to the Scheme; and
- appraisals and targeted surveys for protected and/or notable flora and fauna.

8.5.4 The biodiversity assessment is supported by the following documents:

- Biodiversity Net Gain (BNG) Assessment (Baker Consultants Ltd., 2021a) – found in Appendix 4-2 of Volume 3;

- Shadow Habitats Regulations Assessment (sHRA) (Baker Consultant, 2021b) – found in Appendix 4-4 of Volume 3; and
- Ecological Appraisal (Baker Consultants Ltd., 2020) – found in Appendix 4-5 Volume 3; and
- Ecological Appraisal (Via, 2021) – found in Appendix 8-1 of Volume 2D.

8.5.5 Further detail regarding the scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

8.6 Design and Mitigation

8.6.1 The Project has been designed as far as possible, to avoid and minimise impacts and effects on biodiversity through the process of design development and embedded mitigation as described in Chapter 3: Assessment of Alternatives.

8.6.2 A summary of mitigation required as identified through the assessment of the individual Schemes is provided below.

Ollerton Roundabout

Construction Phase

8.6.3 The Scheme would be subject to measures and procedures as defined within the CEMP for the Scheme as noted in Section 8.6 of Volume 1A. These would include a range best practise working methods and sensitive timings of works, where applicable. A CEMP would be developed by the Principal Contractor and implemented for the duration of the Scheme construction phase.

8.6.4 Dust monitoring adjacent to the Birklands West and Ollerton Corner SSSI would be undertaken during construction to ensure that management measures implemented through the CEMP are successful in reducing dust impacts on this receptor.

Operation Phase

8.6.5 Natural England have raised concerns regarding forecasted trends in emission reduction being inaccurate and have requested a programme of monitoring to compare to the predictions made in the assessment for effects on Birklands West and Ollerton Corner SSSI. A programme of monitoring is therefore proposed adjacent to the roadside closest to the Birklands West and Ollerton Corner SSSI in the opening year.

Kirk Hill Junction, Lowdham Roundabout and Mickledale Lane Junction

Construction Phase

8.6.6 The Schemes would be subject to measures and procedures as defined within the CEMP for the Scheme as noted in Section 8.6 of Volumes 1B to 1D. These would include a range best practise working methods and sensitive timings of works, where applicable. A CEMP would be developed by the Principal Contractor and implemented for the duration of the Scheme construction phase.

Operation Phase

8.6.7 No mitigation measures are considered to be required for the operational phase of the Schemes as no significant effects are predicted.

- 8.6.8 Further detail regarding the scheme specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

8.7 Project Wide Likely Significant Effects

- 8.7.1 There is no overlap in terms of the study areas used to assess each of the Schemes in isolation. Additionally, the nature of the impacts identified and assessed at each Scheme means that they are restricted to the immediate area of the work or the area within close proximity of the assessment boundary. There are not likely to be additional cumulative effects due to the intervening distances between each Scheme.
- 8.7.2 Therefore, there are no changes to the likely significant effects for biodiversity reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction when considering the Project as a whole.

8.8 Additional Mitigation and Monitoring

- 8.8.1 There is no requirement for any further additional mitigation for the project, when considering the Project as a whole. The proposed mitigation for biodiversity in each Scheme can be viewed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

8.9 Summary of Project Wide Significant Residual Effects

- 8.9.1 There are considered to be no project wide significant residual effects for Biodiversity.
- 8.9.2 Further detail regarding the scheme specific effects can be viewed in the 'Residual Effects' sections of Chapter 8: Biodiversity, in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

9. GEOLOGY AND SOILS

9.1 Introduction

- 9.1.1 This chapter provides the overview of effects on geology and soils that are anticipated as a result of the Project when considering all Schemes in-combination.
- 9.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 9.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 9.9 of this chapter.
- 9.1.4 The assessment for geology and soils was undertaken in accordance with DMRB LA 109 Geology and Soils (Highways England, 2019b).

National Legislation

- 9.1.5 Relevant national legislation related to assessing risks from existing / historical contamination includes:
- The Environment Act 1995 (as amended) (HMSO, 1995);
 - The Environmental Protection Act Part 2A 1990 (HMSO, 1990);
 - The Contaminated Land (England) (As Amended) Regulations 2012 (HMSO, 2012); and
- 9.1.6 Relevant national legislation related to assessing pollution risks associated with the proposed development includes:
- The Environmental Permitting (England and Wales) Regulations 2016 (HMSO,2016); and
 - The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (HMSO, 2015).
- 9.1.7 Relevant national legislation related to waste management includes:
- The Waste (England and Wales) Regulations 2011 (HMSO, 2011).
- 9.1.8 Relevant national legislation related to protection of controlled waters includes:
- The Water Act 2003 (HMSO, 2003);
 - The Water Resources Act 1991 (HMSO, 1991a);
 - The Water Environment (Water Framework Directive) Regulations 2017 (HMSO, 2017c);
 - The Private Water Supplies (England) (As Amended) Regulations 2018 (HMSO, 2018c); and
 - The Land Drainage Act 1991 (As Amended) (HMSO, 1991b).

National Planning Policy and Guidance

- 9.1.9 Relevant national planning policies and guidance includes the NPPF. Paragraph 174 which aims to protect and enhance sites of geology value and soils; and encourages the remediation and mitigation of contaminated land where appropriate.
- 9.1.10 PPG provides guidance on ensuring contaminated land is suitable for use and ensure water quality is not compromised. Relevant guidance includes:
- Land affected by contamination (MHCLG, 2019a); and
 - Planning Practice Guidance (MHCLG, 2019b).

Local Planning Policy and Guidance

- 9.1.11 Relevant local planning policies within the NSDC Amended Core Strategy (NSDC, 2019) include:
- **Core Policy 12: Biodiversity and Green Infrastructure:** This policy aims to conserve and enhance the geological diversity of the District by working with partners to implement the aims and proposals of the Nottinghamshire Local Biodiversity Action Plan, the Green Infrastructure Strategy and the Nature Conservation Strategy.
- 9.1.12 Relevant planning policies within the RBC Local Plan. Part 1: Core Strategy (RBC, 2014) and Local Plan. Part 2: Land and Planning Policies (RBC, 2019a) include:
- **Policy 17: Biodiversity:** This policy aims to protect designated geological sites with importance for nature conservation.

Other Relevant Policy, Standards and Guidance

- 9.1.13 Other relevant policy, standards and guidance related to contaminated land investigation and risk assessment includes:
- Land contamination risk management (LCRM) (Environment Agency, 2020). Available at <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm> (last updated 19th April 2021);
 - BS 10175+A2 Investigation of Potentially Contaminated Sites – Code of Practice (British Standards, 2017);
 - BS 5930:2015 Code of Practice for Ground Investigations (British Standards, 2015);
 - C552 Contaminated Land Risk Assessment. A Guide to Good Practice (CIRIA, 2001);
 - C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings (CIRIA, 2007);
 - Control of Asbestos Regulations 2012. Interpretation for Managing and Working with Asbestos in Soil and Construction Materials: Industry Guidance (CL:AIRE, 2016);
 - Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012); and
 - TR P5-065/TR: Technical Aspects of Site Investigation (Volumes 1 & 2) (Environment Agency, 2002).

Other relevant policy, standards and guidance related to waste management includes:

- The Definition of Waste: Development Industry Code of Practice, V2 (Contaminated Land: Applications in Real Environments (CL:AIRE), 2011); and
- Waste Classification. Guidance on the classification and assessment of waste (1st Edition v1.1). Technical Guidance WM3 (Environment Agency, 2018).

Other relevant policy, standards and guidance related to protection of valuable soil resources includes:

- Natural England, 2012: Information Note TIN049. Agricultural Land Classification: protecting the best and most versatile agricultural land.
- Safeguarding our Soils. A Strategy for England (Department of Environment, Food and Rural Affairs, 2009);
- BS 3882:2015 Specification for Topsoil and Requirements for Use (British Standards, 2015); and
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).

9.2 Consultation

- 9.2.1 A summary of the geology and soils related responses from the Scoping Opinion is included in Table 9-1.
- 9.2.2 No relevant consultation responses were received for Kirk Hill. However, the assessment is consistent with the assessments undertaken for the other Schemes and the consultation responses received in relation to those assessments.

Table 9-1: Comments raised in Scoping Opinion

Stakeholder	Scheme	Comment made	Response and where addressed in the ES
Nottinghamshire County Council (Scoping Opinion)	Ollerton Roundabout and Mickledale Lane Junction	Risks to Source Protection Zone 1 and associated groundwater abstraction need to be fully considered. Particular attention is drawn to the need for the drainage design to take account of the highly sensitive nature of groundwater beneath the site. A controlled waters risk assessment would be required.	Risks to the SPZ and groundwater have been considered in this chapter Section 9.7 of Volume 1A.
Environment Agency	Ollerton Roundabout	The Environment Agency stress the importance of considering risks to groundwater beneath the site from the drainage scheme at Ollerton Roundabout.	The comments have been noted in the assessment. See Volume 1A: Table 9-1, Section 9.7 and Section 9.8.
	Mickledale Lane Junction	The Environment Agency stress the importance of considering risks to Source Protection Zone 1 (and associated groundwater abstraction) that is present within the proposed Scheme at Mickledale Lane Junction.	The comments have been noted in the assessment. See Volume 1B: Table 9-1, Section 9.7 and Section 9.8.
Natural England	Ollerton Roundabout	Requested the following to be included in the ES for Ollerton Roundabout: Assessment of the likely impacts on the geodiversity interests of geological sites. Proposals for mitigation of any impacts and if appropriate, compensation measures. Contact with the geo-conservation group or local sites body in this area for further information.	The comments have been noted in the assessment. See Volume 1A: Table 9.1, Section 9.5 and Section 9.7.
	Mickledale Lane Junction and Lowdham Roundabout	Natural England request the following to be included in the ES for Mickledale Lane Junction and Lowdham Roundabout: Assessment of the impact of the proposals on non-statutory sites, for example Regionally Important Geological and Geomorphological Sites (RIGS). Contact with local RIGS group.	The comments have been noted in the assessment. See Volume 1B: Table 9.1, Section 9.5 and Section 9.7 and Volume 1C: Table 9.1, Section 9.5 and Section 9.7.
	Ollerton Roundabout, Mickledale Lane Junction, Lowdham Roundabout	Impacts from the development should be considered in light of the Government's policy for the protection of the best and most versatile (BMV) agricultural land as set out in paragraph 170 and 171 of the NPPF.	The comments have been noted in the assessment. See Volumes 1A, 1B and 1C: Table 9.1, Section 9.5 and Section 9.7.

9.3 Assessment Methodology

Study Area

- 9.3.1 For the purposes of the geology and soils assessment, the study areas include the extents of each scheme and the associated temporary works, as defined by the geology and soils assessment boundaries and a buffer of 250 m from the boundaries. However, any baseline information related to soil geochemistry is limited to the assessment boundaries only.
- 9.3.2 In the case of controlled waters receptors, the study areas have been extended to include relevant features within 1 km of the assessment boundaries. This includes groundwater Source Protection Zones (SPZ), water abstractions, discharge consents and surface water receptors. It is noted that surface water receptors could potentially be impacted by the schemes over greater distances than 1 km downstream. This has been taken into consideration in the assessments, where relevant.
- 9.3.3 Further detail regarding the scheme specific study areas can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 9.3.4 The proposed methodology for the geology and soils assessments is based on the guidance in DMRB LA 109 Geology and Soils, DMRB LA 113 Road Drainage and the Water Environment (Highways England, 2020f) and DMRB LA 104.
- 9.3.5 In addition to the DMRB guidance, the proposed methodology takes account of relevant UK guidance related to contaminated land assessment, as outlined in Section 9.1.9.
- 9.3.6 The proposed methodology also takes account of relevant UK guidance on the protection of soil resources, in particular, TIN049 (Agricultural Land Classification: protecting the best and most versatile (BMV) agricultural land). This guidance sets out the requirement for Natural England to consider proposals which individually or collectively involve the loss of more than 20 hectares (ha) of BMV agricultural land. BMV land is defined as land in grades 1, 2 and 3a of the agricultural land classification (ALC).
- 9.3.7 The methodologies for determining construction effects and operational effects are presented in the individual Scheme reports, Volume 1A – Volume 1D.
- 9.3.8 The project-wide geology and soils effects have been assessed qualitatively, in line with the methods outlined in the Scheme specific assessments.

9.4 Baseline Conditions

- 9.4.1 Baseline conditions have been determined for each scheme using Phase 1 desk studies, prepared by Via EM and the initial results of agricultural land quality (ALC) and soil resource surveys, carried out by Land Research Associates (LRA).
- 9.4.2 The initial findings of intrusive ground investigations, carried out by Nicholls Colton Group at Ollerton Roundabout and Kirk Hill Junction, have also been used to inform the baseline conditions for the relevant schemes.
- 9.4.3 Further detail regarding the scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

9.5 Design and Mitigation

- 9.5.1 The Project has been designed as far as possible, to avoid and minimise impacts and effects on geology and soils through the process of design development and embedded mitigation as described in Chapter 3: Assessment of Alternatives.
- 9.5.2 A summary of additional mitigation required as identified through the assessment of the individual Schemes is provided below.

Table 9-2 Additional Mitigation Measures

Receptor	Additional Mitigation	Design / Implementation
Geology	None required.	N/A
Soil resources	<p>Prior to commencing construction works, agricultural / valuable topsoil and, if required, subsoil would be excavated from the temporary work areas and would be stockpiled for use in restoration of the land on completion of the temporary works. Topsoil and subsoil would not be mixed together.</p> <p>Prior to commencing construction works, valuable SSSI / LNR soil resources from areas of permanent loss at Ollerton Roundabout would be stripped and stockpiled for use in ecological / landscaping areas.</p>	The mitigation measures would be determined within a soil resources plan.
Human health	Additional mitigation may be required if significant contamination is identified that presents a risk to one or more receptors.	<p>Geo-environmental ground investigations will be carried out for each Scheme in advance of any development works. Environmental risk assessments will be carried out to identify any additional mitigation measures required prior to construction.</p> <p>In the event that any unexpected contamination is identified, a remediation strategy will be prepared by a geo-environmental specialist. This will be implemented on-site by the contractor, or a suitably qualified contaminated land consultant.</p>
Controlled waters	Aquifer protection measures would be used if deeper excavations are required, subject to Scheme-specific risk assessment. This could include, for example, measures to ensure that potentially contaminated materials are not smeared or mixed into the natural aquifers at depth and measures to prevent increased migration pathways forming between the ground surface and the underlying groundwater.	Geo-environmental ground investigations will be carried out at each Scheme in advance of any development works. Environmental risk assessments will be carried out to identify any additional mitigation measures required prior to construction.

- 9.5.3 Further detail regarding the Scheme-specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

9.6 Project Wide Likely Significant Effects

Construction

- 9.6.1 The potential geology and soils effects identified during construction are described in Table 9-3. The magnitude of impact and significance are based on the possible effects in the absence of any specific mitigation measures for geology and soils effects.

9.6.2 The significance is based on the matrix in Table 4-3. However, in some cases the significance falls between two levels (e.g. a minor impact on a high sensitivity receptor could have a slight or moderate effect). In these cases, one level of significance has been selected, with justification for that decision included in Table 9-3.

Table 9-3 Project Wide Effects – Construction

Description of Effect	Individual Classification	Project Wide Significance
Permanent damage to BMV agricultural soil resources during construction works.	The significance of effects for the Schemes are moderate adverse.	<p>The impacts on the receptor would be worse due to the larger area of land affected.</p> <p>The environmental sensitivity for the Project is high (due to the presence of largely Grade 3a land within the schemes). The magnitude of impact is minor adverse.</p> <p>The significance of the effect is considered to be moderate adverse (not slight adverse) due to potential unnecessary loss of soil resources. This effect is significant.</p>
Temporary loss of 3.49 ha agricultural land, compared with the existing baseline, including BMV land.	The significance of effects for the Schemes are slight adverse.	The Schemes would not be constructed at the same time. Therefore, there no project wide effects.
Permanent loss of approximately 3.47 ha of agricultural land, compared with the existing baseline, including BMV land.	The significance of effects for the Schemes range from slight adverse to moderate adverse.	<p>The impacts on the receptors would be worse due to the larger area of land affected.</p> <p>The initial findings of the ALC surveys indicate that the agricultural land lost would be largely Grade 3a land.</p> <p>Based on the above:</p> <ul style="list-style-type: none"> ▪ the environmental sensitivity for the Project is high; and ▪ the magnitude of impact is moderate adverse. <p>The significance of the effect is considered to be moderate adverse (not large adverse) due to relatively limited loss of land. This effect is significant.</p>
Impacts on residents within the study areas from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are slight adverse.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Impacts on future consumers of agricultural produce (e.g. crops or meat products) due to contamination of agricultural land (e.g. areas used for storage and compounds).	The significance of effects for the Schemes are slight adverse.	It is considered very unlikely that the same receptors would be affected by more than one Scheme. Therefore, there are no project wide effects.

Description of Effect	Individual Classification	Project Wide Significance
Impacts on users of surrounding businesses within the study areas from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	No significant receptors have been identified at Kirk Hill Junction. The significance of effects for the remaining Schemes are slight adverse.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Construction impacts on visitors to areas of public open space from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are slight adverse.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Construction impacts on road users within the study areas from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are slight adverse.	The Schemes would not be constructed at the same time. Therefore, there are no project wide effects.
Construction impacts on residents within the study areas from inhalation of ground gas or vapours in indoor air that may have migrated from the site.	The significance of effects for the Schemes are slight adverse.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Construction impacts on users of surrounding businesses within the study areas from inhalation of ground gas or vapours in indoor air that may have migrated from the site.	No significant receptors have been identified at Kirk Hill Junction. The significance of effects for the remaining Schemes are slight adverse.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Construction impacts on surface water receptors within the study areas from surface water run-off and / or migration of contaminated groundwater.	The significance of effects for the Schemes are slight adverse.	The Ollerton Roundabout and Mickledale Lane Schemes are hydrologically connected within the same catchment, as Rainworth Water near Mickledale Lane flows into the River Maun near Ollerton Roundabout. However, any cumulative effects on the catchment areas are considered to be minimal, due to the limited potential for contamination, the distance between the Schemes and the construction timing such that the projects would take place sequentially. Based on the above and assuming mitigation is in place: <ul style="list-style-type: none"> ▪ the environmental sensitivity for the Project is high; and ▪ the magnitude of impact is no change.

Description of Effect	Individual Classification	Project Wide Significance
		This results in a combined neutral effect.
Construction impacts on groundwater receptors within the study areas from leaching of contaminated soils, surface water run-off and / or migration of contaminated groundwater.	The significance of effects for the Schemes are slight adverse.	<p>The Schemes at Ollerton Roundabout and Mickledale Lane are both located on the Chester Formation (Sherwood Sandstone Group) which is a Principal Aquifer.</p> <p>Both sites are included within a wider SPZ 3 area; however, the closest SPZ 2 / SPZ 1 areas to the Schemes are not the same.</p> <p>Based on the distance between the two Schemes (over 4.5 km), no cumulative effects are considered plausible.</p> <p>The Schemes at Lowdham Roundabout and Kirk Hill Junction are located on lower sensitivity aquifers, which are separated by the River Trent.</p> <p>Based on the above assessment, no project wide cumulative effects are expected.</p>

Operation

9.6.3 The potential combined geology and soils effects in operation have been identified as described in Table 9-4.

Table 9-4 Project Wide Effects – Operation

Description of Effect	Individual Classification	Project Wide Significance
Impacts on agricultural land through future damage.	The significance of effects for the Schemes range from neutral to slight adverse.	The Scheme-specific assessments only identified potential adverse effects at Mickledale Lane Junction. Therefore, there are no project wide effects.
Impacts on future road users from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.
Impacts on nearby residents from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.
Impacts on visitors to areas of public open space from ingestion of contaminated particulates, dermal contact with soils	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.

Description of Effect	Individual Classification	Project Wide Significance
and / or inhalation of contaminated dust / particles.		
Impacts on future consumers of agricultural produce (e.g. contaminated crops or meat products).	The significance of effects for the Schemes are slight adverse.	It is considered very unlikely that the same receptors would be affected by more than one Scheme. Therefore, there are no project wide effects.
Impacts on users of surrounding businesses from ingestion of contaminated particulates, dermal contact with soils and / or inhalation of contaminated dust / particles.	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.
Impacts on future road users from inhalation of ground gas or vapours.	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.
Impacts on adjacent residents from inhalation of ground gas or vapours migrating from the Schemes.	The effects for the individual Schemes are neutral.	The Schemes would not affect the same receptors. Therefore, there are no project wide effects.
Impacts on users of surrounding businesses from inhalation of ground gas or vapours that have migrated from the Schemes.	The significance of effects for the Schemes are neutral.	There are no project wide effects as all Schemes are assessed to be neutral.
Impacts on the surface water receptors from surface water run-off and / or migration of contaminated groundwater.	The significance of effects for the Schemes range from neutral to slight adverse.	<p>The Ollerton Roundabout and Mickledale Lane Schemes are hydrologically connected within the same catchment, as Rainworth Water near Mickledale Lane flows into the River Maun near Ollerton Roundabout. However, any cumulative effects on the catchment areas are considered to be minimal, due to the limited potential for contamination, the distance between the Schemes and the construction timing such that the projects would take place sequentially.</p> <p>Based on the above, and assuming mitigation is in place:</p> <ul style="list-style-type: none"> ▪ the environmental sensitivity for the Project is high; and ▪ the magnitude of impact is no change. <p>This results in a combined neutral effect.</p>

Description of Effect	Individual Classification	Project Wide Significance
Impacts on aquifers from leaching of contaminated soils, surface water run-off and / or migration of contaminated groundwater.	The significance of effects for the Schemes range from neutral to moderate adverse.	<p>The Schemes at Ollerton Roundabout and Mickledale Lane Junction are both located on the Chester Formation (Sherwood Sandstone Group) which is a Principal Aquifer.</p> <p>Both sites are included within a wider SPZ 3 area; however, the closest SPZ 2 / SPZ 1 areas to the Schemes are not the same.</p> <p>Based on the distance between the two Schemes (over 4.5 km), no cumulative effects are considered plausible.</p> <p>The Schemes at Lowdham Roundabout and Kirk Hill Junction are located on lower sensitivity aquifers, which are separated by the River Trent.</p> <p>Based on the above assessment, no project wide cumulative effects are expected.</p>

9.7 Additional Mitigation and Monitoring

- 9.7.1 The cumulative assessment has not identified any additional mitigation requirements, above the measures outlined in Table 9-2.
- 9.7.2 The permanent loss of approximately 3.47 ha of agricultural land to construct the Schemes cannot be mitigated. Most of this land (2.69 ha) would be lost at Mickledale Lane Junction. The remaining 0.78 ha of loss is divided between the other three Schemes and is not considered to be significant individually.

9.8 Summary of Project Wide Significant Residual Effects

- 9.8.1 The project wide significant residual effects are summarised in Table 9-5.
- 9.8.2 The significance is based on the matrix in Table 4-3. However, in some cases the significance falls between two levels (e.g. a minor impact on a high sensitivity receptor could have a slight or moderate effect). In these cases, one level of significance has been selected, with justification for that decision included in Table 9-5.

Table 9-5: Summary of Project Wide Significant Residual Effects

Description of Significant Effect	Sensitivity of Receptor	Nature of Effect / Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Construction						
Permanent loss of approximately 3.47 ha of agricultural land, compared with the existing baseline, including BMV land.	High	Loss or damage to soil resources project wide.	Moderate (adverse)	Moderate adverse (due to relatively limited total area of loss)	No additional mitigation proposed.	Moderate adverse
Complete and Operational						
None						

10. NOISE AND VIBRATION

10.1 Introduction

- 10.1.1 This chapter provides the overview of effects on noise and vibration that are anticipated as a result of the Project when considering all Schemes in-combination.
- 10.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 10.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 10.9 of this chapter.
- 10.1.4 The assessment for noise and vibration was undertaken in accordance with DMRB LA 111 Noise and Vibration (Highways England, 2020e).

10.2 Legislative and Policy Framework

Legislation

- 10.2.1 Legislation relevant to the Project consists of the following:
- Environmental Noise (England) Regulations 2006 (as amended) (HMSO, 2006b);
 - Noise Insulation Regulations 1975 (as amended 1988) (HMSO, 1988);
 - Land Compensation Act 1973 (HMSO, 1973); and
 - Control of Pollution Act 1974 (HMSO, 1974).

Environmental Noise (England) Regulations 2006 (as amended)

- 10.2.2 These Regulations transposed the EU Environmental Noise Directive (2002/49/EC), into UK law, and under these Regulations, Noise Action Plans have been published by Defra informed by the strategic noise mapping process. The first round of mapping was completed in 2007, the second round in 2012 and the third round in 2017. Noise Important Areas (NIAs), which are those areas most exposed to noise, have been identified in Noise Action Plans, published by Defra and are the First Priority locations to be investigated by the responsible highway authority.

Noise Insulation Regulations 1975

- 10.2.3 The NIR 1975 were made under Part II of The Land Compensation Act 1973. Regulation 3 imposes a duty, and Regulation 4 a power, on the relevant highway authority to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings affected by a new or altered highway. This is subject to meeting a range of criteria relating to road traffic noise levels and distance from the works as specified in these regulations. Regulation 5 also provides discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings with respect to construction noise.

Land Compensation Act 1973

- 10.2.4 In general, noise and vibration are recognised as both a common law nuisance (either private or public) and a statutory nuisance. However, this does not apply to noise and vibration from road traffic. As a result, the Land Compensation Act 1973 and The Noise Insulation Regulations (NIR) 1975 (as amended 1988) are used in respect of road traffic noise.
- 10.2.5 The Land Compensation Act 1973 Part I provides a means by which compensation can be paid to owners of land or property which has experienced a loss in value caused by the use of public works, such as new or altered roads. Noise and vibration are two of the factors which would be considered in any claim for compensation; however, the claim should consider all changes and effects, including betterment.

Control of Pollution Act 1974

- 10.2.6 Under Section 60 of the Control of Pollution Act 1974 (CoPA) the local authority can serve a notice specifying how construction works should be carried out, including working hours and noise/ vibration limits. Breaching the terms of the notice is an offence.
- 10.2.7 Section 61 of the CoPA allows the contractor undertaking demolition or construction works to apply in advance to the local authority for 'prior consent' to undertake the works.

National Policy and Guidance

- 10.2.8 National planning policy relevant to the Project consists of the following:
- the NPPF (Ministry of Housing, Communities and Local Government (MHCLG), 2021); and
 - Noise Policy Statement for England (NPSE) (Defra, 2010).

National Planning Policy Framework

- 10.2.9 The NPPF aims to ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so the planning policies and decisions should:
- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; and
 - identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Noise Policy Statement for England

- 10.2.10 The NPSE sets out the Government's policy on noise and includes the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by an effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development to:
- avoid significant adverse impacts on health and quality of life;
 - mitigate and minimise adverse impacts on health and quality of life; and

- where possible, contribute to the improvement of health and quality of life.

10.2.11 NPSE sets out the definition of the following concepts to aid in the establishment of significant noise effects:

- No Observed Effect Level (NOEL) - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;
- Lowest Observed Adverse Effect Level (LOAEL) - This is the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - This is the level above which significant adverse effects on health and quality of life occur.

10.2.12 The NPSE recognises that “it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations”. The levels are likely to be different for different noise sources, for different receptors and at different times of the day. The assessment methodology presented in Section 10.4 outlines the LOAEL and SOAEL used herein for each potential impact.

Local Planning Policy

10.2.13 Local planning policy relevant to the Project consists of the following:

- Nottinghamshire Local Transport Plan 2011-2026;
- NSDC, the Amended Core Strategy Development Plan Document DPD (adopted March 2019); and
- RBC Local Plan Part 2: Local Planning Policies, (Adopted October 2019).

Nottinghamshire Local Transport Plan 2011-2026

10.2.14 The Nottinghamshire Local Transport Plan 2011-2026 prioritises the introduction of highway measures that reduce noise in areas where there are high levels of road traffic and significant noise sensitive properties affecting a high number of people. However, greater priority will be given to measures that will lead to both the biggest noise benefits and other transport objectives (such as tackling congestion and encouraging active travel) as it is essential to ensure that resources are targeted appropriately.

Newark and Sherwood District Council Amended Core Strategy

10.2.15 NSDC’s Amended Core Strategy DPD does not contain any specific policies relating to noise. However, Spatial Policy 7 states “*The Council will encourage and support development proposals which promote an improved and integrated transport network*” and that “*development proposals should contribute to, the implementation of the Nottinghamshire Local Transport Plan*” and “*should avoid highway improvements which harm the environment and character of the area*”.

Rushcliffe Borough Council Local Plan Part 2: Local Planning Policies

10.2.16 RBC Local Plan Part 2: Local Planning Policies, (Adopted October 2019) contains two policies relevant to this assessment. Policy 39 – Health Impacts of Development and Policy 40 – Pollution and Land Contamination. Policy 39 states “*The potential for achieving positive health outcomes will be taken into account when considering development proposals. Where any significant adverse impacts are identified, the applicant will be expected to demonstrate how these will be addressed and mitigated*”

10.2.17 Policy 40 states “Noise can be an unwanted intrusion that adversely impacts on quality of life, affecting an individual’s health and well-being. Commercial or industrial premises and construction sites are common sources of noise pollution and therefore a restriction on working hours often needs to be applied as part of the planning permission. Noise needs to be considered both in the context of the additional noise generated by new development and when new development would be sensitive to the prevailing acoustic environment”.

10.3 Consultation

- 10.3.1 During the consultation on the Scoping Report, the proposed methodologies were set out and the statutory consultees were invited to comment on the proposals.
- 10.3.2 No specific comments were received in relation to the noise assessment methodology within the formal Scoping Opinions or the consultee responses.
- 10.3.3 A comment was received from the NCC Ecologist regarding the potential noise impacts on sensitive ecological receptors. Project-wide effects with respect to noise impacts on ecological receptors is considered in Chapter 8: Biodiversity.

10.4 Assessment Methodology

Study Area

- 10.4.1 The study area for the construction phase noise and vibration impacts focuses on quantifying the potential impacts at the closest existing identified sensitive receptors to the various works, with some additional receptors selected to represent the impacts further away from the works. The selected receptors are collectively representative of all identified potentially sensitive receptors in the study area.
- 10.4.2 As detailed in DMRB LA 111 noise impacts from construction activities are assessed up to a maximum distance of approximately 300 m from the works, and vibration impacts up to a maximum distance of approximately 100 m from the works, as this is normally sufficient to encompass Noise Sensitive Receptors (NSRs).
- 10.4.3 For the operational phase, the study area comprises an area 600 m from the roads physically changed by the Scheme.
- 10.4.4 Further detail regarding the scheme specific study areas can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 10.4.5 The noise and vibration assessment includes the following elements:
- quantitative/qualitative assessment of construction noise and vibration impacts; and
 - quantitative assessment of operational traffic noise impacts.
- 10.4.6 Construction traffic noise was scoped out as traffic changes during construction are expected to be minimal, and construction traffic would use the Major Road Network, resulting in minimal increases in the proportion of HGVs within the traffic flows. Where short term diversions are required, these are expected to be diverted to the SRN, which would be likely to result in minor changes to traffic flows on these roads during construction.
- 10.4.7 Operational impacts resulting from vibration were scoped out of further assessment in accordance with DMRB.

- 10.4.8 Key methodology documents of relevance to the noise and vibration assessment are as follows:
- DMRB LA 111 Noise and Vibration (Highways England, 2020e);
 - Calculation of Road Traffic Noise (CRTN);
 - BS 5228-1&2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites (BSI, 2009); and
 - BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration (BSI, 1993).
- 10.4.9 DMRB LA 111 describes a standard methodology for the assessment of noise and vibration impacts during the construction and operational phases of road projects.
- 10.4.10 The CRTN is the standard method applied in the UK to assess noise from road traffic. The document defines calculation methods for assessing road traffic noise based on the following five parameters: traffic flows, percentage of heavy vehicles, the traffic speed, the gradient of the road, and the road surfaces.
- 10.4.11 BS 5228-1&2 gives recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and vibration levels. These are the standards more typically used to assess noise and vibration arising from construction activities.
- 10.4.12 Further detail regarding the scheme specific assessment methodology can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

10.5 Baseline Conditions

- 10.5.1 Potentially sensitive receptors within the study area have been determined from the OS address base dataset and OS mapping.
- 10.5.2 The vast majority of potentially sensitive receptors in the vicinity of the Project are residential properties. Non-residential potentially sensitive receptors can include educational buildings, medical buildings, facilities (such as places of worship).
- 10.5.3 The COVID-19 pandemic has resulted in variation in journey patterns compared to pre-COVID travel patterns. Therefore, traditional baseline noise measurements have not been used to validate the noise model due to potential unreliability and inaccuracy of the data.
- 10.5.4 A comparison has been made of the forecast Do Minimum Opening Year (DMOY) and Do Minimum Future Year (DMFY) to determine the change in the baseline condition. The DMOY vs DMFY has been modelled using traffic data factored to opening and future years.
- 10.5.5 Further detail regarding the scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

10.6 Design and Mitigation

- 10.6.1 The Project has been designed as far as possible, to avoid and minimise impacts and effects on noise and vibration through the process of design development and embedded mitigation as described in Chapter 3: Assessment of Alternatives.
- 10.6.2 Examples of embedded mitigation include lower speed limits and road widening, where this increases the distances between some traffic streams and NSRs.

- 10.6.3 At higher speeds, noise from the interaction between the tyre and the road surface dominates over engine noise. Noise from tyre/surface interaction is directly related to traffic speeds with lower speeds generally resulting in lower noise levels from road traffic.
- 10.6.4 Similarly, noise levels from road traffic are directly related to the distance between the traffic streams and NSRs as noise attenuates (reduces) with distance. Therefore, interventions which increase the distance between some traffic streams and NSRs may lead to corresponding reductions in traffic noise.
- 10.6.5 Additional mitigation would be required to mitigate the impact of construction noise and vibration to as low as reasonably practicable. The details of mitigation measures would be developed in conjunction with the contractor for each scheme when the design has been sufficiently developed; and included within a CEMP.
- 10.6.6 Further detail regarding the scheme specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

10.7 Project-Wide Likely Significant Cumulative Effects

- 10.7.1 There is no overlap in terms of the study areas used to assess each of the Schemes in isolation, and the same receptors are not affected by multiple Schemes.
- 10.7.2 Therefore, there are no changes to the likely significant effects for noise and vibration reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction when considering the Project as a whole.

10.8 Additional Mitigation and Monitoring

- 10.8.1 There is no requirement for any further additional mitigation for the Project, when considering the Project as a whole. The proposed mitigation (including Best Practicable Means (BPM) for noise and vibration in each Scheme can be viewed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

10.9 Summary of Project-Wide Significant Residual Effects

- 10.9.1 Significant effects are limited to the construction phase with no noise and vibration significant effects identified for the post completion, operational phase of the Project. There are no additional Project-wide effects when considering the Schemes in combination, therefore the residual significant effects are as reported within the 'Residual Effects' sections of Chapter 10: Noise and Vibration, in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

11. ROAD DRAINAGE AND THE WATER ENVIRONMENT

11.1 Introduction

- 11.1.1 This chapter provides the overview of effects on road drainage and the water environment that are anticipated as a result of the Project when considering all Schemes in-combination.
- 11.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction and Volume 1C Lowdham Roundabout. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here. Note that an assessment for Kirk Hill Junction was scoped out as per the Scoping Opinion for Kirk Hill (Appendix 1-1 in Volume 3).
- 11.1.3 Where the combined effects of the Schemes result in a worsening of the effects reported within Volumes 1A, 1B and 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 11.9 of this chapter.
- 11.1.4 The assessment for road drainage and the water environment was undertaken in accordance with DMRB LA 113 Road Drainage and the Water Environment (Highways England, 2020f).
- 11.1.5 The Project has the potential to affect water resources during both the construction and operational phases. During the construction phase, potential effects may arise from contamination of surface water and groundwater from leakage and spills of fuels, oils, chemicals and concrete. Construction works within floodplains or on drainage to watercourses have the potential to increase the rate and volume of runoff and increase the risk of blockages in watercourses.
- 11.1.6 During operation there can be effects on surface and groundwater quality from routine highway runoff or as a result of accidental spillages. There may be changes on the natural form of the landscape which may affect drainage patterns and flood potential. Flooding potential can be altered within a catchment as a result of an increase in impermeable area.

11.2 Legislative and Policy Framework

- 11.2.1 The key legislation relevant to the road drainage and the water environment assessment includes:
- The Water Act 2014 (HMSO, 2014);
 - The Floods and Water Management Act 2010 (HMSO, 2010);
 - The Land Drainage Act 1991 (as amended) (HMSO, 1991b);
 - The Water Resources Act 1991 (HMSO, 1991a);
 - The Salmon and Freshwater Fisheries Act 1975 as amended (HMSO, 1975);
 - The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017 (HMSO, 2017c);
 - The Environmental Permitting (England and Wales) Regulations 2016 (HMSO, 2016);

- The Environmental Damage (Prevention and Remediation) Regulations 2015 (HMSO, 2015a);
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (HMSO, 2015b);
- The Eels (England and Wales) Regulation 2009 (HMSO, 2009b);
- The Groundwater (England and Wales) Regulations 2009 (HMSO, 2009a);
- The Control of Pollution (Oil Storage) (England) Regulations 2001 (HMSO, 2001); and
- The Flood Risk Regulations 2009 (HMSO, 2009c).

Planning Policy and Guidance

National Planning Policy Framework

11.2.2 The NPPF (MHCLG, 2021a) contains a number of statements which are relevant to water resources and flood risk. These include: making use of underdeveloped land in mitigating flood risk; taking a proactive approach to mitigating and adapting to climate change taking into account the long-term implications for flood risk, coastal change and water supply; taking full account of flood risk in the planning system including planning for climate change; and that development should not cause unacceptable levels of water pollution and should help improve water quality wherever possible.

11.2.3 The requirements of the NPPF have been taken into account in the assessment, with particular regard given to potential impacts in relation to flood risk and water quality. Planning and flood risk is presented in paragraph 159 to 169. The need to assess water quality is included within chapter 15 Conserving and enhancing the natural environment. Paragraph 174 states that planning policies and decisions should contribute to and enhance the natural and local environment.

National Planning Practice Guidance

11.2.4 National PPG (MHCLG, 2021b) provides guidance for local planning authorities on assessing the significance of water environment effects of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development. The assessment presented in this chapter has due regard to this guidance.

The Government's Future Water Strategy

11.2.5 This sets out the Government's long-term vision for water and the framework for water management in England (Defra, 2018b). It includes sustainable management of the water environment and water quality, to ensure no compromise in environmental quality of future generations.

A Green Future: Our 25 Year Plan to Improve the Environment Water Strategy

11.2.6 In 2018 Defra published the 25 Year Environment Plan (Defra, 2018a). The Plan includes specific goals to reduce the environmental impact of water abstraction, meet the objectives of River Basin Management Plans (RBMP) under the WFD, reduce leakage from water mains, improve the quality of bathing waters, restore protected freshwater sites to a favourable condition, and do more to protect communities and businesses from the impact of flooding, coastal erosion and drought.

River Basin Management Plan

- 11.2.7 The Humber River Basin District RBMP (Defra, 2016) sets out how organisations, stakeholders and communities should work together to improve the water environment.

Local Policy

- 11.2.8 Newark and Sherwood Local Development Core Strategy and Allocations (adopted March 2019) contains Core Policy 9 (NSDC, 2019). This promotes sustainable design as part of the Development Management Process, and to increase the number of developments with Sustainable Urban Drainage (SuDS).
- 11.2.9 Core Policy 10 relates to Climate Change. New development should be steered away from areas at highest risk of flooding. New development should positively manage its surface water runoff through the design or layout of development to ensure that there is no unacceptable impact in run-off into surrounding areas or the existing drainage regime.

11.3 Consultation

- 11.3.1 The EIA Scoping Report was submitted in June 2021. Scoping responses have been received from Environment Agency and the NCC as the Lead Local Flood Authority. These are tabulated below for the three Schemes. Copies of the Scoping Opinions and consultee comments can be found in Appendix 1-1 and Appendix 4-1 of Volume 3. A summary of the water environment related response is included in Table 11-1.

Table 11-1 Scoping Response Summary - Road Drainage and the Water Environment

Stakeholder Junction	Comment raised	Response and where address in the ES
Environment Agency Ollerton	<p>A detailed FRA will be required which needs to contain a plan identifying rivers and water bodies, a topographical survey of the existing and proposed site levels, information about historical flood risk, and the flood risk from all sources.</p> <p>The site overlies alluvium and Chester Sandstone Formation, Secondary A and Principal aquifers respectively. The site also lies within a Source Protection Zone 3.</p> <p>Drainage strategies were not available at the time of writing the scoping report (June 2021). It is very important that the drainage schemes are considered thoroughly within the EIA given the highly sensitive nature of the groundwater beneath the site.</p> <p>Chapter 10 (in the scoping report) indicates that areas of infilled land may exist at the site, together with potential coal mining waste. Furthermore, the proposed scheme encroaches onto the fuel station site These areas will be investigated in a Phase 2 site investigation that is planned for the scheme. This will include a controlled waters risk assessment.</p>	<p>A Flood Risk Assessment is included in Appendix 4-3 of Volume 3. This includes the drainage strategy document.</p> <p>A preliminary risk assessment for controlled waters has been undertaken based on the preliminary conceptual model within Appendix 9-1 in Volume 3A. A controlled waters risk assessment would be undertaken in advance of construction work. Chapter 9: Geology and Soils also includes assessment of the Phase 2 geo-environmental ground investigation.</p>
NCC (Scoping Opinion) Ollerton	<p>Consultee states a Flood Risk Assessment is required, and also the need for a controlled waters risk assessment with regard to groundwater.</p>	<p>A Flood Risk Assessment is included in Appendix 4-3 of Volume 3.</p>
Environment Agency Mickledale Lane Junction	<p>The Environment Agency draws attention to controlled water protection.</p> <p>The site overlies Chester Sandstone Formation, which are Secondary A and Principal aquifers respectively.</p> <p>Zone 1 of an SPZ (inner protection zone) for a public water supply is located within the study area, approximately 150 m west of the Scheme junction. Most of the site is located within a Drinking Water Safeguard Zone for groundwater. This relates to the public water supply to the west of the Scheme. A Phase 2 site investigation will include a controlled waters risk assessment.</p>	<p>A preliminary risk assessment for controlled waters has been undertaken based on the preliminary conceptual model within Appendix 9-1 in Volume 3A. A controlled waters risk assessment would be undertaken in advance of construction work. Chapter 9: Geology and Soils also includes</p>

Stakeholder	Junction	Comment raised	Response and where address in the ES
			assessment of the Phase 2 geo-environmental ground investigation.
NCC (Scoping Opinion)	Mickledale Lane Junction	NCC advise that a Flood Risk Assessment and surface water drainage strategy are required as part of any EIA for the Scheme.	A Flood Risk Assessment is included in Appendix 4-3 of Volume 3.
Environment Agency	Lowdham Roundabout	<p>The Environment Agency draws attention to matters to be considered in the FRA.</p> <p>A detailed FRA will be required which needs to contain a plan identifying rivers and water bodies, a topographical survey of the existing and proposed site levels, information about historical flood risk, and the flood risk from all sources.</p> <p>Furthermore the FRA should also assess, as a minimum the potential impacts of both temporary and permanent works, storage of any excavated material, with any temporary placement to ensure it does not impede flood water, potential impacts of climate change, impacts of ongoing of future EA flood risk management scheme such as the Lowdham Recovery Works project, breach/overtopping, impact of ground level raising, whether compensation is required, any impact on EA assets, any impact on flood flow route, requirements for mitigation, surface water runoff rates before and post development and how surface water runoff will be discharged.</p> <p>The EA recently updated the allowances for peak river flow and FRA climate change allowances following research completed in 2020.</p>	A Flood Risk Assessment for Lowdham Roundabout is included in Appendix 4-3 of Volume 3.
NCC (Scoping Opinion)	Lowdham Roundabout	<p>The NCC letter draws attention to the EA point as shown above.</p> <p>Attention is drawn to the County Council's adopted Guidance Note on the Validation Requirement for Planning Applications which sets out the national and local information requirements for planning applications.</p>	A Flood Risk Assessment for Lowdham Roundabout is included in Appendix 4-3 of Volume 3.

11.4 Assessment Methodology

Study Area

- 11.4.1 For the purposes of the water resource (flow and quality) assessment, a study area of approximately 1 km around the assessment boundaries of each of the Schemes has been considered, in order to identify surface and groundwater bodies that could reasonably be affected directly (i.e. there is a pathway between the Scheme and the waterbody).
- 11.4.2 Consideration has also been given to any attributes of surface water or groundwater bodies or water dependent ecological sites outside this study area, as pollutants can propagate downstream. Professional judgment has been applied to identify the extent to which such features are included.
- 11.4.3 For each Scheme, the flood risk study area comprises the Environment Agency flood zones along the watercourses that may be affected by the Scheme. The Environment Agency designates flood risk zones on the basis of the annual probability of a flood event to occur as follows:
- Zone 1 is less than 0.1% annual probability of flood risk (i.e. a very low risk of flooding).
 - Zone 2 between 0.1 - 1% annual probability of flood risk (i.e. a low risk of flooding).
 - Zone 3 is more than 1% annual probability of flood risk (i.e. a medium risk of flooding).
- 11.4.4 The flood risk study area includes the extents of watercourses, 1 km upstream and 1 km downstream of the crossing locations. For Lowdham Roundabout, the use of hydraulic modelling uses a wider area, with approximately 2.6 km upstream and 2.8 km downstream from the roundabout area.

Methodology

- 11.4.5 The methodology for the road drainage and water environment assessment follows the guidance set out within the DMRB LA 113. The assessment includes the following elements:
- Evaluation of receptor importance on the basis of Table 3.70 in LA 113;
 - Evaluation of magnitude of impact, on the basis of Table 3.71 in LA 113; and
 - Combining the two points above using the matrix within Table 4.1 in LA 104 to determine the likely effects, and their significance.
- 11.4.6 Further detail regarding the Scheme specific assessment methodology can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction and Volume 1C Lowdham Roundabout.

11.5 Baseline Conditions

- 11.5.1 The importance of the various water resource parameters is stated in the individual chapters Section 11.5 in Volumes 1A, 1B and 1C.
- 11.5.2 Generally the surface watercourses are of high importance for quality and hydromorphology, with the groundwater being of high importance for Ollerton Roundabout, very high for Mickledale Lane Junction, and medium for Lowdham Roundabout.

- 11.5.3 The flood risk importance varies according to the individual junctions and topographies.
- 11.5.4 Further detail regarding the Scheme specific baseline conditions can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction and Volume 1C Lowdham Roundabout.

11.6 Design and Mitigation

- 11.6.1 The risk of significant, acute pollution to watercourses is greatest during the construction stages of the Project, particularly works within and adjacent to water bodies. Pollution may arise directly from spillages of oil or other polluting chemical substances, or from site runoff containing high levels of suspended solids from hard standing, other sealed surfaces (including compacted earth), and washed off from construction machinery or from the direct disturbance of river bed and banks.
- 11.6.2 Prior to construction starting on site, a CEMP would be prepared by the Principal Contractor. The CEMP would outline the measures necessary to avoid, prevent and reduce adverse effects where possible upon the local surface water and groundwater environment.
- 11.6.3 The CEMP would be standard procedure for the Project and will describe the principles for the protection of the water environment during construction. It would include a Water Management Plan (WMP) that would be included as a technical appendix. The WMP will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse impacts during construction.
 - 11.6.3.1 In order to manage operational impacts, the Project has been designed as far as possible, to avoid and minimise impacts and effects on road drainage and the water environment through design development. Further detail regarding the Scheme-specific design and mitigation can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction and Volume 1C Lowdham Roundabout.

11.7 Project-Wide Likely Significant Effects

Construction

- 11.7.1 Ollerton Roundabout and Mickledale Lane Junction are located within the same Operational Catchment (Idle and Torne Management Catchment) within the river basin management plan for the area. However, as the Mickledale Lane Junction is upstream of the Ollerton Roundabout Scheme, and both would not be constructed at the same time; there are not likely to be any combined effects during construction.
- 11.7.2 Lowdham is located within the Trent and Lower Erewash Operational catchment and therefore is unlikely to interact with the same receptors as the Ollerton Roundabout and Mickledale Lane Junction Schemes. There would be no combined effects during construction of this Scheme with the others.
- 11.7.3 There are considered to be no Project-wide significant effects during construction.

Operation

- 11.7.4 There are considered to be no Project-wide significant effects during operation. The Schemes are designed to independently manage the effects on the water environment such that there are no inter-dependencies and therefore not likely to be any cumulation of effects.

11.8 Additional Mitigation and Monitoring

- 11.8.1 In accordance with DMRB LA 104, as there are no significant adverse effects, there is no requirements for additional mitigation and monitoring.

11.9 Summary of Project-Wide Significant Residual Effects

- 11.9.1 The residual effect of the Project is considered to be 'not significant' for road drainage and the water environment for both the construction and operational phases. The residual effects that are not significant remain as reported within the individual assessments within Volumes 1A, 1B and 1C.

12. CLIMATE

12.1 Introduction

- 12.1.1 This chapter provides the overview of effects on climate that are anticipated as a result of the Project when considering all Schemes in-combination.
- 12.1.2 This Project-wide assessment draws upon the Scheme-specific assessments reported in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction. The detailed methodology, baseline, embedded and additional mitigation for each Scheme can be found within these volumes and is not repeated in full here.
- 12.1.3 Where the combined effects of the Schemes would result in a worsening of the effects reported within Volumes 1A to 1D, additional mitigation has been identified where possible. A summary of the overall likely significant effects is provided in Section 10.9 of this chapter.
- 12.1.4 The assessment for climate was undertaken in accordance with DMRB LA 114 Climate (Highways England, 2021).

12.2 Legislative and Policy Framework

- 12.2.1 The assessment for climate has been undertaken taking into account relevant legislation and guidance set out in national, regional and local planning policy (summarised in the sections below). The legislation and policy requirements have informed the preparation of this ES chapter and the Scheme-specific assessments that can be found in Volumes 1A to 1D.

International and National Legislation

Town and Country Planning (EIA) Regulations 2017 (as amended)

- 12.2.2 The EIA Directive 2011/52/EU sets out the requirement to undertake an EIA. Directive 2011/52/EU was amended by Directive 2014/92/EU (Official Journal of the European Union, 2014). The amendments included the introduction of an express requirement to describe the likely significant effects resulting from the impact of a development on climate change. The amendment also requires the vulnerability of the Project to climate change to be considered. The EIA Directive still applies to UK law through the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 (SI 2018/1232) (HMSO, 2018a).

Change Act 2008 (2050 Target Amendment) Order 2019

- 12.2.3 The Climate Change Act 2008 (HMSO, 2008) (hereafter referred to as the 'Act') provides a framework to meet the UK's greenhouse gas (GHG) emission reduction goals through legally binding national carbon emission caps within five-year periods. The Act was amended in 2019 to revise the existing 80% reduction target and legislate for net zero emissions by 2050 (HMSO, 2019).
- 12.2.4 A trajectory for the UK to achieve its carbon reduction targets is set out through a series of 5-year carbon budgets (Committee on Climate Change, 2020), which provide maximum emissions limits for greenhouse gas emissions. The five carbon budgets currently legislated by parliament cover up to the period ending 2032 and align with the previous target requiring an 80% reduction in emissions by 2050 based on a 1990 baseline.
- 12.2.5 As a result of the amended 2050 carbon reduction target to net zero carbon, the Committee on Climate Change have recommended the 6th carbon budget at 968

MtCO₂e over the 5-year period 2033-2037. This is consistent with the UK's net zero pathway, was adopted into legislation by June 2021.

- 12.2.6 It was also announced in the 6th Carbon Budget Report (2020) that the Committee on Climate Change has advised the UK to commit into law to delivering a 78% reduction by 2035.

Paris Agreement and CoP 26

- 12.2.7 The Paris Agreement is a legally binding agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020 (UNFCCC, 2015). It requires all signatories (including the UK) to strengthen their climate change mitigation efforts to keep global warming to well below 2°C this century and to pursue efforts to limit global warming to 1.5°C. The UNFCCC Conference of Parties (CoP) 26 held in Glasgow in 2021 agreed an action to revisit and strengthen the 2030 targets in nationally determined contributions by the end of 2022 (UNFCCC, 2021).

National Planning Policy and Guidance

National Planning Policy Framework

- 12.2.8 At a national level, the UK Government published an update to the NPPF in 2021 (MHCLG, 2021a). The NPPF supersedes previous national PPGs and PPSs. The NPPF summarises in a single document the Government planning policies for England, and how these are expected to be applied. Policies of relevance to climate change and sustainability assessment as presented herein include those achieving sustainable development and meeting the challenge of climate change. The NPPF (para 152) states that:

“the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk.... It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.”

National Planning Practice Guidance

- 12.2.9 The national PPG (DCLG, 2019) was published on the 6 March 2014 to provide more in-depth guidance to the NPPF. The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. As such, the PPG was amended in July 2017 to reflect the updated EIA Regulations, and further updated in 2019 and 2021.

Local Planning Policy and Guidance

- 12.2.10 NSDC have reviewed the Local Development Framework. Core Policy 10 of the Amended Core Strategy (NSDC, 2019) focuses on climate change: The District Council will work with partners and developers to:

“Mitigate the impacts of climate change through ensuring that new development proposals minimise their potential adverse environmental impacts during their construction and eventual operation. New proposals for development should therefore:

- *Ensure that the impacts on natural resources are minimised and the use of renewable resources encouraged; and*

- *Be efficient in the consumption of energy, water and other resources.*”

12.2.11 RBC published Part 1 of the Rushcliffe Local Plan in 2014. A core spatial strategy objective of the plan is:

“Environmentally responsible development addressing climate change: to reduce the causes of climate change and to minimise its impacts, through locating development where it can be highly accessible by sustainable transport, requiring environmentally sensitive design and construction, reducing the risk of flooding, and promoting the use of low carbon technologies.”

12.2.12 Policy 2 - Climate Change:

“All development proposals will be expected to mitigate against and adapt to climate change, and to comply with national and local targets on reducing carbon emissions and energy use, unless it can be clearly demonstrated that full compliance with the policy is not viable or feasible.

Development will be expected to demonstrate the following:

a) how it makes effective use of sustainably sourced resources and materials and minimises waste and water use;

b) how it is located, laid out, sited and designed to withstand the long-term impacts of climate change, particularly the effect of rising temperatures, sustained periods of high temperatures and periods of intense rain and storms;

c) that the building form and its construction allows for adaptation to future changes in climate; and

d) that the building form and its construction permits further reduction in the building’s carbon footprint where feasible and viable.

Development should demonstrate how carbon dioxide emissions have been minimised in accordance with the following energy hierarchy:

a) Using less energy through energy efficient building design and construction, including thermal insulation, passive ventilation and cooling;

b) Utilising energy efficient supplies, including connection to available heat and power networks;

c) Maximising use of renewable and low carbon energy systems.”

12.2.13 NCC, RBC and NSDC have all formally declared a climate emergency.

Other Relevant Policy, Standards and Guidance

12.2.14 This climate assessment has been undertaken in accordance with the following guidance:

- The British Standards Institution (BSI) (2016). PAS 2080 Carbon Management in Infrastructure;
- Highways England (2021). DMRB Guidance LA 114 for assessing climate in sustainability and environmental appraisal;
- European Commission (2013). Guidance on Integrating Climate Change and Biodiversity into EIA;
- European Commission (2017). EIA of Projects: Guidance on the preparation of the EIA Report;

- European Commission (2010). Guidance for the Calculation of Land Carbon Stocks provides a methodology for calculating carbon stocks from land use;
- IEMA (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance;
- IEMA (2020); Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation;
- The Department for Business, Energy and Industrial Strategy (BEIS) provides GHG emission factors for UK-based organisations (BEIS, 2020);
- The British Standards Institution (BSI) BS EN ISO 14064-1:2019 and 14064-2:2019 specifications for organisational-level and project-level guidance for the quantification and reporting of GHG emissions and removals (BSI, 2019a and 2019b);
- The World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) GHG Protocol provides overarching guidance on developing GHG inventories and reporting standards (WRI & WBCSD, 2015); and
- The Inventory of Carbon & Energy (ICE) database (The University of Bath, 2019) has been used to source appropriate carbon factors to estimate the embodied carbon of materials used for construction of the Project. The ICE database uses some material property data from the Chartered Institution of Building Services Engineers (CIBSE).

12.3 Consultation

12.3.1 A summary of the climate related responses received in the Scoping Opinion is included in Table 12-1.

Table 12-1: Comments raised in Scoping Opinion

Stakeholder	Comment raised	Response Provided in the ES / Planning Application
NCC	<p>As part of the greenhouse gas impact assessment consideration should be given to the impact of emissions arising from increased traffic growth and potential to ease congestion.</p> <p>The need for accurate modelling of greenhouse gas emissions identified by Nottinghamshire Wildlife Trust should be noted.</p>	<p>As noted in the Transport Assessment Report (AECOM, 2021), the Project is designed to relieve congestion, and results in very limited re-routing of traffic or significant traffic growth.</p> <p>During operation it is anticipated that the operation of associated road, signalling and maintenance (including resurfacing) would be similar to the baseline scenario.</p>
Nottinghamshire Wildlife Trust	<p>In the face of the climate emergency, it is essential that accurate modelling for changes in GHG emissions are undertaken in advance, and that NCC considers how they could be reduced through this scheme.</p>	<p>The nature of the assessment ensures that greenhouse gas emissions related to the Project are modelled as per the methodology in Section 0.</p>

12.4 Assessment Methodology

Study Area

- 12.4.1 The identified receptor for GHG emissions is the global climate. As the effects of GHGs are not geographically constrained, “*any GHG emissions might be considered significant*” (IEMA, 2017) due to their combined environmental effect in the atmosphere.
- 12.4.2 The study area adopted for the GHG impact assessment covers the direct GHG emissions (those arising from construction activities undertaken within the respective option red line planning boundary) and indirect GHG emissions (those associated with construction materials, the transportation of materials and waste, and worker transportation). In order to represent the ‘global climate’ for the impact assessment, comparison is made to the UK Carbon Budgets.
- 12.4.3 The receptor for the Climate Change Vulnerability (CCV) assessment is the construction and operation of the Project itself, including associated users (construction workers and members of the public).
- 12.4.4 Further detail regarding the Scheme specific study areas can be viewed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

Methodology

- 12.4.5 The detailed plans that define the Project have been reviewed and form the basis of the assessment of likely significant effects on climate.
- 12.4.6 To align with the requirements of the EIA Regulations and DMRB LA 114, the following two separate aspects have been considered for the potential for likely significant effects:
- **Lifecycle greenhouse gas (GHG) impact assessment** – the effects on the climate of GHG emissions arising from the construction of the Project; and
 - **Vulnerability of Project to climate change assessment** – the resilience of the Project to climate change, including how the Project design would be adapted to take account for the projected impacts of climate change.
- 12.4.7 In order to assess the magnitude of the impact of the Project on the climate, GHG emissions associated with the construction of the Project have been calculated based on the methodologies discussed in Section 0 and are detailed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.
- 12.4.8 The methodology for this Project-wide assessment is consistent with the Scheme-specific assessments.

Significance of Effects - GHG

- 12.4.9 In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets (Committee on Climate Change, 2020). In the absence of sector-based or local emissions budgets, the UK Carbon Budgets can be used to contextualise the level of significance and this approach has been adopted in the present case as a cogent and reasonable basis. DMRB LA 114 states that it is considered unlikely that a project in isolation will have a significant effect on climate.

12.4.10 Both the Department of Energy and Climate Change (Department of Energy and Climate Change, 2012) and the PAS 2050 Specification (BSI, 2011) allow emissions sources of <1% contribution to be excluded from emission inventories and these inventories to still be considered complete for verification purposes. This exclusion of emission sources that are <1% of a given emissions inventory is on the basis of a 'de minimis' (relatively minimal) contribution.

12.4.11 On this basis, where GHG emissions from the Project are equal to or more than 1% of the relevant annual UK Carbon Budgets, the impact of the proposed development on the climate is considered to be of high magnitude. This is summarised in Table 12-2. Impacts that are considered to be of a high magnitude are considered to result in major adverse effects on climate as noted in Table 12-3.

Table 12-2 Magnitude criteria for GHG emissions

Magnitude Magnitude Criteria Description

High	Estimated GHG emissions from the proposed development equate to equal to, or more than 1% of total emissions across the relevant 5-year UK Carbon Budget period in which they arise
Low	Estimated GHG emissions from the proposed development equate to less than 1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise

Table 12-3 Significance of GHG Emissions

Magnitude Significance of Effect

High	Major adverse (significant)
Low	Minor adverse (not significant)

12.4.12 GHG emissions have been assessed against the relevant UK carbon budgets to determine significance. Where a project stage extends over multiple carbon budget periods, the project's GHG emissions are considered against each carbon budget for each project stage. A project is only considered to have a significant effect where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets. Consideration is given to how the Project would operate in line with the UK Government's target to achieve net zero emissions by 2050 since the current carbon budgets are based on the 80% reduction target up until 2032, the 5th carbon budget. The UK Carbon Budgets are detailed in Table 12-4, below.

Table 12-4 UK Carbon Budgets

UK Carbon Budget Period	UK Carbon Budget (MtCO ₂ e)
3rd (2018-2022)	2,544
4th (2023-2027)	1,950
5th (2028-2032)	1,725
6th (2033-2037)	965

Significance of Effects – Climate Change Vulnerability

12.4.13 The likelihood and consequences to project receptors were assessed according to Table 12-5 and Table 12-6 as per DMRB LA 114.

Table 12-5 Measure of likelihood for CCV assessment

Likelihood	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the Project (60 years) e.g. approximately annually, typically 60 events
High	The event occurs several times during the lifetime of the Project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the Project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the Project (60 years) e.g. once in 60 years.
Very low	The event can occur once during the lifetime of the Project (60 years).

Table 12-6 Measure of consequence for CCV assessment

Consequence of impact	Description
Very large adverse	National level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	National level disruption to strategic route(s) lasting more than 1 day but less than 1 week or regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Disruption to an isolated section of a strategic route lasting less than 1 day.

12.4.14 The significance of each climatic impact has been evaluated using a matrix as detailed in Table 12-7, below. Any significant conclusions are based on and incorporate confirmed design and mitigation measures, as described by DMRB LA 114.

Table 12-7 Significance matrix ('S' significant, 'NS' not significant)

		Measure of Likelihood				
		Very Low	Low	Medium	High	Very High
Measure of consequence	Very Large	NS	S	S	S	S
	Large	NS	NS	S	S	S
	Moderate	NS	NS	S	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

12.4.15 In line with the DMRB LA 114 and for the purposes of the CCV assessment, a lifespan of 60 years is used.

Baseline Conditions

12.4.16 For the purposes of the GHG emissions impact assessment, the baseline conditions are defined as the 'Do Minimum' scenario where the Project does not go ahead. The baseline for the Project comprises of existing carbon stocks and sources of GHGs within the boundary of the existing sites.

12.4.17 For the purposes of the CCV assessment, the baseline conditions are based upon historic climate change data obtained from the Met Office recorded by the closest meteorological station to the Project (Watnall).

12.4.18 Further detail regarding the Scheme specific baseline conditions can be viewed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

12.5 Design and Mitigation

12.5.1 The Project has been designed as far as possible, to avoid and minimise impacts and effects on climate through the process of design development and embedded mitigation as described in Chapter 3: Assessment of Alternatives.

12.5.2 A summary of embedded mitigation required as identified through the assessment of the individual Schemes is provided below in Table 12-8 and Table 12-9 respectively.

Table 12-8 Embedded GHG mitigation measures

Lifecycle Stage	Mitigation Measures	Delivery Mechanism
Construction	The Principal Contractor would develop and implement a plan to reduce energy consumption and associated carbon emissions. This could include the consideration of renewable and/or low or zero carbon energy sources and record percentage of savings implemented.	CEMP by the Principal Contractor.

Lifecycle Stage	Mitigation Measures	Delivery Mechanism
	Energy consumption and materials use would be recorded and reported on an ongoing basis during the construction phase.	
	<p>Where practicable, measures would be implemented to manage material resource use during construction including:</p> <ul style="list-style-type: none"> ▪ using materials with lower embodied GHG emissions and water consumption; ▪ using sustainably sourced materials; and ▪ using recycled or secondary materials. 	CEMP by the Principal Contractor.
	Where possible, the use of local construction staff to minimise commuting distances.	Construction Management Plan (CMP)
	Use of well-maintained plant, and no idling of plant or vehicles when stationary.	CMP
	Use contractors/suppliers with low emission fleet vehicles	CMP
	<p>Waste management measures to reduce wastes include:</p> <p>Agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;</p> <p>Implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which increases their risk of damage and disposal as waste;</p> <p>Attention to material quantity requirements to avoid over-ordering and generation of waste materials;</p> <p>Re-use of materials wherever feasible, e.g. re-use of excavated soil for landscaping. Concrete would be taken off-site for crushing and re-use;</p> <p>Segregation of waste at source where practical; and</p> <p>Re-use and recycling of materials off-site where re-use on-site is not practical (e.g. through use of an off-site waste segregation facility and re-sale for direct re-use or re-processing).</p>	Site Waste Management Plan (SWMP) by the Principal Contractor.
	<p>During the design phase, opportunities to reduce wastes include:</p> <p>waste arisings would be prevented and designed out where possible;</p> <p>opportunities to re-use material resources would be sought where practicable, such as the re-use of existing on-site lighting if in adequate condition; and</p> <p>where re-use and prevention are not possible, waste arisings would be managed in line with the waste hierarchy.</p>	Detailed design and SWMP

Table 12-9 Embedded climate change vulnerability mitigation measures

Lifecycle Stage	Mitigation Measures	Delivery Mechanism
Construction	The Principal Contractor would develop and implement a plan to prevent or reduce the likelihood of climatic hazards affecting construction staff and assets.	CEMP SWMP Site Safety Plan
	Net gain of biodiversity through retained, enhanced or created habitats through landscaping	Landscape Proposals and BNG strategy (see BNG Report (See Appendix 2-2 in Volumes 3A to 3D and Appendix 4-2 of Volume 3)
Operation	The Schemes have been designed to accommodate a 1 in 100-year flood event (with a climate change allowance of 40 % added).	Flood Risk Assessments (Appendix 4-3 of Volume 3)
	A range of measures would be put in place to improve the resilience of the scheme to climate change during the scheme operation, including maintenance plans for drainage systems to allow them to operate effectively, and temperature and extreme weather resilient surfaces.	Operation and Maintenance Manuals
	The detailed landscaping proposals are to include drought, and extreme weather -tolerant species where appropriate.	Landscape Proposals (see Appendix 2-2 of Volumes 3A to 3D)

12.5.3 Further detail regarding the scheme specific design and mitigation can be viewed in Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

12.6 Project-Wide Likely Significant Cumulative Effects – GHG Assessment

12.6.1 As detailed in Table 12-10 the total GHGs estimated to be emitted from the construction associated with the Project have been calculated to be 4,828 tCO_{2e} over the course of the construction period. The majority of emissions are associated with embodied carbon in raw materials and transport of materials to site, accounting for approximately 30% and 57% of all construction emissions respectively.

12.6.2 All these emissions are considered 'additional' and are included in the impact assessment of the Project. They are defined as additional as they are considered new and would not occur if the Project did not go ahead.

Table 12-10 Project-Wide Estimated Construction GHG Emissions

Emission Source	Emissions (tCO ₂ e)				Total emissions
	Ollerton	Mickledale	Kirk Hill	Lowdham	
Embodied carbon in raw materials	420	546	251	254	1,471
Fuel usage onsite	37	22	25	20	104
Transport of materials to site	686	1,258	390	403	2,737
Disposal of construction waste	44	160	31	11	246
Employee commuting	101	91	38	40	270
Total emissions	1,288	2,077	735	728	4,828

GHG Emissions Significance

12.6.3 To contextualise the change in GHG emissions, these emissions have been compared to the UK Carbon budgets. As highlighted in Table 12-11, detailing the construction emissions against that of the relevant UK Carbon Budgets, the Project contributes 0.0002% to the 4th Carbon Budget only.

12.6.4 The magnitude of impact during construction is therefore considered to be Low. As per Table 12-2 and Table 12-3, this is considered to be a minor adverse (not significant) effect.

Table 12-11 Project-Wide Contribution of the Construction Emissions to the UK Carbon Budgets

UK Carbon Budget Period	UK Carbon Budget (MtCO ₂ e)	Do Something Construction Phase Emissions (MtCO ₂ e)	Do Something Percentage Contributions to UK Carbon Budget
4 th (2023-2027)	1,950	0.004819	0.0002%

12.7 Project-Wide Likely Significant Cumulative Effects - CCV Assessment

12.7.1 The Scheme effects identified are specific to the location of each Scheme and are expected to remain isolated to the area of each Scheme. There is no cumulative effect on the resilience of the Project.

12.7.2 The likely significant effects described in the text below are as predicted for each individual Scheme during construction and operation.

Construction

12.7.3 During construction works, receptors such as the construction work force, construction plant, vehicles, materials and workplan may be vulnerable to a range of climate risks. These could include:

- inaccessible construction site due to severe weather event (flooding, snow and ice, storms) restricting working hours and delaying construction;
- health and safety risks to the workforce during severe weather events;

- unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- damage to construction materials, plant and equipment, including damage to temporary buildings/facilities within the site boundary, such as offices, compounds, material storage areas and worksites, for example as a result of stormy weather.

12.7.4 Taking into consideration the embedded and design mitigation and management measures described in Section 12.5, the resulting significance matrix for climate vulnerability is presented in Table 12-12. No significant vulnerability effects have been identified for the construction phase of work.

Table 12-12 Construction Stage Climate Vulnerability Significance Assessment

Climate Variable	Potential Impacts from Climate Variables	Likelihood (Probability and Frequency of Occurrence) 2020-2039	Measure of Consequence	Significance Level
Increased frequency and severity of extreme weather events (such as heavy and/or prolonged precipitation, storm events and heatwaves)	Flooding and storm damage to site and site assets, danger to construction workers, inaccessible work site, possible power disruption, overheating of electrical equipment	Low	Minor Adverse	Not Significant
Increased winter precipitation	Flooding of construction site, damage to site assets, danger to construction workers, inaccessible work site	Medium	Minor Adverse	Not Significant
Decreased summer precipitation	Drought	Low	Negligible	Not Significant
Increased summer and winter temperatures	Heat stress to construction workers, deterioration of materials and assets, overheating of electrical equipment	Medium	Minor Adverse	Not Significant

Operation

12.7.5 During operations, receptors such as the road users, physical assets, maintenance workers, maintenance plant and maintenance vehicles may be vulnerable to a range of climate risks. These could include:

- inaccessible maintenance site due to severe weather event (flooding, snow and ice, storms) restricting working hours and delaying construction;
- health and safety risks to the workforce and road users during severe weather events;

- unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- damage to assets, landscaping, materials, plant and equipment as a result of stormy weather, flooding and excessive heat.

12.7.6 Taking into consideration the embedded and design mitigation and management measures described in Section 12.5, the resulting significance matrix for climate vulnerability is presented in Table 12-13. No significant vulnerability effects have been identified for the operational phase of work.

Table 12-13 Operational Stage Climate Vulnerability Significance Assessment

Climate Variable	Potential Impacts from Climate Variables	Likelihood (Probability and Frequency of Occurrence) 2020-2039	Measure of Consequence	Significance Level
Increased frequency and severity of extreme weather events (such as heavy and/or prolonged precipitation, storm events and heatwaves)	Flooding and storm damage to site and site assets, danger to maintenance workers and road users, inaccessible work site, possible power disruption, overheating of electrical equipment, damage and deterioration of assets, 'summer ice' slippery roads after prolonged periods of no rain, land subsidence, traffic related rutting and migration of road material, damage to landscaping	Medium	Minor Adverse	Not Significant
Increased winter precipitation	Flooding of construction site, damage to site assets, danger to maintenance workers and road users and drainage systems, inaccessible work site, damage to roads, land subsidence, damage to landscaping	Medium	Minor Adverse	Not Significant
Decreased summer precipitation	Drought, damage to landscaping	Medium	Negligible	Not Significant
Increased summer and winter temperatures	Heat stress to maintenance workers, deterioration of materials and assets, overheating of electrical equipment, thermal expansion and movement of bridge joints and paved surfaces, damage to landscaping	Medium	Minor Adverse	Not Significant

12.7.7 There would be unavoidable GHG emissions resulting from both the construction phase as materials, energy and fuel use, and transport. The effects are minor adverse, therefore of low significance, and no mitigation measures further to the

ones detailed in the 'Environmental Design and Management' section of this ES chapter have been identified.

- 12.7.8 The residual effect of GHG emissions on global climate during the construction phase of The Project are considered to be 'minor adverse' resulting in low significance in terms of residual effect since the effect of GHG emissions on the global climate from each of the Schemes is considered to be of low significance.
- 12.7.9 The residual impact of climate change on the Project is considered to be 'minor adverse' resulting in low significance in terms of residual effect since the impact of climate change on each of the Schemes is considered to be of low significance.
- 12.7.10 There are no likely significant adverse effects on climate change resulting from the Project.
- 12.7.11 Further detail regarding the Scheme specific residual effects of The Project can be viewed in: Volume 1A Ollerton Roundabout, Volume 1B Mickledale Lane Junction, Volume 1C Lowdham Roundabout and Volume 1D Kirk Hill Junction.

12.8 Additional Mitigation and Monitoring

- 12.8.1 The cumulative impact of the Project has not resulted in any likely significant adverse effects; therefore no additional mitigation measures are required.

12.9 Summary of Project-Wide Residual Effects

- 12.9.1 There are no significant residual effects associated with the Project, which is a cumulative assessment of the four individual Schemes: Ollerton Roundabout, Mickledale Lane, Junction, Kirk Hill Junction, and Lowdham Roundabout.
- 12.9.2 The residual effects resulting from the Project are summarised in Table 12-14 and Table 12-15 below.

Table 12-14 Project-Wide Residual Effects of GHG Assessment

Description of Effect	Sensitivity of Receptor	Nature of Effect/ Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Construction						
Effect of GHG emissions on global climate	High	Long term global	Low	Minor Adverse	No further mitigation measures are proposed	Low Significance

Table 12-15: Project-Wide Residual Effects of CCV Assessment

Description of Effect	Sensitivity of Receptor	Nature of Effect/ Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Construction						

Description of Effect	Sensitivity of Receptor	Nature of Effect/ Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Increased frequency and severity of extreme weather events (such as heavy and/or prolonged precipitation, storm events and heatwaves)	Medium	Long term, isolated to the Schemes	Minor adverse	Not significant	No further mitigation measures are proposed.	Not significant
Increased winter precipitation	Medium	Long term, isolated to the Schemes	Minor adverse	Not significant	No further mitigation measures are proposed.	Not significant
Decreased summer precipitation	Medium	Long term, isolated to the Schemes	Minor adverse	Not significant	No further mitigation measures are proposed.	Not significant
Increased summer and winter temperatures	Medium	Long term, isolated to the Schemes	Minor adverse	Not significant	No further mitigation measures are proposed.	Not significant
Complete and Operational						
Increased frequency and severity of extreme weather events (such as heavy and/or prolonged precipitation, storm events and heatwaves)	Medium	Long term, isolated to the Schemes	Low	Minor Adverse	No further mitigation measures are proposed	Not Significant
Increased winter precipitation	Medium	Long term, isolated to the Schemes	Low	Minor Adverse	No further mitigation measures are proposed	Not Significant
Decreased summer precipitation	Medium	Long term, isolated to the Schemes	Low	Minor Adverse	No further mitigation measures are proposed	Not Significant

Description of Effect	Sensitivity of Receptor	Nature of Effect/ Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Increased summer and winter temperatures	Medium	Long term, isolated to the Schemes	Low	Minor Adverse	No further mitigation measures are proposed	Not Significant

13. COMBINED EFFECTS ASSESSMENT

13.1 Introduction

- 13.1.1 This chapter presents the assessment of the combined effects of the Project. The combined effects assessment was undertaken at a project-wide level, combining and assessing impacts from the individual Schemes that comprise the Project. As the Warren Hill Junction and White Post Roundabout Schemes were scoped out of any detailed Scheme-specific assessments (see Chapter 4: Environmental Assessment Methodology), these junctions are not considered any further.
- 13.1.2 Combined effects arise from the accumulation or interaction of different impacts due to the Project at a specific location or on a specific sensitive receptor. For example, construction noise and visual intrusion affecting a single receptor. Individually these may not be significant, but the accumulation of different impacts may give rise to an overall significant effect.

13.2 Consultation

- 13.2.1 No consultation responses were received which relate to combined effects.

13.3 Legislative Policy and Framework

EIA Regulations

- 13.3.1 Regulation 4 (2) of the EIA Regulations requires an EIA to “*identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*”
- *population and human health;*
 - *biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(1) (Council of the European Union, 1992) and Directive 2009/147/EC(2) (Council of the European Union, 2009);*
 - *land, soil, water, air and climate;*
 - *material assets, cultural heritage and the landscape;*
 - *the interaction between the factors referred to in sub-paragraphs (a) to (d).”*

National Planning Policy Framework

- 13.3.2 The NPPF (MHCLG, 2021a) paragraph 185 requires that cumulative effects are considered in decision-making:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development”.

Local Policy

- 13.3.3 There are no relevant local policies within either the NSDC Local Plan: Amended Core Strategy 2019-2033 (NSDC, 2019), the RBC Local Plan (RBC, 2019a) or the GBC Local Plan (GBC, 2018).

13.4 Assessment Methodology

- 13.4.1 There is no established EIA methodology for assessing and quantifying combined effects on sensitive receptors, however, the European Commission (EC) has produced guidelines for assessing combined effects *“which are not intended to be formal or prescriptive, but are designed to assist EIA practitioners in developing an approach which is appropriate to a project...”*. (European Commission, 1999).
- 13.4.2 These guidelines have informed an approach which uses the defined residual effects of the Project to determine the potential for significant combined effects.
- 13.4.3 The EIA has identified a number of beneficial and adverse effects during construction and on completion and operation of the Project, some of which are classified as minor, moderate or major. Several effects on one receptor or receptor group could interact or combine to produce a combined significant overall effect.
- 13.4.4 The study area for the assessment of combined effects is defined by the study areas used in each of the environmental topics set out in Volume 1 and Volumes 1A to 1D of the ES.
- 13.4.5 Where the combined effect on a receptor or resource is inherently covered within the technical assessments report in Volume 1 and Volumes 1A to 1D of the ES, this is stated, and this effect is not considered further in this chapter. Where there is considered to be no potential for combined effects, this is stated. The remaining areas where combined effects could occur are considered further in this chapter.
- 13.4.6 The identified residual effects have been reviewed against the receptors they affect. Where more than one effect on a particular receptor/ resource has been identified, the potential for combined effects has been assessed. Consideration has been given to the construction phase, and once the Scheme is complete and operational. The value of the receptor/resource has been taken from the assessments reported in Volume 1 and Volumes 1A to 1D of the ES and where there is a conflict in the value, the highest value is used.

Identifying Significance

- 13.4.7 The significance of combined effects upon environmental resources and receptors has been determined using professional judgement, with input provided by the competent experts responsible for the production of the individual technical assessments. Typical descriptions for combined effects are noted in Table 13-1.
- 13.4.8 Combined effects which are moderate, large or very large (adverse or beneficial) are deemed to be significant and are expected to be material in the decision-making process.

Table 13-1: Typical Descriptions of Combined Effects

Significance Category	Typical descriptions of effect
Very Large (adverse or beneficial)	Where the combined effects upon an individual or collection of environmental receptors would be very highly significant (adverse or beneficial, though typically adverse). Effects would be permanent for receptors of very high value*. Effects at this level are material in the decision-making process.
Large (adverse or beneficial)	Where the combined effects upon an individual or collection of environmental receptors would be highly significant (adverse or beneficial). Effects would be:

Significance Category	Typical descriptions of effect
	<ul style="list-style-type: none"> ▪ widespread/ large scale for a receptor of high value ▪ permanent for a receptor or receptors of high value ▪ localised for a receptor or receptors of very high value ▪ temporary for a receptor or receptors of very high value <p>Effects at this level are likely to be material in the decision-making process.</p>
Moderate (adverse or beneficial)	<p>Where the combined effects upon an individual or collection of environmental receptors would be significant (adverse or beneficial). Effects would be:</p> <ul style="list-style-type: none"> ▪ permanent for a receptor or receptors of medium value ▪ localised for a receptor or receptors of high value ▪ temporary for a receptor or receptors of high value ▪ Effects at this level can be considered to be material decision-making factors.
Slight (adverse or beneficial)	<p>Where the combined effects upon an individual or collection of environmental receptors would be noteworthy but not significant (adverse or beneficial). Effects would be:</p> <ul style="list-style-type: none"> ▪ permanent for receptors of low value ▪ localised for a receptor or receptors of medium or high value ▪ temporary for a receptor or receptors of medium or high value ▪ Effects at this level are not material in the decision-making process.
Neutral	<p>Where the combined effects upon an individual or collection of environmental receptors would be negligible and not significant (adverse or beneficial).</p>

* Note that the term 'value' refers here to both intrinsic value and sensitivity.

Assumptions and Limitations

- 13.4.9 The assessment requires the application of professional judgement to come to a conclusion of significant combined effects in line with the criteria in Table 13-1.
- 13.4.10 As the assessment of combined effects relies on other technical assessments within the ES, the limitations and assumptions noted within those assessments are also limitations and assumptions for this assessment.
- 13.4.11 The assessment of combined effects has assumed that effects arising from two different topics on one receptor would occur concurrently, unless timing is explicitly mentioned in the assessment.

13.5 Assessment of Combined Effects

- 13.5.1 Potential interactions were identified by reviewing the effects identified within the environmental assessment topics covered in ES Volume 1 and Volumes 1A to 1D. Based on the effects and interactions likely to occur from the Project, the following receptor groups have been identified and considered in relation to the combined effects:
- Human receptors (residential properties and community facilities);
 - Ecological receptors;
 - Built heritage features; and

- Waterbodies.
- 13.5.2 The following chapters within Volume 1 and Volumes 1A to 1D are considered to have reported combined effects relating to the above receptors, and therefore these assessments are not repeated in this chapter:
- Cultural Heritage and Biodiversity consider the potential interactions of effects relating to construction and operational noise and air quality, and construction dust on receptors.
 - Cultural Heritage also takes into account visibility and landscape effects to inform the assessment of setting impacts and historic landscape as noted therein.
 - Biodiversity includes consideration of effects on the water environment and how this could affect ecological receptors.
 - With the exception of dust generation during construction, the effects reported in Geology and Soils would not be expected to affect the receptors noted in paragraph 13.5.1 after mitigation. As construction dust is already considered within the Air Quality assessment, a separate section relating to Geology and Soils has not been included.
 - Road Drainage and the Water Environment considers the effects of traffic in combination with changes that would be made to the water environment.
 - Climate includes specific consideration of combined climate impacts.
- 13.5.3 This assessment has therefore considered the combined effects on residential receptors. No other sensitive receptor types (e.g. community facilities) were identified in relation to the assessments for noise and air quality. The types of effects that could be experienced by these receptors and which may interact are noise, air quality, land use change, severance and visual effects, during both construction and operation.
- 13.5.4 The assessment has scoped out consideration of effects upon population in relation to land use change or severance (see Chapter 4: Environmental Assessment Methodology) due to the nature of the Schemes and Project, therefore these topics are not considered any further.
- 13.5.5 The following effects have been considered for each topic where they are likely to affect a common receptor:
- Air quality – where receptors identified as sensitive locations with respect to construction dust and receptors would experience a small magnitude or larger change in NO₂ or particulate matter in the Opening Year (as the worst-case scenario);
 - Visual effects – where receptors would experience a slight adverse or worse impact during construction or in the Opening Year (as the worst-case scenario); and
 - Noise and Vibration – where receptors would experience a slight adverse or worse impact during construction or in the Design Year (as the worst-case scenario).
- 13.5.6 For further detail in relation to the methodology and assessment criteria refer to Volumes 1A to 1D Chapter 5: Air Quality, Chapter 7: Landscape and Visual Effects and Chapter 10: Noise and Vibration.
- 13.5.7 Table 13-2 and Table 13- identify the likely residual effects on these receptors during construction and operation and provide a description of the combined effects

likely to be experienced. Where it is considered that the combination of effects may change the overall effect upon the receptor, the resulting effect has been assigned in accordance with the significance categories set out within Table 13-1.

Table 13-2: Combined Effects upon a Single Receptor During Construction

Receptor and Receptor Value	Potential Combined Effects				Additional Mitigation	Residual (Combined) Effect
	Air Quality (construction dust)	Noise	Vibration	Visual Effects		
Ollerton Roundabout						
Residential properties within close proximity to the Scheme assessment boundary (properties adjacent to Blyth Road and one property off Mansfield Road) Value : High	High sensitivity to dust, no significant effects with mitigation.	Potentially significant adverse effects for daytime and evening activities.	Annoyance - Moderate adverse (properties within 20 m) significant effects.	Slight adverse effect – not significant (taken from photoviewpoints 2 and 7).	None identified beyond that already identified in topic assessments.	Moderate adverse effects as a result of combined noise, vibration and visual impacts that are temporary on a receptor of high value. Effects could be material in the decision-making process. Significant
Residential properties typically over 50 m from Scheme assessment boundary Value : High	Low sensitivity to dust, no significant effects with mitigation.	Negligible to minor adverse impacts for daytime activities (not significant). Potentially moderate to major adverse impacts for evening activities (significant).	Annoyance - Negligible to minor adverse impacts – not significant.	Slight adverse effect – not significant (taken from photoviewpoint 5).	None identified beyond that already identified in topic assessments.	Combined effects of noise, vibration and some visual effects, most notably at night. Combined effects likely to be slight adverse. Effects are noteworthy, but unlikely to be material in the decision-making process. Not significant
Mickledale Lane Junction						
Residential properties within close proximity to the Scheme assessment boundary (properties adjacent Mickledale Lane to and A614 Old Rufford Road)	High sensitivity to dust, no significant effects with mitigation.	Negligible to minor adverse impacts for daytime activities – not significant. Potentially moderate to major impacts effects for evening activities (significant).	Annoyance - Moderate adverse (properties within 20 m) significant effects.	Slight adverse effect – not significant (taken from photoviewpoints 5 and 6)	None identified beyond that already identified in topic assessments.	Moderate adverse effects as a result of combined noise, vibration and visual impacts that are temporary on a receptor of high value. Effects could be material in the decision-making process. Significant

Receptor and Receptor Value	Potential Combined Effects				Additional Mitigation	Residual (Combined) Effect
	Air Quality (construction dust)	Noise	Vibration	Visual Effects		
Value : High						
Residential properties typically over 50 m from Scheme assessment boundary Value : High	Low sensitivity to dust, no significant effects with mitigation.	Negligible to minor adverse impacts for daytime activities – not significant. Potentially moderate to major impacts effects for evening activities (significant).	Annoyance - Negligible to minor adverse effects – not significant.	No significant effects predicted.	None identified beyond that already identified in topic assessments.	Combined effects of noise and vibration, most notably at night. Although in all likelihood, the noisiest of works would not occur at night. Combined impacts likely to be negligibly worse than when considered in isolation, therefore Neutral. Not significant
Kirk Hill Junction						
Residential properties within close proximity to the Scheme assessment boundary (properties on Kirk Hill) Value : High	High sensitivity to dust, no significant effects with mitigation.	Potentially major adverse impacts for daytime and evening activities (significant).	Annoyance - Moderate adverse (properties within 20 m) significant effects.	Slight adverse effect – not significant (taken from photoviewpoint 7)	None identified beyond that already identified in topic assessments.	Moderate adverse effects as a result of combined noise, vibration and visual impacts that are temporary on a receptor of high value. Effects could be material in the decision-making process. Significant
Residential properties typically over 50 m from Scheme assessment boundary Value : High	Low sensitivity to dust, no significant effects with mitigation.	50- 100 m minor to major adverse impacts (significant). In excess of 200 m negligible to minor adverse impacts for daytime and evening activities – not significant.	Annoyance - Negligible to minor adverse effects – not significant.	No significant effects predicted.	None identified beyond that already identified in topic assessments.	Combined effects of noise and vibration, most notably at night. Although in all likelihood, the noisiest of works would not occur at night. Combined impacts likely to be negligibly worse than when considered in isolation, therefore Neutral. Not significant.

Receptor and Receptor Value	Potential Combined Effects			Additional Mitigation	Residual (Combined) Effect	
	Air Quality (construction dust)	Noise	Vibration			Visual Effects
Lowdham Roundabout						
Residential properties within close proximity to the Scheme assessment boundary (A612 Nottingham Road and Nottingham Road) Value : High	High sensitivity to dust, no significant effects with mitigation.	Potentially major adverse impacts for daytime and evening activities (significant).	Annoyance - Moderate adverse (properties within 20 m) significant effects.	Slight adverse effects – not significant (photoviewpoint 4 and 6)	None identified beyond that already identified in topic assessments.	Moderate adverse effects as a result of combined noise and vibration impacts that are temporary on a receptor of high value. Effects could be material in the decision-making process. Significant
Residential properties typically over 50 m from Scheme assessment boundary Value : High	Low sensitivity to dust, no significant effects with mitigation.	50- 100 m minor to moderate adverse impacts during daytime activities – potentially significant. In excess of 75 m negligible to minor adverse impacts for daytime activities – not significant. If night-time working is required, there is potential for major impacts to extend to receptors located up to 200 m from the works boundary and moderate impacts up to around 300 m – significant.	Annoyance - Negligible to minor adverse effects – not significant.	Slight adverse effects (not significant) predicted (photoviewpoint 1 and 4).	None identified beyond that already identified in topic assessments.	Combined effects of noise and vibration, most notably at night. Although in all likelihood, the noisiest of works would not occur at night. Combined impacts likely to be negligibly worse than when considered in isolation, therefore Neutral. Not significant

Table 13-3: Combined Effects upon a Single Receptor During Operation

Receptor and Receptor Value	Potential Combined Effects			Additional Mitigation	Residual (cumulative) Effect
	Air Quality	Noise	Visual Effects		
Ollerton Roundabout					
Residential properties within close proximity to the Scheme assessment boundary (Properties adjacent to Blyth Road and one property off Mansfield Road) Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effects at both years 1 and 15 of operation – not significant (taken from photoviewpoints 2 and 7)	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Residential properties typically over 50 m from Scheme assessment boundary Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effect at year 1 of operation and neutral effect by year 15 of operation - not significant (taken from photoviewpoints 5).	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Mickledale Lane Junction					
Residential properties within close proximity to the Scheme assessment boundary (Properties adjacent Mickledale Lane to and A614 Old Rufford Road) Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effect at both years 1 and 15 of operation – not significant (taken from photoviewpoints 5 and 6)	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Residential properties typically over 50 m from Scheme assessment boundary Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	No significant effects predicted.	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.

Receptor and Receptor Value	Potential Combined Effects			Additional Mitigation	Residual (cumulative) Effect
	Air Quality	Noise	Visual Effects		
Kirk Hill Junction					
Residential properties within close proximity to the Scheme assessment boundary (Properties on Kirk Hill) Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effect at year 1 and neutral adverse effect at year 15 of operation – not significant (taken from photoviewpoint 7)	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Residential properties typically over 50 m from Scheme assessment boundary Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Neutral adverse effect at both years 1 and 15 of operation – not significant (taken from photoviewpoint 2)	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Lowdham Roundabout					
Residential properties within close proximity to the Scheme assessment boundary (A612 Nottingham Road and Nottingham Road) Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effect at year 1 and neutral adverse effect at year 15 of operation – not significant (photoviewpoints 4 and 6)	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.
Residential properties typically over 50 m from Scheme assessment boundary Value: High	No receptors are predicted to experience an exceedance of the AQO for annual mean NO ₂ (no likely significant effect)	No significant effects predicted for all receptors.	Slight adverse effect at both years 1 and 15 of operation – not significant (photoviewpoint 1 and 3).	None identified beyond that already identified in topic assessments.	Unlikely to be any combined effects in operation. Effects would be at most negligible adverse, therefore the significance of effects is considered to be neutral.

13.6 Additional Mitigation and Monitoring

- 13.6.1 Whilst there are individual significant effects predicted, the Project is not expected to result in any significant adverse combined effects and therefore no additional mitigation measures are required.

13.7 Summary of Significant Combined Effects

Construction Phase Effects

- 13.7.1 Based on this assessment, there is potential for combined effects during construction for all Schemes for properties within close proximity of the assessment boundaries – typically 0-50 m. This is due to combinations of construction noise, dust, vibration and visual effects. Significant combined effects are predicted at the closest properties for all four Schemes.
- 13.7.2 For all Schemes the prominent impacts are those expected from noise and vibration activities. As suggested within the noise and vibration chapters of the ES (Volumes 1A to 1D), at this stage there is insufficient information on the construction activities and programme to discount the possibility that the timescales outlined would be exceeded. Therefore, it is conceivable that a significant adverse effect due to construction noise may occur at nearby residential properties, however through the use of BPM and planning for the construction programme, it may be possible to reduce the number of significant effects.
- 13.7.3 For properties typically over 50 m of the Scheme assessment boundaries there are no significant combined effects anticipated.

Operation

- 13.7.4 As outlined by Table 13-3, during operation, no significant combined effects are anticipated.

14. CUMULATIVE EFFECTS ASSESSMENT

14.1 Introduction

- 14.1.1 This chapter presents the assessment of the cumulative effects of the Project. The cumulative effects assessment was undertaken at a project-wide level, considering the impacts from the individual Schemes that comprise the Project.
- 14.1.2 Cumulative effects arise as a result of the combination of activities associated with the Project together with the activities associated with other development. For example, impacts caused by the Project may be exacerbated by the activities from other development nearby or non-significant individual impacts at different sites collectively may give rise to an overall significant effect in the local area or wider region.
- 14.1.3 The assessment for cumulative effects was undertaken in accordance with DMRB LA 104 and supplemented by the Planning Inspectorate Advice Note Seventeen (Planning Inspectorate, 2019).
- 14.1.4 This chapter is supported by Appendix 14-1 of Volume 3 which contains the long list of other developments as shown on Figure 14-1 of Volume 2.

14.2 Consultation

- 14.2.1 No consultation responses were received which relate to cumulative effects.

14.3 Legislative Policy and Framework

EIA Regulations

- 14.3.1 Schedule 4 of the EIA Regulations requires development projects to consider the potential for cumulative effects with other existing and 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.
- 14.3.2 Schedule 4 Part 5 of the EIA Regulations requires: “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”.
- 14.3.3 The EIA Regulations state that this description of likely significant effects “*should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*”.

National Planning Policy Framework

- 14.3.4 The NPPF (MHCLG, 2021a) paragraph 185 requires that cumulative effects are considered in decision-making:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development”.

Local Policy

- 14.3.5 There are no relevant local policies within either the NSDC Local Plan: Amended Core Strategy 2019-2033 (NSDC, 2019), the RBC Local Plan (RBC, 2019a) or the GBC Local Plan (GBC, 2018).

14.4 Cumulative Assessment Methodology

- 14.4.1 The assessment of the cumulative effects has followed the methodology within DMRB LA 104. The assessment has also drawn upon the Planning Inspectorate Advice Note Seventeen (Planning Inspectorate, 2019) as it is one of the few more comprehensive pieces of guidance for cumulative effects assessment which are available. This Advice Note has been used in the identification of the cumulative Zones of Influence (Zol) as noted below.
- 14.4.2 DMRB LA 104 suggests that it is appropriate to consider the cumulative effects of the proposed development together with other existing or consented developments and developments that are ‘reasonably foreseeable’ to be delivered within the timescale of the proposed development. Development described as ‘reasonably foreseeable’ is interpreted to include other projects that are ‘committed’.
- 14.4.3 As part of this assessment however, a worst-case scenario has been undertaken in order to consider some developments which do not meet the criteria noted in paragraph 14.4.7. These were included through discussion with NSDC where there is a possibility they could be under construction and then operational during the same timeframe as the proposed development. These developments and their cumulative assessment have been differentiated in the assessment from those developments which are described as “reasonably foreseeable”.

Cumulative Zone of Influence

- 14.4.4 The maximum study area or cumulative Zol has been developed based on an assumption that sensitive receptors at the furthest extent of the study areas used in the environmental chapters in Volumes 1A to 1D of this ES would also be at the furthest extent of a theoretical study area used for other development. The cumulative Zol is the combined area over which the Project and other developments could have impacts on the same receptors.
- 14.4.5 The cumulative Zol used for the assessment are noted Table 14-1, below. Note that topics use alternative assessment boundaries for each Scheme and topic, as described in Chapter 4: Environmental Assessment Methodology.

Table 14-1: Cumulative Effects Assessment Zone of Influence

Environmental Topic	Scheme Zol (Scheme Study Area)	Cumulative Zol (Cumulative Study Area)
Air Quality	<p>Construction: 0.2 km from the edge of each Scheme assessment boundary for construction dust.</p> <p>The effects from construction phase traffic have been scoped out of the assessment as noted Chapter 4: Environmental Assessment Methodology.</p> <p>Operation: The ARN within the traffic model defines study area, as described in the Air Quality chapter in Volumes 1A to 1D. As the operational phase traffic data includes traffic associated with other development, including Teal Close and Thoresby</p>	Up to 0.4 km from each Scheme assessment boundary (for construction dust only)

Environmental Topic	Scheme Zol (Scheme Study Area)	Cumulative Zol (Cumulative Study Area)
	Colliery, the air quality assessment reported in this ES is inherently cumulative.	
Cultural Heritage	Construction and operation: 0.5 km from the Scheme assessment boundary for designated heritage assets and their settings.	Up to 1 km from each Scheme assessment boundary
Landscape and Visual	Construction and operation: 2 km from each Scheme assessment boundary, subject to localised variations based on the ZTV and on-site verification of up to 2 km.	Up to 4 km from each Scheme assessment boundary
Biodiversity	Construction and operation: 2 km from each Scheme assessment boundary for statutory and non-statutory designated sites. Within this, the study area for assessment purposes varies according to specific biodiversity receptors.	Up to 4 km from each Scheme assessment boundary
Geology and Soils	Construction and operation: within each Scheme assessment boundary and an additional area of 0.25 km for geology, soils and land contamination.	Up to 0.5 km from each Scheme assessment boundary
Noise and Vibration	Construction: from each Scheme assessment boundary the vibration study area is a maximum of 0.1 km from the works, and the construction noise study area is a maximum of 0.3 km.	Up to 0.6 km from each Scheme assessment boundary
Road Drainage and the Water Environment	Construction and operation: The study area is 1 km beyond each Scheme assessment boundary for water quality; extended up to 2 km for water dependent ecological sites and rivers. The study area for flood risk is 1 km upstream and 1 km downstream of watercourse crossings.	Up to 4 km from each Scheme assessment boundary
Climate	<p>Construction and operation: The cumulative effects of GHG emissions on the global climate are acknowledged as being potentially significant, but it is not possible to quantitatively assess these effects within this assessment. Whilst the emissions from this individual Project can be estimated and compared against regional and national carbon budgets, due to the global nature of the receptor it is not appropriate to only combine the impact of the Scheme being assessed with other local schemes being brought forward.</p> <p>By comparing the scheme to UK carbon budgets, the assessment methodology within Chapter 12: Climate and ES Volumes 1A to 1D is inherently cumulative as this already allows for all emissions during a set period of time.</p>	Not applicable.

Identifying the Long List of 'Other Development' for Cumulative Effects Assessment

- 14.4.6 A 4 km maximum search area was used to prepare the long list, as reflected by the cumulative Zols for biodiversity, landscape and visual, and road drainage and the water environment noted in Table 14-1, above.
- 14.4.7 DMRB LA 104 paragraph 3.21.2 notes that the assessment should report on projects which meet the following criteria:
- roads projects which have been confirmed for delivery over a similar timeframe;

- development projects where planning consent has been granted, and for which an EIA was undertaken; and
 - proposals in adopted development plans with a clear identified programme for delivery.
- 14.4.8 The long list of other development was compiled based on information and records at the time of undertaking the assessment. A review of the developments for which planning permission has been granted between 1 September 2018 and 1 September 2021 was undertaken using the planning application search functions of the NSDC, RBC and GBC and NCC planning websites.
- 14.4.9 The local authority allocations of land for housing and employment that have clear identified programmes for delivery were sought from the following documents:
- Newark and Sherwood Development Framework Allocations and Development Management – Development Plan Document (NSDC, 2013);
 - NSDC Statement of Five Year Housing Land Supply (NSDC, 2021);
 - GBC Aligned Core Strategy – Policies Map (GBC, 2014);
 - RBC Local Plan Adopted Policies Map (RBC, 2019b); and
 - RBC Local Plan Part 2 – Land Planning and Policies (RBC, 2019a).
- 14.4.10 Once the initial long list was compiled, this was provided to NSDC, RBC, GBC and NCC for comment. A response was received from NSDC which provided some additional information, which has been taken into account in this assessment.
- 14.4.11 Developments which are expected to be constructed and in operation prior to commencement of construction of the Project (January 2023) are not considered within the cumulative assessment. They have instead been considered as part of the future baseline situation against which the effects of the individual Schemes have been assessed in Volumes 1A to 1D.

Identifying the Short List of 'Other Development' for Cumulative Effects Assessment

- 14.4.12 This stage involved sourcing further information relating to the shortlisted developments, in order to establish the details of their likely environmental effects and potential for cumulative effects with the Project.
- 14.4.13 This information has been primarily obtained from documentation submitted as part of planning applications or used in the appraisals for site allocations. Information gathered for each development included (where available) the design of the development and Environmental Statements.
- 14.4.14 The other developments on the long list were then reviewed to identify the potential for these to result in cumulative effects with the Project. This included consideration for the nature and scale of the other development, and the potential for temporal and/ or spatial interactions with receptors affected by the Project within the relevant cumulative Zols. Other developments with the potential to result in significant cumulative effects were placed on the short list.
- 14.4.15 The value of receptor and significance of construction and operational phase environmental effects has been brought forward from the individual topic assessments reported in the technical assessments reported in Chapters 5 to 12 of this ES.

Identifying Significance

14.4.16 The significance of cumulative effects upon environmental resources and receptors has been determined using professional judgement, with input provided by the competent experts responsible for the production of the individual technical assessments. Typical descriptions for cumulative effects are noted in Table 14-2.

14.4.17 Generally, cumulative effects which are moderate, large or very large (adverse or beneficial) are deemed to be significant and are expected to be material in the decision-making process.

14.4.18 The cumulative effects assessment only considers those receptors that would experience a residual effect associated with the Project on its own. For receptors where the Project's residual effects are assessed to be neutral or negligible, it is considered that such receptors would not experience significant cumulative effects.

Table 14-2: Typical Descriptions of Cumulative Effects

Significance Category	Typical descriptions of effect
Very Large (adverse or beneficial)	<p>Where the cumulative effects in association with other development upon an individual or collection of environmental receptors would be very highly significant (adverse or beneficial, though typically adverse). Effects would be permanent for receptors of very high value*.</p> <p>Effects at this level are material in the decision-making process.</p>
Large (adverse or beneficial)	<p>Where the cumulative effects in association with other development upon an individual or collection of environmental receptors would be highly significant (adverse or beneficial). Effects would be:</p> <ul style="list-style-type: none"> ▪ widespread/ Large scale for a receptor of high value ▪ permanent for a receptor or receptors of high value ▪ localised for a receptor or receptors of very high value ▪ temporary for a receptor or receptors of very high value <p>Effects at this level are likely to be material in the decision-making process.</p>
Moderate (adverse or beneficial)	<p>Where the cumulative effects in association with other development upon an individual or collection of environmental receptors would be significant (adverse or beneficial). Effects would be:</p> <ul style="list-style-type: none"> ▪ permanent for a receptor or receptors of medium value ▪ localised for a receptor or receptors of high value ▪ temporary for a receptor or receptors of high value <p>Effects at this level can be considered to be material decision-making factors.</p>
Slight (adverse or beneficial)	<p>Where the cumulative effects in association with other development upon an individual or collection of environmental receptors would be noteworthy but not significant (adverse or beneficial). Effects would be:</p> <ul style="list-style-type: none"> ▪ permanent for receptors of low value ▪ localised for a receptor or receptors of medium or high value ▪ temporary for a receptor or receptors of medium or high value <p>Effects at this level are not material in the decision-making process.</p>

Significance Category

Typical descriptions of effect

Neutral	Where the cumulative effects in association with other development upon an individual or collection of environmental receptors would be negligible and not significant (adverse or beneficial).
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* Note that the term 'value' refers here to both intrinsic value and sensitivity.

Assumptions and Limitations

- 14.4.19 The assessment requires application of professional judgement to come to a conclusion of significant cumulative effects in line with the criteria in Table 14-2.
- 14.4.20 As the assessment of cumulative effects relies on other technical assessments within the ES, the limitations and assumptions noted within those assessments (see Volumes 1A to 1D) and Chapter 4: Environmental Assessment Methodology are also limitations and assumptions for this assessment.
- 14.4.21 The assessment has been undertaken based upon the information related to other developments that is publicly available. Any third-party environmental assessments used to inform this assessment will have their own assumptions and limitations.
- 14.4.22 The following available documents relating to the short listed developments have been used in this assessment of the cumulative effects:
- Redevelopment of Land and Buildings at RAF Newton - ES (Newton Nottingham LLP, 2010);
 - Chapel Lane Bingham, ES Non-Technical Summary (Entec, 2010);
 - Chapel Lane Bingham, ES Addendum Report (Amec, 2013);
 - Thoresby Colliery Environmental Statement (Pegasus Group, 2016);
 - Land at Thoresby Colliery Heritage Assessment (Prospect Archaeology, 2016);
 - Mixed Use development at former Thoresby Colliery – Noise Assessment (Rodgers Leask, 2016); and
 - Thoresby Colliery Landscape and Visual Impact Assessment (Pegasus Group, 2016).
- 14.4.23 Further information regarding the other developments is likely to become available as they progress through their own programme for delivery. There may also be future planning applications submitted within the cumulative Zol for further developments than those identified that could result in significant cumulative effects with the Project, which at this time cannot be assessed. The planning applications listed and documents used in this assessment were last checked on 6th October 2021.
- 14.4.24 Where limited information or certainty regarding the delivery programmes of other developments has been available, worst-case assumptions have been made. Where this uncertainty was presented, it has been assumed that the other development and the Project would have concurrent construction programmes and that the other development would be fully operational by the Opening Year.

14.5 Assessment of Cumulative Effects

- 14.5.1 The process of preparing the long list and short list has been documented within Appendix 14-1 of Volume 3. This table provides the justification for including or excluding development within the short list.
- 14.5.2 All long list and short list developments are shown on Figure 14-1 within Volume 2.
- 14.5.3 A total of 31 developments were included on the initial long list. A total of three other developments were shortlisted for the assessment of cumulative effects. These developments are listed in Table 14-3.

Table 14-3: Short list of 'Other Development' For Cumulative Assessment

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
1	16/02173/OUTM (NSDC)	<p>Former Thoresby Colliery, Ollerton Road, Edwinstowe, Nottinghamshire</p> <p>Residential development up to 800 dwellings, Strategic Employment Site, a new Country Park, a Local Centre, "The Heart of the New Community" containing a mix of leisure (to include zip wire), commercial, employment, community, retail, health, and residential uses, a Primary School, Open Space and Green Infrastructure (including SuDS), and associated access works including the details of the primary access junctions into the site from Ollerton Road.</p>	<p>Distance and location from nearest Scheme: 580 m west from Ollerton Roundabout.</p> <p>Overlap with Zols: Cultural Heritage, Biodiversity, Landscape and Visual, Noise and Vibration, Road Drainage and the Water Environment</p> <p>Cultural Heritage: The other development and the Ollerton Roundabout both have Ollerton Conservation Area within the study area. The heritage assessment for the other development indicates a negligible effect on Ollerton Conservation Area as there is limited views between the two. The Ollerton Roundabout Scheme assessment indicates the temporary increase of noise and traffic during construction would have a slight adverse (not significant) effect and no effects during operation. As such, the combined effect of the two developments is expected to be the same as that for the Scheme alone.</p> <p>With regard to archaeology, the other development is sufficiently distant such that no cumulative effects upon archaeology are expected.</p> <p>Biodiversity: The other development and the Ollerton Roundabout Scheme have several shared receptors, including a number of statutory and non-statutory designated sites, woodland habitats, bats, badger, birds and common lizard. Following mitigation, the ES submitted for the other development reported temporary construction effects on bats, badger and birds and common lizard. As construction is ongoing, relatively remote from the Ollerton Roundabout Scheme and due to the limited impact of the Scheme on these species, there is not expected to be a significant cumulative on these species.</p> <p>Effects associated with vehicle emissions on the Birklands and Bilhaugh SAC, Birklands and Bilhaugh SSSI, Birklands West and Ollerton Corner SSSI and Sherwood ppSPA are considered within the sHRA (Volume 3 Appendix 4-4).</p>	<p>None above that specified in assessments within Volumes 1A to 1D</p>	<p>Cultural Heritage: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Biodiversity: Potential for slight adverse effect on designated sites, bats, badger, birds and common lizard where construction programmes would overlap. Slight adverse during operation for designated sites.</p> <p>Landscape and Visual: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Noise and Vibration: Neutral – effects remain as reported within the topic assessment in this ES.</p>

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
			<p>The other development is noted to result in a negligible adverse effect on the Birklands and Bilhaugh SAC, Birklands and Bilhaugh SSSI and Sherwood ppSPA during construction and operation after mitigation. The Ollerton Roundabout Scheme is predicted to result in at worst a slight adverse effect on these designated sites in construction and operation. Whilst both projects do result in an impact on the site, with mitigation in place, this should be no worse cumulatively than individually.</p> <p>Landscape and Visual: The development and the Ollerton Roundabout Scheme share two of the same visual receptors, visitors to Sherwood Heath LNR and travellers on the A6075. The other development is expected to result in a neutral effect upon both visitors to Sherwood Heath LNR and travellers on the A6075, at both completion and Year 15, according to the LVIA submitted with the planning application. The Ollerton Roundabout Scheme is expected to result in a slight adverse effect upon both visitors to Sherwood Heath LNR and upon travellers on the A6075 (during construction and operation Years 1 and 15). Therefore, the combined effect of the two developments is expected to be the same as that for the Scheme alone.</p> <p>The other development and the Scheme fall within different landscape character areas and policy zones, therefore cumulative effects on landscape character are not expected.</p> <p>Noise and Vibration: The other development is partially built-out. The remaining areas to be developed are distant from the Scheme construction noise assessment study area. Therefore it is unlikely that significant cumulative effects would arise.</p> <p>Road Drainage and the Water Environment: The FRA notes that the groundwater in the area has a high sensitivity to contamination. Measures are included to avoid contamination of this resource. Therefore no cumulative effects in terms of groundwater are anticipated.</p> <p>Both the other development and the Ollerton Roundabout Scheme would discharge to the River Maun, however there was no water environment assessment included within the ES for the other development. It is</p>		<p>Road Drainage and the Water Environment: Neutral – effects remain as reported within the topic assessment in this ES.</p>

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
11	10/01962/OUT (RBC)	<p>Land East & West Of Chapel Lane, Bingham, Nottinghamshire</p> <p>Up to 1050 residential dwellings; 15.6 hectares of employment development; local centre comprising up to 300 m sq. of retail floor space; primary school; and community centre; a 1.6 hectare mixed use site; allotments and open space (including play areas and community park); flood management and drainage works; transport and access works; and ancillary works </p>	<p>assumed that water quality will be treated sufficiently on the site of the other development before being discharged to the River Maun (swales and attenuation ponds are noted as part of the drainage strategy). Therefore, there would be no change to the reported effects for water quality.</p> <p>An FRA was provided within the application. The FRA concludes that the overall risk of flooding on site is very low. The Ollerton Roundabout Scheme assessment concludes that there would be neutral to slight adverse effects on flooding, during both construction and operation. Therefore, the combined effect of the two developments is expected to be the same as that for them in isolation.</p> <p>Distance and location from nearest Scheme: 1443 m south-east from Kirk Hill Junction</p> <p>Overlap with Zols: Landscape and Visual, Biodiversity, Road Drainage and the Water Environment</p> <p>Landscape and Visual: The Kirk Hill Junction Scheme is located in the landscape character area of SNO5 East Bridgford Escarpment Farmlands. The other development non-technical summary states that it would not have a significant effect on SNO5 during construction or operation. Due to distance between the Scheme and the other development there are considered to be no cumulative effects upon landscape character.</p> <p>The Kirk Hill Junction Scheme and the other development are unlikely to affect the same visual receptors due to the distance between the Scheme and intervening vegetation. There are considered to be no cumulative effects during construction and operational phases.</p> <p>Biodiversity: The other development and the Kirk Hill Junction Scheme have the following same receptors: hedgerow, woodland, bats and birds. The non-technical summary for the other development indicates that through various mitigation measures there are considered to be no significant adverse effects to these receptors and positive impacts are anticipated through the creation of various habitat types including woodland. Due to the distance between the Scheme and the development</p>	<p>None above that specified in assessments within Volumes 1A to 1D</p>	<p>Landscape and Visual: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Biodiversity: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Road Drainage and the Water Environment: Neutral – effects remain as reported within the topic assessment in this ES.</p>

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
			<p>there are considered to be no cumulative effects during construction and operational phases.</p>		
			<p>Road Drainage and the Water Environment: The Kirk Hill Junction Scheme is within the Shelford Brook (trib of Trent) Catchment and the other development is within the Carr Dyke catchment. In terms of water quality, no significant effects were predicted for the Scheme (as this topic was scoped out of the EIA for Kirk Hill Junction) and therefore it is anticipated that no cumulative effects would be likely with the other development.</p>		
			<p>The FRA submitted for the other development indicates that whilst the development will create a new impermeable area resulting in increased surface water runoff compared to the existing agricultural field. Offsite drainage is noted to benefit from a 10% betterment on the rate of discharge to Car Dyke. The site is also at risk of flooding, however that will be mitigated through implementation of a flood management scheme. With the implementation of the proposed mitigation measures, there will be no significant adverse effects.</p>		
			<p>The FRA undertaken for the Kirk Hill Junction Scheme concludes that the risk of flooding from all sources as a result of the Scheme, from all sources, is considered low, and no mitigation is required.</p>		
			<p>As such, it is considered that the combined effect of the two developments is expected to be the same as that for the Scheme alone.</p>		
19	10/02105/OUT (RBC)	<p>Land At Royal Air Force Newton, Newton, Nottinghamshire</p> <p>Outline proposals with all matters reserved seeking the delivery of: up to 500 dwellings; up to 50 live/work units; up to 5.22ha of new</p>	<p>Distance and location from nearest Scheme: 789 m south from Kirk Hill Junction</p> <p>Overlap with Zols: Cultural Heritage, Biodiversity, Landscape and Visual, Noise and Vibration, Road Drainage and the Water Environment</p> <p>Cultural Heritage: With regard to built heritage, the available ES for the other development states that the cultural heritage assessment and archaeology assessment were covered in a previous ES that was not available on the RBC planning website. The summary provided in the 2010 ES indicates that there are no Scheduled Ancient Monuments, historic or</p>	<p>None above that specified in assessments within Volumes 1A to 1D</p>	<p>Cultural Heritage: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Biodiversity: Neutral – effects remain as reported</p>

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
		<p>employment land (B1, B2 & B8); up to 1000sqm of space for ancillary A1, A3, & A4 uses and community uses; retention of existing hangars for employment purposes; a perimeter cycle track; provision of land for new primary school; and associated public open space, recreation space and landscaping.</p>	<p>listed buildings within the application site or its immediate vicinity. Potential for buried archaeology was noted with the requirement for archaeological recording and excavation ahead of development on the site. Due to the limited receptors identified for the other development it is concluded that the receptors identified for the Kirk Hill Junction Scheme are not common to those affected by the other development and therefore no cumulative effects are anticipated.</p> <p>With regard to archaeology, the other development is sufficiently distant such that no cumulative effects upon archaeology are expected.</p> <p>Biodiversity: The development and the Kirk Hill Junction Scheme have the following same receptors: hedgerow, woodland, semi-improved grassland, bats, birds, badgers and other mammals. The ES for the other development indicates that through various mitigation measures there are considered to be no adverse significant effects to these receptors and positive impacts are expected overall for habitats due to improvements and creation. The Kirk Hill Junction Scheme, after mitigation, would result slight adverse effects on hedgerow, woodland, and grassland, and a natural effects bats, birds, badger and other mammals. In the longer term (20 years plus), the effects on hedgerows would improve to a slight beneficial effect. Due to the distance between the development and the Scheme, the minor scale of the Scheme (junction improvement) and with the wider local area providing alternative suitable habitat for fauna, there are considered to be no cumulative effects during construction and operational phases.</p> <p>Landscape and Visual: The other development and the Kirk Hill Junction Scheme do not share any of the same landscape character or visual receptors, therefore there is no potential for cumulative effects upon landscape or visual receptors.</p> <p>Noise and Vibration: The other development is approximately 1 km away from the end of the Kirk Hill Junction Scheme assessment boundary. There are no residential properties between the two developments. Therefore it is unlikely that significant cumulative effects would arise.</p> <p>Road Drainage and the Water Environment:</p>		<p>within the topic assessment in this ES.</p> <p>Landscape and Visual: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Noise and Vibration: Neutral – effects remain as reported within the topic assessment in this ES.</p> <p>Road Drainage and the Water Environment: Neutral – effects remain as reported within the topic assessment in this ES.</p>

ID	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with the Project	Proposed additional mitigation	Residual cumulative effect
			<p>The ES submitted for the other development at RAF Newton states that the development is not with any floodplain defined by the EA and that water quality is acceptable. It states that it is anticipated that the residual impacts of the development on water quality and surface water drainage would be beneficial, with the introduction of SuDS features.</p> <p>The FRA undertaken for the Kirk Hill Junction Scheme concludes that the risk of flooding as a result of the Scheme, from all sources, is considered Low, and no mitigation is required.</p> <p>In terms of water quality, no significant effects were predicted for the Scheme (as this topic was scoped out of the EIA for Kirk Hill Junction) and therefore it is anticipated that no cumulative effects would be likely with the other development.</p> <p>As such, it is considered that the combined effect of the two developments is expected to be the same as that for the Scheme alone.</p>		

14.6 Additional Mitigation and Monitoring

- 14.6.1 The cumulative impacts of the Project together with other developments would not result in any significant adverse cumulative effects, therefore no additional mitigation measures are required.

14.7 Summary of Significant Cumulative Effects

- 14.7.1 Three other developments were shortlisted for inclusion in the assessment of cumulative effects.
- 14.7.2 Based on the review of environmental information available for the Project and these other developments, there are not likely to be any significant cumulative effects as a result of the Project in conjunction with other developments.
- 14.7.3 This is due to a number of factors including the low level of impact from the Project and from the other developments on the identified common receptors following mitigation and the distance between the individual Schemes which constitute the Project and the other developments.

15. SUMMARY

15.1 Introduction

15.1.1 This chapter summarises the findings of the assessments, highlighting any significant environmental effects, and states the proposed mitigation and monitoring measures to be implemented during construction and operation of the Project.

15.2 Summary of Significant Effects

15.2.1 The following assessments reported no likely significant residual environmental effects during the construction or operation phases of the Project or individual Schemes:

- Air quality;
- Biodiversity;
- Road drainage and the water environment;
- Climate; and
- Cumulative effects.

15.2.2 The assessments reported in the following chapters identified likely significant environmental effects during the construction phases of the Project or individual Schemes:

- Landscape and visual;
- Cultural heritage;
- Geology and soils;
- Noise and vibration; and
- Combined effects assessment.

15.2.3 Table 15-1 summarises the likely significant effects associated with the construction and operation of the Project as detailed in Chapters 5 to 14 of this report and Volumes 1A to 1D.

Table 15-1 Summary of Likely Significant Residual Effects

Scheme / Project	Topic	Receptor	Phase	Mitigation and Monitoring	Residual effect
Project-wide	Geology and Soils	Approximately 3.47 ha of agricultural land, including BMV land.	Construction (permanent loss)	No additional mitigation proposed.	Moderate adverse
Ollerton Roundabout	Visual Effects	Residents at Forest Side (represented by photoviewpoint 2)	Construction	Standard mitigation measures, no additional mitigation.	Moderate adverse
Ollerton Roundabout	Construction Noise	4no. receptors (R1-R3) Blyth Road (A614)	Construction	BPM and temporary	Significant adverse

Scheme / Project	Topic	Receptor	Phase	Mitigation and Monitoring	Residual effect
				screening where feasible	
Ollerton Roundabout	Construction Vibration	4no. receptors (R1-R3) Blyth Road (A614)	Construction	BPM	Significant adverse
Ollerton Roundabout	Combined construction effects relating to noise, vibration and visual effects.	Residential properties within close proximity to the Scheme assessment boundary (properties adjacent to Blyth Road and one property off Mansfield Road)	Construction	None above the mitigation and BPM described in the topic assessments.	Moderate adverse
Mickledale Lane Junction	Construction Noise	7no. receptors	Construction	BPM and temporary screening where feasible	Significant adverse
Mickledale Lane Junction	Construction vibration	6no. receptors	Construction	BPM	Significant adverse
Mickledale Lane Junction	Combined construction effects relating to noise, vibration and visual effects.	Residential properties within close proximity to the Scheme assessment boundary (properties adjacent Mickledale Lane to and A614 Old Rufford Road)	Construction	None above the mitigation and BPM described in the topic assessments.	Moderate adverse
Kirk Hill Junction	Construction Noise	5no. receptors (R1-R5) Kirk Hill, NG13 8PE	Construction	BPM and temporary screening where feasible	Significant adverse
Kirk Hill Junction	Construction vibration	3no. receptors (R1-R3) Kirk Hill, NG13 8PE	Construction	BPM	Significant adverse
Kirk Hill Junction	Combined construction effects relating to noise, vibration and visual effects	Residential properties within close proximity to the Scheme assessment boundary	Construction	None above the mitigation and BPM described in the topic assessments.	Moderate adverse

Scheme / Project	Topic	Receptor	Phase	Mitigation and Monitoring	Residual effect
		(properties on Kirk Hill)			
Lowdham Roundabout	Construction Noise	35no. receptors	Construction	BPM and temporary screening where feasible	Significant adverse
Lowdham Roundabout	Construction vibration	28no. receptors	Construction	BPM	Significant adverse
Lowdham Roundabout	Combined construction effects relating to noise, vibration and visual effects	Residential properties within close proximity to the Scheme assessment boundary (A612 Nottingham Road and Nottingham Road)	Construction	None above the mitigation and BPM described in the topic assessments.	Moderate adverse