

A46 Newark Bypass

Environmental Scoping Report

P04
26 August 2022

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1 Introduction

1.1 Purpose of the report

- 1.1.1 This Environmental Scoping Report has been prepared in accordance with Section 10 of the Infrastructure Planning (Environmental Impact Assessment) (EIA) Regulations 2017¹. It is submitted by Skanska Mott MacDonald on behalf of National Highways in respect to the A46 Newark Bypass (hereafter referred to as ‘the scheme’).
- 1.1.2 The purpose of this Environmental Scoping Report is to establish the scope of the Environmental Statement (ES) and the level of detail required, and to support the request for a Scoping Opinion under Regulation 10(1) of the Infrastructure Planning (EIA) Regulations 2017.
- 1.1.3 This Environmental Scoping Report also aims to demonstrate the ability of the scheme to meet the requirements within the National Highways Licence², the objectives set out in the Road Investment Strategy 2³, and how compliance with the National Networks National Policy Statement (NPSNN)⁴ will be met by the scheme.
- 1.1.4 This Environmental Scoping Report has been completed in accordance with LA103 (Scoping projects for Environmental Assessment) of the Design Manual for Roads and Bridges (DMRB)⁵ and the Planning Inspectorate’s Advice Note Seven⁶ for all environmental factors (topics) set out in the Infrastructure Planning (EIA) Regulations 2017.

1.2 Legislative context and the need for EIA

- 1.2.1 The scheme is classified as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 Section 22 (3) and (4) (as amended

¹ Statutory Instrument (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, No. 527.

² Highways England (2015) Highways England Licence – Secretary of State for Transport statutory directions and guidance to the strategic highways companies [online] available at: [Highways England: licence \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/Highways_England_Licence.pdf) (last accessed July 2022).

³ Department for Transport (2020) Road Investment Strategy 2: for the 2020 to 2025 Road Period [online] available at: [Road Investment Strategy 2: 2020-2025 \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/Road_Investment_Strategy_2_2020-2025.pdf) (last accessed June 2022).

⁴ Department for Transport (2014) National Policy Statement for National Networks [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/NNNPS-web.pdf (last accessed June 2022).

⁵ Standard for Highways (2020) Design Manual for Roads and Bridges, LA103 ‘Scoping projects for environmental assessment’.

⁶ The Planning Inspectorate (2020) Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements [online] available at: [Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements | National Infrastructure Planning \(planninginspectorate.gov.uk\)](https://www.planninginspectorate.gov.uk/advice-note-seven/) (last accessed June 2022).

by The Highway and Railway (National Significant Infrastructure Project) Order 2013) by virtue of the fact that it meets the following conditions:

- The scheme would involve the alteration of a highway.
- That is wholly within England.
- For which the Secretary of State is the highway authority.
- Where the highway is not a motorway and the speed limit for any class of vehicle is expected to be 50 miles per hour or greater.
- The area of development is greater than 12.5 hectares.

1.2.2 The scheme falls within paragraph 10(f) of Schedule 2 to the Infrastructure Planning (EIA) Regulations 2017. By virtue of the fact that the potential for significant environmental effects has been identified, an ES will be prepared to accompany the Development Consent Order (DCO) application to the Planning Inspectorate. The Regulation 8(1)(b) notice was submitted to the Planning Inspectorate alongside submission of this Environmental Impact Assessment Scoping Report.

1.2.3 The ES will meet the requirements of Regulation 14 of the Infrastructure Planning (EIA) Regulations 2017.

1.3 Planning policy context

National policy

National Policy Statement for National Networks

1.3.1 The NPSNN⁷ sets out the need for, and Government's policies to deliver development of NSIPs on the national road network in England and sets out the primary basis for making decisions of development consent for NSIPs on the national network in England.

1.3.2 The Government recognises in the Appraisal of Sustainability accompanying the NPSNN that some developments will have some adverse local impacts on noise, emissions, landscape / visual amenity, biodiversity, cultural heritage and water resources. The significance of these effects and the effectiveness of mitigation is uncertain at the strategic and non-locational specific level of the NPSNN. Therefore, whilst applicants should deliver developments in accordance with Government policy and in an environmentally sensitive way, including considering opportunities to deliver environmental benefits, it is acknowledged that some adverse local effects of development may remain.

⁷ Department for Transport (2014) National Policy Statement for National Networks [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/NNNPS-web.pdf (last accessed June 2022).

- 1.3.3 Evidence demonstrating compliance of the scheme with the NPSNN will be provided within the NPSNN Accordance Table which will be submitted as part of the DCO application. Any environmental assessment principles outlined in the NPSNN will be taken into account within the ES.
- 1.3.4 The ES will also confirm within each of the environmental discipline chapters how the requirements of the NPSNN will be met.

National Planning Policy Framework

- 1.3.5 The National Planning Policy Framework (NPPF)⁸ sets out the Government's planning policies for England and the requirements for the planning system. It provides a framework within which local authorities and residents can produce local and neighbourhood plans reflecting the needs and priorities of communities.
- 1.3.6 The NPPF seeks to promote a strong and competitive economy with Local Plans identifying 'priority areas for economic regeneration, infrastructure provision, and environmental enhancement'. In addition, the NPPF seeks to promote sustainable transport by encouraging solutions which support reductions in greenhouse gas emissions and reduce congestion.
- 1.3.7 The NPPF does not contain specific policies for NSIPs for which particular considerations apply. NSIPs are determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant National Policy Statements for major infrastructure. For highways schemes, the relevant National Policy Statement is the NPSNN, as described above. However, the NPPF may be an important and relevant consideration under Section 104(2)(d) of the Planning Act 2008.

National Highways policy, plans and guidance

National Highways Licence

- 1.3.8 The National Highways Licence⁹ sets out the Secretary of State's aims, objectives and conditions for National Highways to meet by way of an Order in accordance with Section 1 of the Infrastructure Act 2015. This maintains the functions of a strategic highways company to make sure the strategic road network (SRN) is managed responsibly, in a way that safeguards value for public investment, meeting the needs of road users,

⁸ Communities and Local Government (2021) National Planning Policy Framework [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf (last accessed June 2022).

⁹ Highways England (2015) Highways England Licence – Secretary of State for Transport statutory directions and guidance to the strategic highways companies [online] available at: [Highways England: licence \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk) (last accessed July 2022).

securing individual well-being and supporting economic purpose, both today and for future generations.

National Highways Delivery Plan 2020-2025

1.3.9 The Delivery Plan¹⁰ outlines how National Highways will invest their government funding in the SRN between 2020 to 2025, over the second road period. The Delivery Plan identifies that fifty two schemes are planned to be opened during this road period to increase safety, improve reliability and deliver value for money. While the A46 Newark Bypass scheme will be open for traffic after the second road period, progression of this major road enhancement scheme throughout this period to enable road-user capacity, connectivity and access to be improved will be complete in the third road period.

National Highways Performance Specification

1.3.10 As part of the Road Investment Strategy 2¹¹, the Performance Specification¹² sets out the expectations for National Highways and the SRN, including metrics and indicators measuring the performance of both National Highways and the network against outcomes.

National Highways Net Zero Plan

1.3.11 In addition to the UK government, National Highways have outlined their net-zero strategy¹³ which contains three core commitments:

- Corporate emissions – net zero by 2030.
- Maintenance and construction emissions – net zero by 2040.
- Road user emissions – net zero by 2050.

National Highways' People, Places and Processes

1.3.12 National Highways' 'People, places and processes: A guide to good design at National Highways'¹⁴ sets out a vision, which aims to put people at the heart of National Highways' work, by designing an inclusive, resilient and sustainable road network. This road network should be appreciated

¹⁰ National Highways (2020) National Highways Delivery Plan 2020-2025 [online] available at: [5-year-delivery-plan-2020-2025-final.pdf \(nationalhighways.co.uk\)](#) (last accessed July 2022).

¹¹ Department for Transport (2020) Road Investment Strategy 2: for the 2020 to 2025 Road Period [online] available at: [Road Investment Strategy 2: 2020-2025 \(publishing.service.gov.uk\)](#) (last accessed June 2022).

¹² Department for Transport (2014) Road Investment Strategy: Performance Specification [online] available at: [Road Investment Strategy: Performance Specification \(publishing.service.gov.uk\)](#) (last accessed July 2022).

¹³ National Highways (2020) Net zero highways: our 2030 / 2040 / 2050 plan available at <https://nationalhighways.co.uk/media/eispjcm/net-zero-highways-our-2030-2040-2050-plan.pdf> (Last accessed July 2022)

¹⁴ National Highways (2022) People Places and Processes: A guide to good design at National Highways [online] available at: [People, places and processes \(nationalhighways.co.uk\)](#) (last accessed August 2022).

for its usefulness but also its elegance, reflecting in its design the beauty of the natural, built and historic environment through which it passes, and enhancing it where possible. The accompanying set of principles for good road design follow the themes of people, places and processes. The focus on good design seeks to make a difference to both road users and the communities through which the roads pass, while being sensitive to the context of a road's surroundings. The road should contribute to higher quality of life, greater economic vitality and a more efficient use of resources.

2 The scheme

2.1 Road Investment Strategy 2

2.1.1 In December 2014, the Department for Transport (DfT) published the Road Investment Strategy (RIS) for 2015-2020¹⁵. The RIS sets out the list of schemes that are to be developed by National Highways over the period covered by the RIS.

2.1.2 Following this, in December 2019, the Government built on the foundations of RIS by introducing a second Road Investment Strategy (RIS2)¹⁶ which sets a long-term strategic vision for the network. This strategy specifies the performance standards that National Highways must meet, lists the planned enhancement schemes that are expected to be built, and states the funding that will be made available during the second Road Period, covering the financial years 2020/21 to 2024/25.

2.1.3 In exercising its functions and complying with its legal duties National Highways must act in a manner which it considers best calculated to, among others:

- Minimise the environmental impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment.
- Conform to the principles of sustainable development.

2.2 Need for the scheme

2.2.1 The A46 forms part of the strategic Trans-Midlands Trade Corridor between the M5 in the southwest and the Humber Ports in the northeast. The improvements to the A46 corridor are detailed within the RIS2 as a mechanism for underpinning the wider economic transformation of the country. RIS2 makes a commitment to create a continuous dual carriageway from Lincoln to Warwick.

2.2.2 The stretch of A46 between the Farndon Junction, to the west of Newark and the A1 to the east of Newark, is the last remaining stretch of single carriageway between the M1 and A1 and consequently queuing traffic is a regular occurrence, often impacting journey time reliability.

¹⁵ Department for Transport (2015) Road Investment Strategy: for the 2015/16 – 2019/20 Road Period [online] available at: [Road Investment Strategy: for the 2015/16 – 2019/20 Road Period \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/424247/road-investment-strategy-2015-2020.pdf) (last accessed June 2022).

¹⁶ Department for Transport (2020) Road Investment Strategy 2: for the 2020 to 2025 Road Period [online] available at: [Road Investment Strategy 2: 2020-2025 \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/884247/road-investment-strategy-2-2020-2025.pdf) (last accessed June 2022).

2.3 Scheme objectives

DfT objectives

2.3.1 The DfT's RIS2 sets out the following Strategic Outcomes:

- Improving safety for all.
- Providing fast and reliable journeys.
- A well maintained and resilient network.
- Being environmentally responsible.
- Meeting the needs of all users.
- Achieving efficient delivery.

National Highways' objectives

2.3.2 The current National Highways' scheme objectives are below, but will be reviewed and refined as necessary as the scheme progresses.

Safety:

- Improve safety of the A46 and its junctions, reducing the frequency and severity of incidents along the A46.

Congestion:

- Reduce congestion along the A46 and its junctions.
- Improve links to the A1 by removing A46 through-traffic from the A1/A46 junction.
- Improve journey times and journey time reliability along the A46 and its junctions between Farndon and Winthorpe.
 - Support the movement of Goods and Access to Transport Hubs along the A46 corridor including the Humber ports and East Midlands Airport.
 - Improve accessibility to Newark-on-Trent and the local area
 - Enabling Economic Growth and Development in Newark-on-Trent, Nottinghamshire, and Lincolnshire.

Resilience:

- Increase resilience of the A46 by providing two lanes in each direction separated by a central reserve barrier.
- Increase resilience of the wider Strategic Road Network (for example the A1 and M1) by providing a more suitable alternative route when incidents occur

Environment:

- Seek to improve noise levels in Noise Important Areas ('noise hotspots') affected by improvements to the A46.

- Deliver better environmental outcomes through mitigation, protection and enhancement, and contribute to biodiversity net gain.

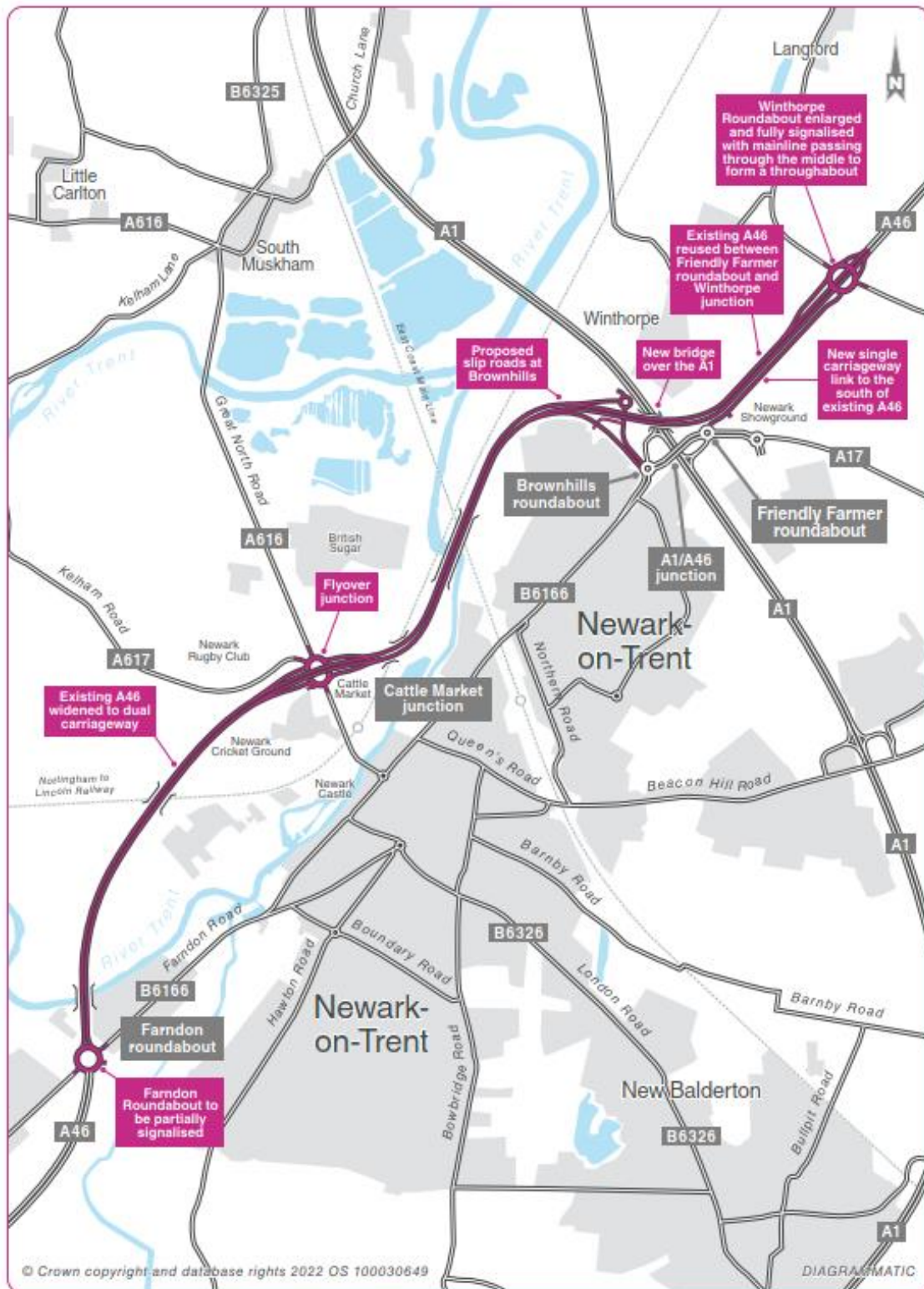
Customer:

- Improve the customer experience and satisfaction of all customers affected by the scheme
- Maintain and improve facilities for cyclists, walkers and horse riders where existing facilities are affected.

2.4 Scheme location

2.4.1 The scheme will provide a dual carriageway on the A46 between Farndon and Winthorpe. The Farndon roundabout is located at the western extent of the scheme where the B6166 Farndon Road joins the A46. The Winthorpe junction is located at the eastern extent where the A1133 joins the A46. Along its route, it crosses A617 and B6326, at the Cattle Market junction, and A1 between the Friendly Farmer and Brownhills roundabouts. Figure 2.1 below shows the location of the scheme.

Figure 2.1: Scheme location plan



2.4.2 The scheme will be situated within the county boundary of Nottinghamshire County Council and Newark and Sherwood District Council.

2.4.3 The scheme crosses the River Trent twice, the Nottingham to Lincoln railway line twice, and the East Coast Main Line once.

2.4.4 The existing A46, currently single carriageway, is generally elevated on embankment due to the low-lying floodplain of the River Trent. Several roundabouts form key junctions along the route, linking with several local A roads. Road infrastructure is softened by roadside vegetation in places and the River Trent is a strong natural influence within an otherwise manmade landscape. To the north of the A46, farmland dominates, interspersed with small-scale settlement. To the south of the road, the town of Newark forms a notable urban settlement.

2.4.5 All of the environmental designations located within 2 kilometres of the scheme extent are shown on the Environmental Constraints Plan contained within Appendix A. Notable statutory and non-statutory environmental designations and additional environmental constraints are as follows:

- Devon Park Pastures Local Nature Reserve (LNR) (approximately 500 metres east of Farndon junction) and Farndon Ponds LNR (approximately 800 metres west of Farndon junction);
- 42 locally designated non-statutory ecological sites (39 of which are Local Wildlife Sites (LWS), 11 of which lie within the scheme footprint). ;
- The River Trent and four other Main Rivers (two of which are crossed by the existing A46), which are reported reaches under the Water Framework Directive (WFD) and fall within the Humber River Basin District (RBD).
- The scheme is located across areas within Flood Zone 2 and Flood Zone 3.
- Noise Important Areas (NIAs) within the scheme footprint along the A1, A46, A617, Fosse Road and the East Coast Main Line;
- Designated heritage assets including Scheduled Monuments (a Civil War sconce at Devon Bridge, Civil War redoubts at Dairy Farm, Valley Farm and the Sugar Refinery, and a Moated site at Dairy Farm are within the draft red line boundary.
- Numerous Listed Buildings and structures (including Smeaton's Arches, Newark Castle, and Newark and Winthorpe Conservation Areas) within 2 kilometres of the scheme extent;
- Winthorpe Conservation Area and Newark Conservation Area are within the draft red line boundary. Averham and Kelham Conservation Areas are located immediately adjacent to the draft red line boundary. Farndon Conservation Area is located 1 kilometre west of the draft red line boundary.
- Newark Castle Gardens Grade II Listed Registered Park and Garden is located approximately 580 metres south of the A46;

- Non-designated heritage assets including from the English Civil War period and the likely potential for buried archaeological Palaeolithic remains of national or even international importance at Farndon;
- Predicted grade 3 land (good to moderate), according to Natural England's Agricultural Land Classification (ALC) maps (it is not possible to differentiate between subgrades 3a (deemed 'best and most versatile', BMV) and 3b (not deemed BMV) until soil surveys have been completed);
- The Trent and Belvoir Vales NCA;
- Four veteran and 10 notable trees have been identified within, or directly adjacent to, the draft red line boundary (of which 1 veteran and 9 notable trees are located at Kelham). Three veteran trees are currently in conflict with the scheme footprint.
- Extensive areas of Tree Protection Orders (TPOs), 3 of which will be in partial conflict with the scheme footprint (TPOs 116, 152 and 153);
- Existing communities in the vicinity of the scheme that are sensitive to environmental change include Newark-on-Trent to the south west of the scheme, accessed from the A46 via Farndon Road; Great North Road, and Lincoln Road; and the village of Winthorpe, located to the north east of the scheme, accessed via the A1133.

2.5 Scheme description

Introduction

- 2.5.1 The section of the A46 that is to be upgraded is approximately 6.5 kilometres in length. The scheme comprises on-line widening for the majority of its length between Farndon roundabout and the A1. A new section of offline dual carriageway is proposed between the western and eastern sides of the A1 before the new dual carriageway ties into the existing A46 to the west of Winthorpe roundabout. The widening works include earthwork widening along the existing embankments, and new structures where the route crosses the railway lines, River Trent and the A1.
- 2.5.2 A new grade separated junction will be provided at Cattle Market roundabout with improvements proposed at both the Farndon and Winthorpe roundabouts.
- 2.5.3 Three areas have been identified for floodplain compensation which are being referred to as the Kelham and Averham Floodplain Compensation Area, Brownhills Floodplain Compensation Area, and the Borrow Pits West Floodplain Compensation Area.

2.5.4 The maximum parameters (size and scale) of the scheme are unknown at this stage. However, the ES will define these, along with any limits of deviation, and the description will reflect the description of the scheme within the draft DCO submission. The ES will be supported by appropriate figures and design drawings.

Proposed scheme components

2.5.5 The scheme consists of the following principal elements, which are described in further detail in the below sections:

- Widening of the existing A46 to a dual carriageway for a distance of 6.5 kilometres (approximately 4 miles) to provide two traffic lanes in both directions.
- Partial signalisation of Farndon roundabout at the southern extents of the scheme.
- A new grade-separated junction at Cattle Market junction with the A46 elevated to pass over the roundabout. A larger roundabout beneath the A46 to provide increased capacity.
- Proposed off-line section between (approximately) Brownhills roundabout and Friendly Farmer roundabout.
- New grade separated roundabout junction (Brownhills junction) providing local access with a two-way link road on the southern arm to connect with the existing Brownhills roundabout.
- A new bridge structure across the existing A1, located to the north of the existing bridge.
- An upgraded roundabout with possible signal controls at Winthorpe junction.
- Improvements to non-motorised user (NMU) facilities through safer, enhanced routes for walkers, cyclists, and horse riders.
- Provision of floodplain compensation to account for loss of floodplain as a result of the scheme footprint.

Mainline description

2.5.6 At its south-western limits, the scheme ties in with the northern arm of the existing Farndon roundabout, which already has two lanes on the entry and exit. Travelling north-eastwards, the route follows the alignment of the existing A46 for 2.5 kilometres during which it crosses over the River Trent and the Nottingham to Lincoln railway line. As the route approaches Cattle Market roundabout it begins to elevate so that it passes over the top of the southern half of the existing roundabout. The route then remains elevated and continues to follow the alignment of the A46 whilst it passes over the Nottingham to Lincoln railway line for a second time, the River Trent for a second time, and the East Coast Mainline. Throughout this stretch,

between Farndon and just beyond the East Coast Main Line, the route is being widened to the north, away from Newark-on-Trent. Following this, the existing A46 bends to the right whilst the route of the scheme diverts to the north where it crosses at a skew over the A1. The route then ties back into the existing A46 dual-carriageway, and follows this alignment before it ties into Winthorpe roundabout at the north-eastern extent of the scheme.

Junction description

- 2.5.7 Farndon junction at the south-west extent of the scheme will be enlarged to facilitate an additional circulatory lane, providing increased capacity. Traffic signals, operating during peak-hours, will control traffic movements through the roundabout, helping to improve flows and reduce congestion.
- 2.5.8 Cattle Market roundabout in the middle of the scheme will be enlarged, with the mainline elevated over the top to separate local traffic and through traffic. Eastbound and westbound slip roads will be provided to allow traffic to pass between the roundabout and mainline.
- 2.5.9 To the west of the A1 a new westbound on slip will be provided from Brownhills roundabout that will utilise the existing A46 carriageway. An eastbound off slip will be provided the other side of the dual carriageway that will tie into a new small roundabout near the A1. This provides access to the properties and businesses to the north, and links to Brownhills roundabout via a new two-way link that crosses perpendicular beneath the mainline.
- 2.5.10 Winthorpe roundabout at the north-eastern extent of the scheme will be enlarged and fully signalised, with the mainline passing through the centre of the roundabout in a throughabout layout. Eastbound and westbound slip roads will be provided to allow traffic to merge and diverge between the mainline and the roundabout. An additional fifth arm will be provided for the two-way link to the Friendly Farmer roundabout.

Side roads description

- 2.5.11 Connections to all local roads in the vicinity of Farndon, Cattle Market and Winthorpe junctions will be retained, with the new junction layouts being designed to accommodate them. This includes Fosse Road, Farndon Road, the A617, the Great North Road, Drove Lane and the A1133. In addition, a new single carriageway link is provided between the Friendly Farmer roundabout and the new enlarged roundabout at Winthorpe.

Floodplain compensation site description

2.5.12 The proposed enlarged embankment for the A46 carriageway passes through land that acts as the floodplain for the River Trent. By using this land, the scheme has the potential to increase flood risk elsewhere unless mitigation is provided. This mitigation will include floodplain compensation which will seek to provide an equivalent volume of floodplain storage in the local catchment by excavating land at similar elevations to that which will be displaced by the scheme.

2.5.13 To demonstrate that the floodplain compensation areas are effective, analytical flood modelling will be carried out. Three areas have been identified for floodplain compensation. These are being referred to as the Kelham and Averham Floodplain Compensation Area, Brownhills Floodplain Compensation Area, and the Borrow Pits West Floodplain Compensation Area. The location of these are shown on the draft red line boundary drawing contained in Appendix B. Floodplain compensation may be required at all three of these areas, for two reasons.

1. Like-for-like floodplain compensation is required. This means that the floodplain compensation needs to be at similar elevations to that which the new embankment would remove from the floodplain. The Kelham and Averham Floodplain Compensation Area would seek to provide floodplain compensation at higher elevations, the Borrow Pits West Floodplain Compensation Area middle elevations, and the Brownhills Floodplain Compensation Area lower elevations.
2. Where possible floodplain compensation will be provided close to where the floodplain losses are occurring. From a scheme perspective, providing multiple sites would be more effective and would likely require less land-take and shallower depressions than providing all of the compensation at one location.

2.5.14 Where land is reduced in levels to create the additional floodplain compensation areas, these will effectively be borrow pits enabling the potential for material to be used in the permanent earthworks for the scheme. These areas will be re-topsoiled and landscaped appropriately on completion of the scheme. The current draft red line boundary (contained in Appendix B) includes large areas for the Borrow Pits West Floodplain Compensation Area and the Kelham and Averham Floodplain Compensation Area, however the floodplain compensation may not require all of this land. The draft red line boundary currently includes for a range of flood compensation options and ways of connecting the River Trent to the floodplain compensation areas and will be refined prior to submission of the DCO application.

Additional features

2.5.15 In addition to the above principal scheme elements, additional features associated with the scheme include new drainage, including improvements to existing infrastructure, landscape planting, environmental mitigation, lighting, traffic signage, facilities in and around proposed junctions to accommodate walking, cycling and horse riding as required, and utility diversions.

2.5.16 Details of these additional features will be provided within the ES following further development of the scheme design.

Land take

2.5.17 Land would be required both temporarily and permanently to construct, operate and maintain the scheme. It has been estimated that the scheme would require approximately 3,571,482 m² of land within the red line boundary to be acquired permanently, and approximately 601,567 m² of land would be needed temporarily during construction. There would be requirements for National Highways to acquire permanent rights and to extinguish other rights over this land.

Demolition

2.5.18 The scheme would require the demolition of the redundant equipment / vehicle maintenance shed within the now disused Nottinghamshire County Council Highways depot to the west of the Great North Road at Cattle Market and the demolition of the disused Mint Leaf restaurant adjacent to the existing A46 to the east of the A1 which is currently closed for business.

Scheme construction

2.5.19 As part of the proposed scheme, the following elements are likely to be required during construction:

- Temporary working and storage areas, material stockpiles, haul roads, borrow pits, and provision for site compounds to be used during the construction period for project offices, welfare facilities and material and plant storage.
- Enabling works including utility diversions.
- Temporary traffic management arrangements on the A46, A1 and local road networks.

2.5.20 The types of construction elements that are likely to form part of the scheme include the following:

- Pre-construction and mobilisation activities, for example establishing site compounds, borrow pits and haul roads, and topsoil storage.
- Excavation of soil to form flood compensation areas.
- Earthworks to include noise attenuation and landscape bunds.
- Diversion of Statutory Undertaker's (SU) equipment and other apparatus.
- Installation of attenuation features.
- Ground water management.
- Site clearance.
- General excavation.
- Earthworks, including the construction of embankments and the relocation of spoil.
- Placing concrete foundations, including piling works.
- Laying of asphalt.
- Installation of drainage, which will include excavation and placement of pipes and chambers.
- Installation of a concrete central reservation along the A46.
- Installation of new street lighting and traffic signals at junctions.
- Landscaping and planting.
- Construction of new bridge structures including the lifting of beams into place.
- Construction of retaining wall solutions for the retention of new embankments.

2.5.21 Details of the construction methodology will be included as part of the ES. The ES will describe the construction phasing, the likely duration and location of construction activities, any requirements for night-time working, and the anticipated numbers and types of vehicle movements associated with the construction phase.

2.5.22 The development of the construction strategy will aim to ensure that adverse effects are reduced for sensitive receptors as far as practicable.

2.6 Embedded mitigation

2.6.1 The scheme design will be developed in line with the principles set out in DMRB GG 103¹⁷ 'Introduction and general requirements for sustainable development and design'. To date, embedded mitigation has been established in line with these principles, as appropriate. The continued development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles

¹⁷ National Highways (2019) GG 103 – Introduction and general requirements for sustainable development and design [online] available at: [GG 103 - Introduction and general requirements for sustainable development and design - DMRB \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk) (last accessed August 2022).

of the design and mitigation hierarchy outlined in DMRB LA104 Environmental Assessment and Monitoring¹⁸. The first principle being to avoid potential effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy.

2.6.2 Embedded design features for the scheme, grouped by National Highways design principles in DMRB GG 103, that have informed the scope of the EIA are as follows:

Safe and useful, and understandable

- LED lighting columns limited to the approach to junctions, subject to further assessment in preliminary and detailed design stages.
- Traffic signals as required.
- Road restraint systems providing protection from features which may present a hazard, such as high embankments.
- Traffic signs at appropriate locations to provide route and destination information.
- Road markings as required.

Restraining, fitting into the context and environmentally sustainable

- An important part of the design philosophy is to asymmetrically widen the A46 to mitigate the potential impact on views from Newark and the setting of the conservation area. This will be achieved by maintaining the position of the existing eastern edge of carriageway in the southbound direction wherever possible, and proposing drainage solutions that will aim to retain where practical the existing earthworks and screen planting, and avoid vegetation clearance.
- Flood compensation is required to mitigate the loss of existing flood plain along the western side of the scheme. This requires existing land to be lowered through the excavation of material which would ordinarily be sent to landfill. This has been mitigated by identifying areas of land that can be used as a borrow pit to provide the structural fill to the widened embankments thus removing the need to send material to landfill and import material from other locations.
- Retrofitting of existing structures, new rail and river crossings and an additional viaduct across the River Trent:
 - Changes were made in the option design to try to preserve the fabric of the original structures (existing highways bridges including the Windmill viaduct and the Nether Lock viaduct) by proposing a separate structure adjacent to the existing ones rather than removal of the historic structures and replacement with new.

¹⁸ National Highways (2020) LA 104 – Environmental assessment and monitoring [online] available at: [LA 104 - Environmental assessment and monitoring - DMRB \(standardsforhighways.co.uk\)](#) (last accessed August 2002).

- The use of thin surface courses on new carriageways to provide a reduction in road surface noise compared to hot rolled asphalt or concrete.
- Drainage features such as balancing ponds, drainage ditches and culverts, subject to further design consideration.
- Fencing for the highway boundary and restricted features (for example drainage ponds).
- Retention of the existing dual carriageway between Friendly Farmer and Winthorpe and building a new link to the south which will move the A46 away from Winthorpe (when compared with the scheme design for the preferred route announcement). This also enables the retention of the Esso garage.
- Moved Brownhills junction offslip so that it no longer crosses beneath the dualled A46 near to the A1, to substantially reduce the height of the new dual carriageway.
- Retention of the existing A46 for the new southbound onslip from Brownhills junction, allowing existing bunds and the majority of established vegetation to be retained.

Inclusive

- Access in and around proposed junctions to accommodate walking, cycling and horse riding as required (excluding Winthorpe, existing provisions retained at Farndon).
- Where the proposed alignment severs an existing public right of way, connectivity will be maintained wherever possible. This will be achieved with the reconnection of severed PRow with permanent diverted routes.

2.6.3 In addition, there are a number of opportunities for further embedded mitigation, grouped by National Highway's design principles in DMRB GG 103, that will be considered during the development of the ongoing scheme design. These are detailed in the individual topic chapters (Chapters 6 to 16).

3 Assessment of alternatives

3.1 Introduction

3.1.1 This chapter presents the process by which the preferred route for the scheme has been identified. This will be further detailed within the Assessment of Alternatives chapter of the ES, which will also examine the design variations of the preferred route.

3.2 Assessment history

3.2.1 An initial 'Option Generation' exercise began in 2015, and identified three corridors of interest, Corridors A, B and C. Figure 3.1 below shows their geographical locations. A further two corridors were identified as part of the 'Initial Sifting' stage. Figure 3.2 shows the further two corridors, Corridors D and E. Detailed descriptions of Corridors A-E are as shown in Table 3.1.

Figure 3.1: Corridors A, B and C

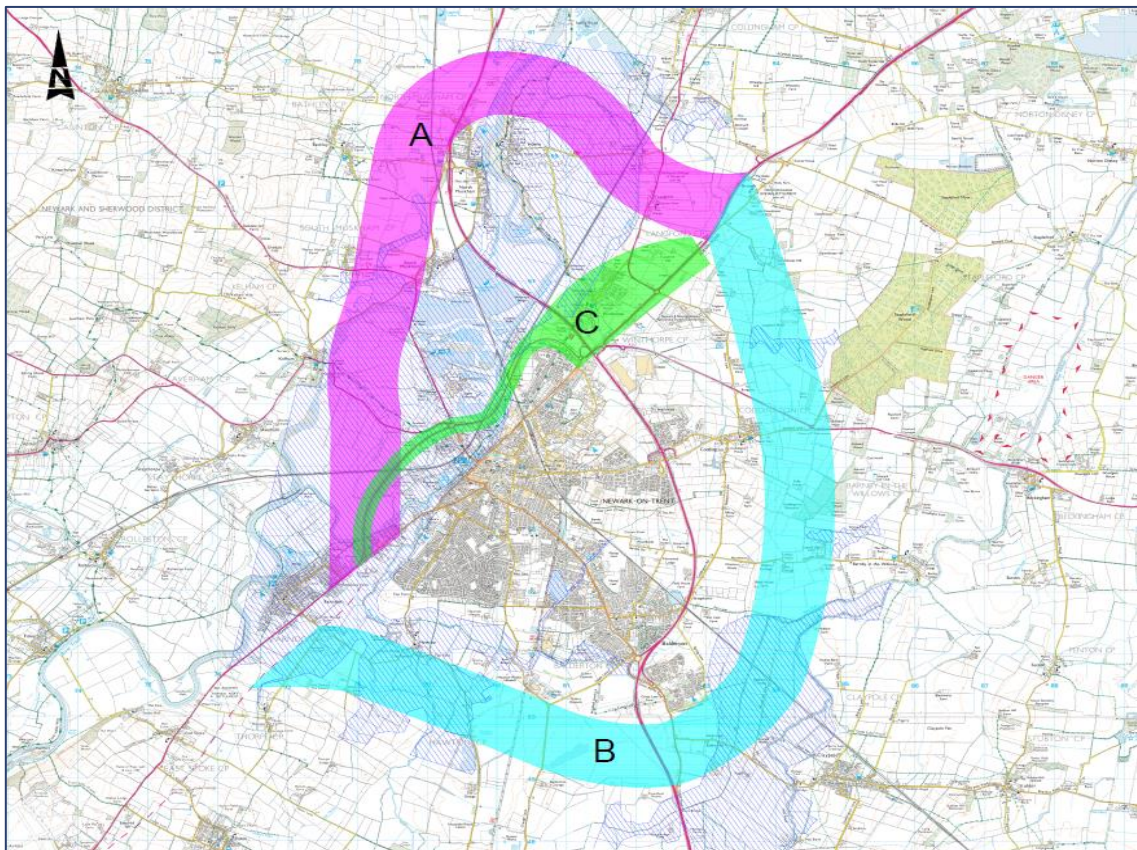


Figure 3.2: Corridors D and E

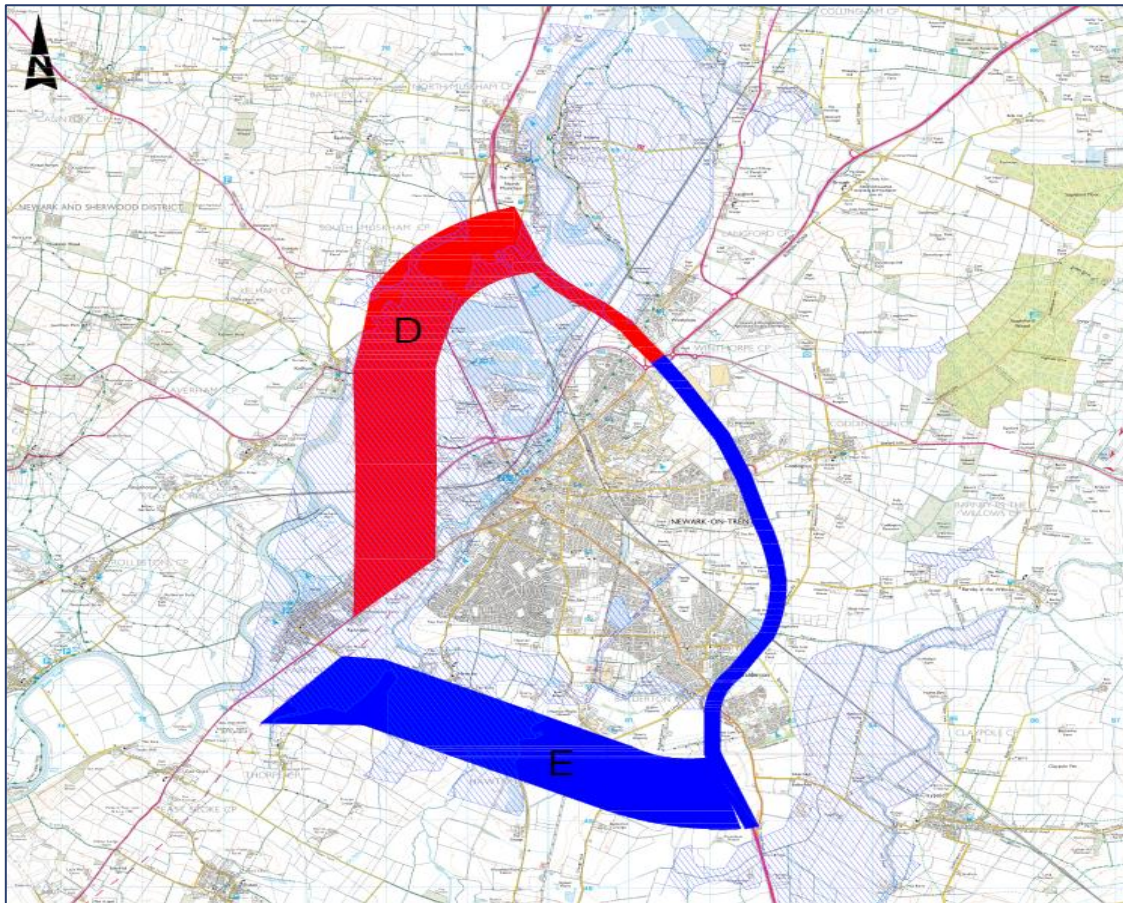


Table 3.1: Corridor descriptions

Corridor	Description
A	Starts south-west of Newark, diverging towards west of Newark, cuts across the railway line, crosses the River Trent, bypasses South and North Muskham, crossing A1 road, crosses the River Trent again, cuts the railway line and re-joins the existing A46 near Brough.
B	Starts south-west of Newark, diverging near Thorpe on existing A46 avoiding the built-up area towards the east of Newark, crosses A1 road, cuts across the railway line, crosses the A17 road and re-joins the existing A46 near Brough.
C	Follows the existing A46 corridor which starts from Farndon junction through to Winthorpe junction. The carriageway would be widened to dual carriageway between Farndon and the A1/A46 junctions. Capacity improvements are proposed for the Cattle Market, the A1/A46 and Winthorpe junctions.
D	Starts south-west of Newark, diverging from the existing A46, avoiding the built-up area towards the west of Newark, cuts across the railway line and the River Trent, bypasses south Muskham, connects and follows A1 road and re-joining the existing A46 at Winthorpe junction.
E	Starts south-west of Newark, diverging near Thorpe on existing A46 avoiding the built-up area towards east of Newark and connects A1 road near Fernwood, further follows the existing A1 road and re-joining the existing A46 near Winthorpe junction.

- 3.2.2 An options workshop was held in January 2018 which included a review of the constraints and opportunities related to traffic, environment and highways for each corridor.
- 3.2.3 Each corridor was assessed against the following criteria, using a five-point scale:
- Client Scheme Requirements (CSRs).
 - Environmental criteria and the National Policy Statement for National Networks (NPSNN).
 - The DfT's Early Assessment and Sifting Tool (EAST) which includes environmental criteria.
- 3.2.4 Following the assessment, it was concluded that Corridor C should be taken forward for further consideration, and that all other corridors should not be considered further. This is because Corridor C, which uses the existing A46 corridor, was the best performing corridor in terms of user benefits, providing the greatest reductions in journey times, delays and incidents, and improvement in reliability. The user benefits would be lower for corridors A, B, D and E. With a longer corridor there are less journey time savings and the lower level of diversion from the existing A46 corridor (as this would still remain in place) would mean it is unlikely to resolve the capacity issues on the A46 at Cattle Market, Friendly Farmer, Brownhills or Winthorpe roundabouts, reducing the benefits for other users.
- 3.2.5 Furthermore, Corridor C performed better in environmental terms in achieving potential improvements in terms of carbon, noise and the local water environment. Corridor C was preferential in comparison with Corridors A, and D, and slightly more preferential than Corridors B and E resulting in a moderate risk of potential adverse effects on key environmental constraints, including sensitive, high-value heritage, water, landscape and visual and noise receptors. Corridor C performed more strongly across a range of criteria including value for money and environment.
- 3.2.6 Various routes and junction arrangements within Corridor C were considered. Having determined which route and junction options provided the benefits and improvements sought along the A46, to meet CSR objectives, the recommended route and junction options were combined into scheme options to allow them to be assessed.
- 3.2.7 The scheme options based on Corridor C were:
- Option A – Route Option 1A with all grade separated junctions.
 - Option B – Route Option 1B with all at grade junctions except A1/A46 Junction which would be grade separated.

- Option C – Route Option 1A with all grade separated junctions as per Option A but with an additional proposed grade-separated junction at Hawton Lane.

3.2.8 All three options were evaluated against:

- Engineering Assessment.
- Traffic and Economic Assessment.
- Environmental Assessment.
- Social Assessment.
- Safety, Operational, Technology and Maintenance Assessment.

3.2.9 Following consideration and assessment of the objectives and examination of the constraints present in the vicinity of the scheme, Options A, B and C were all recommended to be taken forward for non-statutory public consultation. These options were more favoured due to the substantial safety and economic benefits of the grade separated Cattle Market junction together with the more marginal but still recognisable environmental benefits achieved through the online routes of the A46 in the vicinity of Winthorpe.

3.2.10 Following further review, a new scheme option (Option D) was identified and taken forward for further assessment. Option D follows the existing A46 mainline from Farndon roundabout to the north of the existing Trent River Viaduct at Nether Lock. The route would then diverge away from the existing mainline, crossing over the A1 via a new structure. The route would run parallel to the northbound carriageway of the existing A46, to the south of Winthorpe, before tying-in to the existing Winthorpe roundabout. Farndon roundabout and Winthorpe roundabout would remain at-grade, with Cattle Market junction and the A1/A46 junction being grade separated.

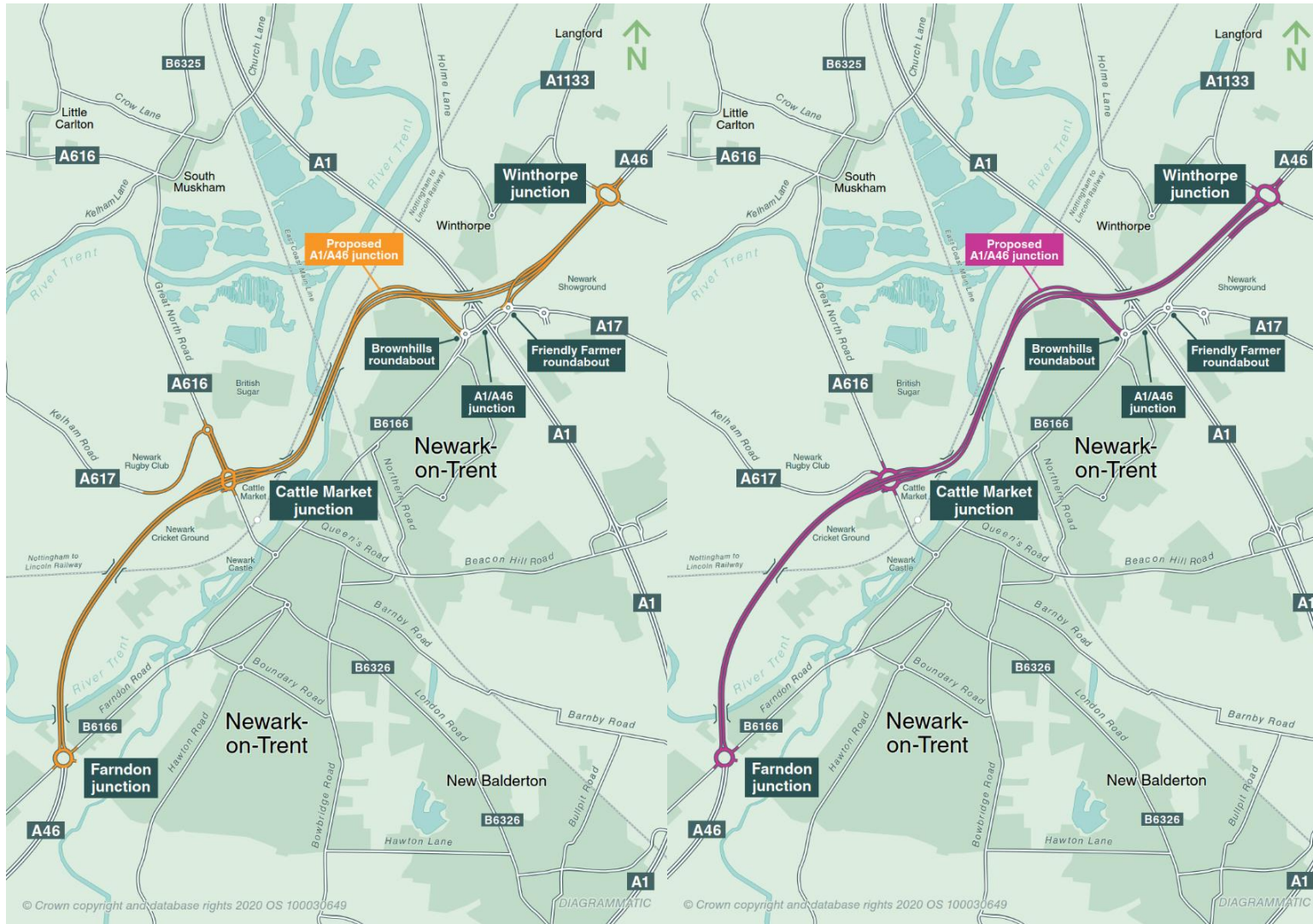
3.2.11 A second option sifting exercise resulted in two scheme options being carried forward; Options B and D. This is because Option B and Option D, compared to Option A and Option C, included:

- The least number of structures and volumes of earthworks, hence the lowest scheme costs.
- Less land take, including agricultural and BMV land, resulting in a smaller volume of additional flood compensation storage required outside of the flood risk areas (Flood Zones 2 and 3).
- Less likely significant adverse environmental effects with mitigation as there would be less habitat fragmentation, have fewer heritage assets and a smaller impact on affected listed structures along the A616, and have the least likely significant adverse effects predicted for noise.
- Less likely significant adverse effects on landscape, townscape and visual receptors, water, mineral resources, waste generation and

materials asset use. This is due to the extent of land take, new sections of road and additional grade separated junctions, area of permeability and increased construction within the floodplain (which would require compensation).

3.2.12 The options were thus renamed Option 1 and Option 2 (Figure 3.3), respectively.

Figure 3.3: Option 1 and 2



3.2.13 The options consultation that took place at earlier stages of the scheme was a crucial part of the stakeholder engagement and development of the scheme. It was the first formal opportunity for all stakeholders to contribute their views to ensure the design team understand the local area and any potential impacts the scheme may have on users and the community. The views and feedback gained from the options consultation has helped to inform scheme development and feed into the decision on a preferred option. The options consultation lasted for eight weeks from 9 December 2020 until on 2 February 2021.

3.2.14 852 respondents gave feedback on concerns about issues in relation to the scheme. The most cited concerns included:

- Amendments/improvements required to the proposed options. This covered comments such as:
 - Need to grade separate all junctions.
 - Need to resolve issues caused by roundabouts.
 - Prefer a hybrid of the two options presented.
 - Consideration of Newark Flat Crossing (rail).
 - Scheme options not addressing safety concerns at the A1/A46 junction.
 - Noise pollution as a result of the scheme and associated noise mitigation.
 - Negative impact on local residents, including visual and setting impacts of residential properties, risk of flooding and water drainage capacity and associated mitigation.
 - Environmental/ecological impact and the associated mitigation required.
 - Air pollution and carbon emissions.
 - Safety and access for cyclists and pedestrians.
 - Negative impact of, and disruption during, construction.

3.2.15 Option 2 Modified was developed in response to these concerns, with the route of the new A46 link crossing the A1 moved approximately 75 metres further from Winthorpe than Option 2.

3.2.16 The 'Think Again' Action Group proposed an alternative solution for the section of the A46 between the A1 and Winthorpe junction. Therefore, Think Again Option 3 was presented late on in the optioneering process. A qualitative assessment was carried out to evaluate this option. Whilst there was a potential for some slight benefits to delays and journey times compared to Options 1 and 2, this would be unlikely to be sufficient to offset the substantially higher costs associated with the additional structures, land take and earthworks that would be required. This would adversely affect the value for money of the scheme, which was already assessed as having low value for money for Options 1 and 2. From an

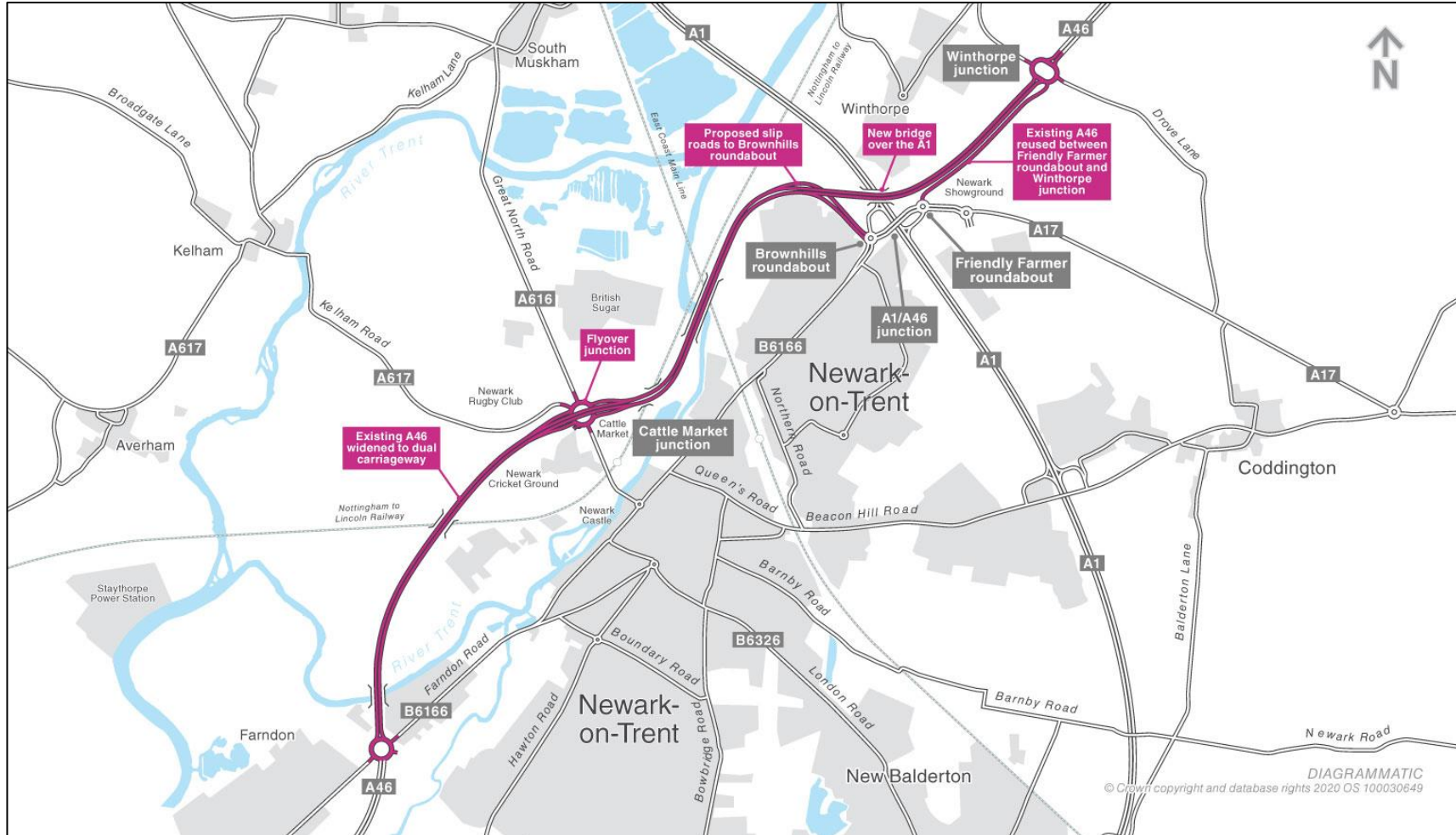
environmental perspective, on balance, the Think Again Option 3 was considered to be environmentally worse than Option 1 and 2 due to the potential for this option to generate more materials and waste and the additional significant adverse effects it would have on landscape and visual, cultural heritage, development land and businesses, and water quality receptors. Therefore, given that the Think Again Option 3 was identified as being less favourable in engineering, economic and environmental regards than Options 1 and 2, would present lower value for money and would still bring the proposed A46 route closer to the village of Winthorpe, it was recommended that the Think Again Option 3 should not be assessed further.

3.2.17 An Environmental Assessment Report was produced to inform the comparison of environmental effects and to support the option selection.

3.2.18 Option 2 was selected on the basis of a number of factors, including safety, improved journey time reliability, and the level of overall support from the local community. Creating a flyover for the A46 to pass over Cattle Market junction and adding traffic lights at Farndon roundabout means Option 2 would provide additional capacity and the greatest travel time savings on the road. Furthermore, Option 2 would have the most potential going forward to incorporate further embedded design and essential measures to help mitigate any potential significant effects, especially around Winthorpe and Cattle Market junction.

3.2.19 Concerns were voiced by Winthorpe with Langford Parish Council, the Think Again group, Newark & Sherwood District Council, Newark Town Council, Nottinghamshire County Council and local residents that Winthorpe village would experience negative environment impacts including noise, vibration, visual impact and light pollution as well as an impact on the conservation area of Winthorpe. Support was given to exploring alternatives in the vicinity of Winthorpe in order to minimise these impacts. Option 2 Modified was developed in response to these concerns, with the route of the new A46 link crossing the A1 moved approximately 75 metres further south from Winthorpe than Option 2. National Highways announced the preferred route (Option 2 modified) in February 2022 (Figure 3.4 below).

Figure 3.4: Option 2 Modified



3.3 Assessment of alternatives within the ES

3.3.1 The Assessment of Alternatives presented within the ES will examine the design variations of the preferred route, including ‘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’, in line with the Infrastructure Planning (EIA) Regulations 2017. This will demonstrate the rationale and decisions made for the final preliminary design to be submitted as part of the DCO application.

4 Consultation

4.1 Environmental consultation undertaken to date

Engagement with statutory and non-statutory environmental bodies

4.1.1 In addition to engagement with local authorities, landowners, hard to reach groups, and the community, National Highways has engaged with statutory environmental bodies (SEBs) (Natural England, the Environment Agency and Historic England) and non-statutory environmental bodies. A summary of the meetings is provided in Table 4.1. Stakeholders were engaged by group meetings, telephone discussions and emails.

Table 4.1: Meetings with environmental stakeholders to date

Date	Stakeholder	Discussion / topics raised
Engagement with environmental stakeholders during optioneering stages		
11/01/2021	Environmental Stakeholder Briefing	Introduction to the scheme, briefing regarding various route options, discussions around key environmental features, constraints, and opportunities and hear views and share local knowledge of stakeholders.
13/01/2021	Nottinghamshire County Council	A meeting to inform the County Archaeologist about the heritage work being undertaken for the scheme, and an opportunity for the County Archaeologist to raise any issues that should be addressed within the options assessments.
16/03/2021	Newark and Sherwood District Council	A meeting to introduce the scheme, discuss environmental features, constraints and opportunities, and share local knowledge.
29/04/2021	Environment Agency	A meeting to introduce the scheme and discuss the climate change allowances, hydraulic model, flood compensation methodology, the flood reduction opportunities including legacy work and the Flood Risk Assessment.
26/05/2021	Nottinghamshire County Council, Newark and Sherwood District Council	Introduce the scheme and discuss climate change allowances, the hydraulic model and hydrology, flood compensation methodology and flood reduction opportunities including legacy work.

Date	Stakeholder	Discussion / topics raised
09/06/2021	Environment Agency	Discussion regarding the Water Framework Directive (WFD) receptors, potential impacts and opportunities. To start engagement and dialogue around the WFD compliance assessment that will continue during the scheme development.
Engagement with environmental stakeholders following preferred route announcement		
02/03/2022	County Archaeologist, Nottinghamshire County Council	To review and agree the scope and specification for proposed geophysical and metal detector surveys and to discuss the contents of the proposed Archaeological Management Plan.
30/03/2022	Environment Agency	Introductory meeting to discuss Water Quality and Flood Management issues.
05/04/2022	Nottinghamshire County Council, Internal Drainage Board (Water Management Consortium)	Introductory drainage steering group meeting.
11/05/2022	Internal Drainage Board (Water Management Consortium), Environment Agency	Second drainage steering group meeting to collate further information on the following items; River Trent Model and Others, Basis of Design for Flood Level Compensation, Land Drainage, Records and models, Historic Flood Records, Run-off Control Conditions, Flood Resilience – Joint Probability.
12/05/2022	Environment Agency	Flood Risk Data Transfer discussion following request for information submissions.
31/05/2022	Natural England	Introduction to the A46 scheme, overview and findings of the ecology surveys undertaken to date, and survey-specific queries.
13/06/2022	Environment Agency	A meeting with the relevant Environment Agency water quality specialists to agree proposals for water quality monitoring for the scheme, to inform both the EIA as well as during construction.

Date	Stakeholder	Discussion / topics raised
06/07/22	Senior Conservation Officer, Newark and Sherwood District Council	Introduction to the A46 scheme, discussion regarding engagement with archaeological advisers, and discussion around potential impacts to the Grade II listed arches at Cattle Market junction.
08/07/22	Historic England	A meeting to provide an overview of the scheme, level of engagement required / expected during development of scheme design up to DCO submission, and review of key heritage assets in the area.
20/07/22	Archaeology Advisor, Newark and Sherwood District Council	A meeting to provide an overview of the scheme, the environmental assessment milestones and a summary of work to date, including the draft Archaeological Management Plan and the geophysical, metal detecting and field walking survey specification.
21/07/22	Senior Conservation Officer and Landscape/Ecology/Tree Officer, Newark and Sherwood District Council	A meeting to provide an overview of the scheme, including the current scheme status, overview of EIA key milestones and level of engagement. Specifics included the agreement of visual receptor locations, a discussion regarding key built heritage assets, a summary of tree surveys undertaken to date and planned surveys going forward, and a summary of ecology surveys undertaken to date and planned surveys going forward.
05/08/22	Senior Conservation Officer, Newark and Sherwood District Council	A meeting to explain the current design aspirations at Cattle Market junction and understand any mitigation required or areas of the design that would need amending to ensure adverse effects to Smeaton's arches along the Great North Road are reduced as far as practicable.

4.2 Proposed consultation

4.2.1 National Highways announced the preferred route (Option 2 modified) in February 2022. The decision considered criteria including the scheme objectives and feedback received from the options consultation that took place between 9 December 2020 to 2 February 2021.

- 4.2.2 The scheme is progressing towards a period of statutory engagement and consultation. Engagement with the Environment Agency, Natural England, Historic England, Nottinghamshire County Council and Newark and Sherwood District Council, as well as other relevant environmental organisations will continue, through the format of an Environmental Technical Working Group (TWG).
- 4.2.3 The Environmental TWG will be responsible for studying scheme environmental issues, agreeing the proposed environmental assessment methodologies, considering appropriate scheme solutions and agreeing Statements of Common Ground (SoCGs) on environmental matters between National Highways and key stakeholders.
- 4.2.4 The Environmental TWG will also be responsible for the technical review of the Environmental Impact Assessment (EIA) and associated surveys, development and review of environmental design, mitigation requirements and environmental opportunities and enhancements.
- 4.2.5 In Autumn 2022, National Highways plan to hold a statutory public consultation, seeking views, comments, and feedback on the scheme. A series of public events and invitation-only meetings will be held with key stakeholders, the local community and landowners. Members of the project team will be available at events to discuss the scheme with members of the public.
- 4.2.6 A Preliminary Environmental Information (PEI) report and a non-technical summary (NTS) of the PEI will be published for the statutory consultation and will be available for statutory consultees to comment on. The PEI will acknowledge the Scoping Opinion and explain how the ES intends to respond to the Scoping Opinion comments received.
- 4.2.7 The public events will be advertised in accordance with the published Statement of Community Consultation (SoCC). A full copy of the SoCC will be made available during the statutory consultation, in accordance with the Planning Act 2008.
- 4.2.8 The following consultation material will be made available during the consultation period:
- Public consultation brochure.
 - Public consultation response form.
 - Scheme maps.
 - PEI report and NTS.
 - Section 47 and 48 Notice.
 - SoCC.

4.2.9 All feedback and formal responses received during the statutory consultation period will be recorded and will be summarised in the Consultation Report. All responses received during the statutory consultation will be taken into account when finalising the DCO application for the scheme, before it is submitted to the Planning Inspectorate.

5 Environmental assessment methodology

5.1 Approach to assessment

5.1.1 This Environmental Scoping Report considers the following factors contained in Regulation 5(2) of the Infrastructure Planning (Environmental Impact Assessment) (EIA) Regulations 2017¹⁹. These include:

- Population and human health (a).
- Biodiversity (b).
- Land, soil, water, air and climate (c).
- Material assets, cultural heritage and the landscape (d).
- The interaction between the factors referred to in sub-paragraphs (a) to (d).

5.1.2 The assessment for each of these factors are covered in one or more environmental assessment chapters in this report. The chapters have been written in accordance with the requirements presented in the Design Manual for Roads and Bridges (DMRB) LA 103 – Scoping projects for environmental assessment²⁰ and LA 104 – Environmental assessment and monitoring²¹, for each of the relevant environmental factors (topics). This is shown in Table 5.1 below.

Table 5.1: Environmental factors and respective DMRB environmental topics

Environmental factors contained within Regulation 5(2) of the Infrastructure Planning (EIA) Regulations 2017	DMRB environmental topic
Population and human health	Chapter 6 Air Quality (LA 105) Chapter 12 Noise and Vibration (LA 111) Chapter 13 Population and Human Health (LA 112) Chapter 14 Road Drainage and the Water Environment (LA 113)
Biodiversity	Chapter 9 Biodiversity (LA 108 and LD 118)
Land, soil, water, air and climate	Chapter 6 Air Quality (LA 105) Chapter 10 Geology and Soils (LA 109)

¹⁹ Statutory Instrument (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, No. 527.

²⁰ National Highways (2020) DMRB Volume 11 Environmental Assessment, LA 103 – Scoping projects for environmental assessment.

²¹ National Highways (2020) DMRB Volume 11 Environmental Assessment, LA 104 – Environmental assessment and monitoring.

Environmental factors contained within Regulation 5(2) of the Infrastructure Planning (EIA) Regulations 2017	DMRB environmental topic
	Chapter 14 Road Drainage and the Water Environment (LA 113) Chapter 15 Climate (LA 114)
Material assets, cultural heritage, and the landscape	Chapter 7 Cultural Heritage (LA 106) Chapter 8 Landscape and Visual Effects (LA 107, LD 117 and LD 119) Chapter 11 Material Assets and Waste (LA 110)
The interaction between the factors referred to in sub-paragraphs a) to d)	Chapter 16 Assessment of Cumulative Effects

5.1.3 In accordance with DMRB LA 103, scoping shall ensure that environmental assessment is proportionate, by identifying those environmental factors (or any elements):

1. Which are likely to result in significant environmental effects.
2. Where sufficient uncertainty for significant effects remains .

5.1.4 Each topic chapter of this Environmental Scoping Report contains:

- a summary of the topic-specific legislative and policy drivers.
- a description of the defined study area.
- the existing baseline conditions including any environmental constraints present.
- a description of the potential impacts.
- a summary of the likely design mitigation and enhancement measures.
- a description of the likely significant effects.
- any assumptions and limitations associated with the assessments to date
- a description of the proposed assessment methodology (including significance criteria).
- details of any consultation undertaken to date and further consultation plans to inform the Environmental Statement (ES).
- a summary of the proposed scope of the ES and responses to scoping questions as set out in the relevant topic-specific DMRB standards, for each topic.

5.1.5 Each topic has considered the potential environmental effects associated with the construction and operational phases of the scheme. The scheme would be unlikely to be decommissioned as it would form an integral part of the Strategic Road Network (SRN). As such, decommissioning has not

been considered within this Environmental Scoping Report, and it is proposed that decommissioning is scoped out of the ES.

5.1.6 The ES will reflect the topics scoped in for further assessment and will also take into consideration feedback received as part of the Scoping Opinion.

Major accidents and disasters

5.1.7 The Infrastructure Planning (EIA) Regulations 2017 (at paragraph 8 of Schedule 4) require an assessment 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’.

5.1.8 The scope of the assessment will cover:

- Vulnerability of the project to risks of major accidents and/or disasters.
- Any consequential changes in the predicted effects of that project on environmental factors.

5.1.9 To address the requirements of the Infrastructure Planning (EIA) Regulations 2017, the factor of major accidents and disasters will be assessed as part of the ES. In considering the elements of vulnerability, professional judgement will be applied to develop project specific definitions of major events. Major events, both man-made and naturally occurring, will be identified and any potential effects and likely mitigation measures will be included as part of the assessment.

Heat and radiation

5.1.10 Due to the nature of the scheme, it is considered unlikely that heat and radiation effects associated with the proposals are likely to arise. Further assessment as part of the ES has therefore been scoped out.

5.2 Future baseline scenario

5.2.1 A description of the relevant aspects of the current state of the environment (baseline scenario) is included for each environmental factor within the baseline sections of Chapters 6 to 15 of this Environmental Scoping Report. Within the ES, an outline of the likely evolution of the baseline and future baseline scenarios, without implementation of the scheme and appraising only natural changes, will be included. This will make use of readily available information such as that available from Local Development Plan documents.

5.3 Surveys and predictive techniques and methods

5.3.1 Information gathered through desk top studies, environmental walkovers and any site surveys undertaken to date have been collated to inform this report. Specific details of the information sources used to inform this Environmental Scoping Report are included within each of the individual environmental topic chapters (Chapters 6 to 16).

5.4 General assessment assumptions and limitations

5.4.1 General assessment assumptions and limitations relating to the scoping exercise are listed below. There are also a number of topic-specific assumptions and limitations, and these are detailed in the relevant sections of Chapters 6 to 16 of this report.

General assumptions

5.4.2 Scoping has assumed that the extents of the draft red line boundary (shown on the plan in Appendix B) represent the maximum area within which physical disturbance may occur to environmental resources and receptors.

5.4.3 In relation to construction, conventional methodologies and techniques have been assumed to be employed during construction of the scheme, with best practice mitigation measures implemented to protect sensitive environmental receptors during the works.

5.4.4 The key milestones for the scheme include:

- Start of construction – 2025 (construction duration has been assumed to be approximately three years in length).
- Opening year – 2028.
- Design year – 2043.

5.4.5 This report is based on the scheme design provided in June 2022 (refer to the scheme description in Chapter 2, Section 2.5).

5.4.6 Scoping has acknowledged that the design of the scheme will be subject to further refinement and adjustment in response to the outcomes of statutory consultation and further stakeholder engagement, ongoing design development and the iterative EIA process.

5.4.7 As the scheme will become an integral part of England's strategic road network, it has been assumed that the scheme will not be decommissioned.

5.4.8 Should any standards or guidance be updated prior to the DCO submission, consideration will be given to applying the new standards or guidance, in discussion with relevant consultees and also if sufficient time allows for this to be done, and a justification provided in the ES.

5.4.9 Conclusions and recommendations may be revised within the ES, on the basis of updated information following further research, survey, and investigation. Any changes would be discussed with the relevant consultees.

General limitations

5.4.10 To date, no site walkovers or site surveys have taken place at the Kelham and Averham Floodplain Compensation Area. Surveys will commence shortly following access agreements with landowners, and any survey information collected at the Kelham and Averham Floodplain Compensation Area will be used to inform the ongoing design development and EIA and will be reported in the ES.

5.4.11 The scoping-level assessments for air quality and noise have been informed by previous options appraisal results which themselves were informed by traffic forecasts. There are several assumptions and limitations associated with the previous traffic model. These include:

- The traffic model prepared to support the Stage Two Business Case for the A46 Newark Northern Bypass scheme is known as the Enhanced A46 MRTM SATURN model. This model was based on the first-generation regional transport models (RTM) developed by National Highways in 2015 / 2016. These first-generation RTM are based to March 2015. The Enhanced A46 MTRM primarily used the Midlands Regional Transport Model (MRTM), although some of the details from the Trans-Pennine South Regional Transport Model (TPSRTM) was incorporated as Newark was close to the edge of the MRTM boundary. In developing the Enhanced A46 MRTM network and zoning detail were added into the model in the area of interest, additional traffic count data was collected and the model rebased to 2017.
- The Enhanced A46 MTRM comprises of a SATURN highway assignment model and a DIADEM variable demand model.
- The Enhanced A46 MRTM provides future year traffic forecasts for 2028 (scheme opening year), 2043 (scheme design year) and 2051 (the latest available year for traffic forecasts) based on NTEM7.2 for cars and Road Traffic Forecasts (RTF) (2018) for LGV and HGV. The future year forecasts were used to develop the scheme and provide the traffic data that underpins the monetised appraisal including the Environmental appraisal for noise, air quality and greenhouse gases.
- The scheme modelled is an earlier version of the scheme design and has more capacity than the Preferred Route Announcement design.

5.4.12 To support the scheme through DCO and the final Business Case (FBC) the traffic modelling will be updated. The updated model will use the second generation regional transport models (RTM2) which have a March 2019 base. Quantitative air quality and noise assessments will be undertaken using these revised traffic flows and will inform the ES.

- The model will comprise of a SATURN highway assignment model and a DIADEM variable demand model.
- Future year forecasts will be provided for 2028, 2043 and the latest available year for traffic forecasts.
- NTEM8 and updated RTF are due to be issued by DfT and will provide the basis of the future year forecasts if available in advance of the traffic forecasting. If they are not available then NTEM7.2 and RTF 2018 will be used.
- The Uncertainty Log covering future network and developments will be updated to reflect the current situation. This will provide development trip information for the future year traffic models.

5.5 Significance criteria

5.5.1 The output of the environmental assessment is to report the likely significance of effects within the ES, using established significance criteria, as presented within the DMRB LA 104 – Environmental assessment and monitoring²¹. This requires an assessment of the receptor or resource's environmental value (or sensitivity) and the magnitude of the project's impacts (change).

5.5.2 LA 104 of the DMRB 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. For some factors, predicted effects may be compared with quantitative thresholds and scales in determining significance. Each environmental assessment chapter within the ES will describe the specific thresholds / criteria used to determine value / magnitude / sensitivity and will align within the general methodology described within this section.

5.5.3 Assigning each effect to one of the five significance categories enables different environmental factor issues to be placed upon the same scale, to assist the decision-making process at whatever stage the project is at within that process. These five significance categories are set out in Table 5.2 below.

Table 5.2: Description of the significance of effect categories

Significance	Typical descriptors of effects
Very Large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Source: DMRB LA 104²¹

5.5.4 The environmental value will be identified for each of the receptors identified within the individual environmental factor that have been carried forward from the Scoping exercise for further environmental assessment, along with the magnitude of change. Five significance categories can result from the assessment, as defined in Table 5.3. It is important to note that significance categories are required for positive (beneficial) as well as negative (adverse) effects. The greater the magnitude of impact, the more significant the effect. For example, the consequences of a highly valued environmental resource suffering a major detrimental impact would be a significant adverse effect. Impacts that are Moderate Beneficial/ Adverse or above will be considered significant.

Table 5.3: Assessing significance of potential effects

	Magnitude of potential impact (degree of change)					
		No Change	Negligible	Minor	Moderate	Major
Environmental value (sensitivity)	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

Source: DMRB LA 104²¹

5.5.5 There are a number of environmental topics which, for various reasons, do not follow this methodology exactly for defining significance; these include air quality, noise and vibration, material assets and waste, human health and effects on climate. Where this is the case, the criteria used to determine the significance of effects is outlined in these individual chapters.

5.6 Duplication of assessment

5.6.1 The ES will be prepared with reference to environmental assessment that has been carried out, or is ongoing, for nearby schemes. In this way, duplication of assessment or survey effort can be avoided and consistency of approach, unless scheme-specific factors determine otherwise, can be assured. See Chapter 16 Combined and Cumulative Effects, for further details.

5.7 Environmental Statement

5.7.1 The ES will comprise four volumes:

- Volume 1 – Non-technical summary.
- Volume 2 – Main ES text.
- Volume 3 – ES figures.
- Volume 4 – ES appendices.

5.7.2 Volume 2 of the ES is currently anticipated to be structured as below, subject to further discussion with the statutory environmental bodies:

- Chapter 1 – Introduction.
- Chapter 2 – The scheme.
- Chapter 3 – Assessment of alternatives.
- Chapter 4 – Consultation.
- Chapter 5 – Environmental assessment methodology.
- Chapter 6 – Air Quality.
- Chapter 7 – Cultural Heritage.
- Chapter 8 – Landscape and Visual Effects.
- Chapter 9 – Geology and Soils.
- Chapter 10 – Biodiversity.
- Chapter 11 – Material Assets and Waste.
- Chapter 12 – Noise and Vibration.
- Chapter 13 – Population and Human Health.
- Chapter 14 – Road Drainage and the Water Environment.
- Chapter 15 – Climate.
- Chapter 16 – Combined and Cumulative Effects.
- Chapter 17 – Conclusions.
- Chapter 18 – Glossary.

5.7.3 Relevant supporting documents include:

- Habitat Regulations Assessment (HRA):
 - An HRA will be undertaken for each Special Area of Conservation (SAC) and Special Protection Area (SPA) which could be affected. As a matter of policy Ramsar sites (wetlands of international importance) are also considered within the HRA process. Where HRA Screening identifies that there is a likely significant effect this will determine any requirement for an Appropriate Assessment. The Appropriate Assessment will define any requirement for mitigation that is necessary to ensure there is no adverse effect on the integrity of these sites, alone or in combination with other plans and projects. Any required mitigation would then be incorporated into the proposed scheme.
- Flood Risk Assessment (FRA):
 - A FRA will be undertaken because the majority of the scheme is within Flood Zones 2 and 3. This report will review the scheme to assess it against the risk of flooding, whether that be from groundwater, river (fluvial), surface water (pluvial), estuary/coastal (tidal), or from sewer sources. It should also take the surrounding area into account and whether the development poses a flood risk to areas nearby. The outcomes of this assessment will determine how, if any, mitigation will be implemented into the design to minimise the effect of flood risk. The results will be presented as a technical appendix to the ES.
- Water Framework Directive (WFD) Assessment:
 - A WFD Assessment will be undertaken and a WFD compliance assessment report produced alongside the ES. This report will consider the extent to which the proposed scheme could impact on the current and future target WFD status of the waterbodies. Where potential adverse effects are identified, an assessment of these will inform what mitigation measures need to be incorporated into the design and construction methods of the proposed scheme to remove or minimise the effect. The results will be presented in the ES.

5.7.4 A number of plans would be produced that would support the preparation of the ES and the results presented therein and would also be a

mechanism for securing the required mitigation. These are likely to include:

- A First Iteration Environmental Management Plan
- Environmental Masterplan

5.7.5 The First Iteration Environmental Management Plan will be submitted as part of the DCO application, and will be further developed into the Second Iteration Environmental Management Plan by the contractor prior to construction commencing.

6 Air Quality

6.1 Introduction

- 6.1.1 This chapter presents the baseline air quality in the vicinity of the scheme and describes the proposed approach for the assessment of air quality.
- 6.1.2 This chapter has been prepared in accordance with the DMRB LA 105²². The potential requirement for further assessment in accordance with the DMRB LA 105 is identified within this chapter. Where necessary, further assessment will be presented within the ES.

6.2 Legislation and policy

Legislation

- 6.2.1 The Air Quality Standards Regulations 2010²³, Air Quality Standards (amendment) Regulations 2016²⁴, Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019²⁵, and Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020²⁶ implement Directive 2008/50/EC on ambient air quality²⁷.
- 6.2.2 These pieces of legislation define limit values, and times by which they are to be achieved, for the purpose of protecting human health and the environment by avoiding, reducing, or preventing harmful concentrations of air pollutants.
- 6.2.3 The limit values apply everywhere, with the exception of:
- Any locations situated within areas where members of the public do not have access and there is no fixed habitation.
 - In accordance with Article 2(1) of Directive 2008/50/EC, on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply.
 - On the carriageway of roads.
 - On the central reservations of roads except where there is normally pedestrian access to the central reservation.

²² National Highways (2019) DMRB LA 105 – Air quality, Revision 0 [online] available at: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk) (last accessed June 2022)

²³ Statutory Instrument. (2010), The Air Quality Standards Regulations, No. 1001.

²⁴ Statutory Instrument. (2016) The Air Quality Standards (Amendment) Regulations, No. 1184.

²⁵ Statutory Instrument. (2019) Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations

²⁶ Statutory Instrument. (2020) Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, No. 1313.

²⁷ European Union. (April 2008) Directive on ambient air quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044

- 6.2.4 The Department for Environment Food and Rural Affairs (Defra) assesses and reports on the compliance with the limit values for each of the 43 zones and agglomerations across the UK. Zones and / or agglomerations achieve compliance when everywhere within the zone and/or agglomeration (except locations provided in the Directive) does not exceed the relevant limit value. The scheme is located within the Eastern Zone.
- 6.2.5 Part IV of the Environment Act 1995²⁸ (as amended in Schedule 11 of the Environment Act 2021²⁹) requires that every local authority shall periodically carry out a review of air quality within its area, including predictions of likely future air quality. The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000³⁰ and the Air Quality (England) (Amendment) Regulations 2002³¹. In most cases, the air quality objectives are set at the same pollutant concentrations as the limit values transposed in UK law, although compliance dates differ.
- 6.2.6 As part of the review of air quality, the local authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods and identify the key sources of emissions responsible for the failure to achieve the objectives. Any parts of a local authority's area where the objectives are not being achieved or are not likely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a declaration has been made, local authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.
- 6.2.7 The Environment Act requires the UK Government to produce a national Air Quality Strategy (AQS). The AQS establishes the UK framework for air quality improvements. The previous 2007 AQS³² has now been superseded as of 14th January 2019 with the Clean Air Strategy 2019 (CAS)³³.
- 6.2.8 The CAS does not set legally binding objectives, the CAS instead has targets for reducing total UK emissions of nitrogen oxides (NO_x) and fine

²⁸ Department for Environment Food and Rural Affairs. (2003) Part IV of the Environment Act 1995 Local Air Quality Management.

²⁹ Statutory Instrument. (2021) Chapter 30, Schedule 11 Local Air Quality Management Framework of Environment Act 2021.

³⁰ Statutory Instrument. (2000) Air Quality (England) Regulations, No. 928.

³¹ Statutory Instrument. (2002) Air Quality (England) (Amendment) Regulations, No. 3043.

³² Department for Environment Food and Rural Affairs. (July 2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.

³³ Department for Environment Food and Rural Affairs. (January 2019), 'The Clean Air Strategy'.

particulate matter (PM_{2.5}) from sectors such as road transport, domestic sources and construction plant (non-road mobile machinery (NRMM)).

6.2.9 Air quality objectives and limit values relevant to the scheme are summarised in Table 6.1.

Table 6.1: Relevant air quality objectives and limit values

Pollutant	Averaging period	Concentration	Allowance	Attainment date	
				Air quality objective	Limit values
Nitrogen dioxide (NO ₂)	Annual	40 µg/m ³	-	31 December 2005 ^(a)	1 January 2010 ^(c)
	1 Hour	200 µg/m ³	18	31 December 2005 ^(a)	1 January 2010 ^(c)
Particulates (PM ₁₀)	Annual	40 µg/m ³	-	31 December 2004 ^(a)	1 January 2005 ^(c)
	24 Hour	50 µg/m ³	35	31 December 2004 ^(a)	1 January 2005 ^(c)
Fine particulates (PM _{2.5}) ^(e)	Annual	20 µg/m ³	-	-	1 January 2020 ^(c)
		25 µg/m ³	-	2020 ^(b)	-
Oxides of nitrogen (NO _x) ^(d)	Annual	30 µg/m ³	-	31 December 2000 ^(a)	19 July 2001 ^(c)

Notes: ^(a) Air Quality (England) Regulations 2000 as amended.

^(b) Air Quality Strategy 2007.

^(c) EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe, as transposed into UK

Law

^(d) Designated for the protection of vegetation and ecosystems and also referred to as the 'critical level' for NO_x. The policy of the UK statutory nature conservation agencies is to apply the annual mean NO_x criterion in internationally designated conservation sites and Site of Special Scientific Interest (SSSI) on a precautionary basis, as the limit value applies only to locations more than 20 kilometres from towns with more than 250,000 inhabitants or more than 5 kilometres from other built-up areas, industrial installations or motorways.

^(e) As the Air Quality Strategy 2007 and EU Directive 2008/50/EC have a different numerical standard for PM_{2.5}, the more stringent standard of 20µg/m³ has been adopted for this assessment.

6.2.10 Table 6.2 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment of air quality.

Table 6.2: Locations where the air quality objectives apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	<p>All locations where members of the public might be regularly exposed.</p> <p>Building façades of residential properties, schools, hospitals, care homes, etc.</p>	<p>Building façades of offices or other places of work where members of the public do not have regular access.</p> <p>Hotels, unless people live there as their permanent residence.</p> <p>Gardens of residential properties.</p> <p>Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.</p>
24-Hour	<p>All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.</p>	<p>Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.</p>
1-Hour	<p>All locations where the annual mean and 24-hour mean objectives apply.</p> <p>Kerbside sites (for example, pavements of busy shopping streets).</p> <p>Those parts of car parks, bus stations and railway stations, etc., which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.</p> <p>Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.</p>	<p>Kerbside sites where the public would not be expected to have regular access.</p>

Source: Defra Local Air Quality Management Technical Guidance (LAQM TG16)³⁴.

³⁴ Department for Environment, Food and Rural Affairs and Devolved Administrations (April 2021). Local Air Quality Management – Technical Guidance LAQM.TG16.

Statutory Nuisance

6.2.11 Section 79(1)(d) of the Environmental Protection Act 1990³⁵ defines one type of ‘statutory nuisance’ as “any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance”. Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. Best practicable means is a widely-used defence by operators, if employed to prevent or to counteract the effects of the nuisance.

Policy

National Policy Statement for National Networks

6.2.12 The National Policy Statement for National Networks (NPSNN)³⁶ sets out the policy which the scheme should comply with. Although it is also the basis for informing a judgement on the impacts of a scheme, for example is the scheme consistent with the needs of the NPSNN.

6.2.13 The NPSNN notes that the applicant should undertake an assessment of the impacts of the proposed project as part of the ES and should describe:

- Existing air quality levels.
- Forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account the impact of the scheme.
- Any significant air quality effects, their mitigation and any residual effects, distinguish between the construction and operation stages and taking account of the impact of road traffic generated by the project.

6.2.14 Paragraphs 5.12 and 5.13 of the NPSNN provides advice for decision makers:

6.2.15 “5.12 The Secretary of State must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and / or where they lead to a deterioration in air quality in a zone / agglomeration.”

6.2.16 “5.13 The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will:

- *“Result in a zone / agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant.”*

³⁵ Parliament of the United Kingdom (1990) Environmental Protection Act 1990.

³⁶ Her Majesty's Stationery Office. 2014. National Policy Statement for National Networks.

- *“Affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision.”*

6.2.17 Advice set out in DMRB LA 10537 ensures that an assessment to inform reasonable and robust decision making on judgements of significant air quality impacts (NPSNN para 5.12) and determining whether a scheme would affect the UK’s reported ability to comply with the limit values transposed into UK law (NPSNN para 5.13) can be completed and evaluated in line with the requirements of the NPSNN.

National Planning Policy Framework

6.2.18 The revised National Planning Policy Framework³⁸ was published in July 2021 and sets out the Government’s planning policies for England. With regard to air quality, it states that:

6.2.19 *“Planning policies and decisions should contribute to and enhance the natural and local environment by: ...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality...”*

6.2.20 And:

6.2.21 *“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.*

6.2.22 *“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.*

6.2.23 *“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.”*

³⁷ National Highways (2019) DMRB LA 105 – Air quality, Revision 0 [online] available at: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk) (last accessed June 2022)

³⁸ Ministry of Housing, Communities and Local Government (July 2021). National Planning Policy Framework.

National Planning Practice Guidance

6.2.24 On 6 March 2014, the Department for Communities and Local Government published a national planning practice guidance web-based resource³⁹ which was updated on 1 November 2019.

6.2.25 The National Planning Practice Guidance includes a dedicated section on air quality. It notes that, for new planning applications, the local planning authority may require information on:

6.2.26 *“The ‘baseline’ local air quality, including what would happen to air quality in the absence of the development*

6.2.27 *“whether the Scheme could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity) and*

6.2.28 *“whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.”*

6.2.29 It also states the following in relation to determining whether air quality is relevant to a planning decision:

6.2.30 “Whether air quality is relevant to a planning decision will depend on the Scheme and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the Scheme would be particularly sensitive to poor air quality in its vicinity)⁴⁰.”

Local Policy

6.2.31 The Newark and Sherwood Amended Core Strategy Development Plan⁴¹, adopted in 2019, sets out policy up until 2033 and presents the objectives for development in the area. Core Policy 12, Biodiversity and Green Infrastructure, relates to air quality. This policy states that the council will work with partners to develop a strategic approach to air quality, with a specific focus on the Sherwood area. The strategy says that an air quality supplementary planning document will be produced. This document is not

³⁹ National Planning Practice Guidance web-based resource. Accessible at: <https://www.gov.uk/government/collections/planning-practice-guidance>.

⁴⁰ National Planning Practice Guidance ‘Air Quality Section’. Accessible at: <https://www.gov.uk/guidance/air-quality--3>

⁴¹ Amended Core Strategy Development Plan (2019) Newark and Sherwood District Council. Accessible at: <https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-core-strategy-dpd/amended-core-strategy-DPD.pdf>

currently available but will be considered if it is available during the assessment for the Environmental Statement.

6.3 Study area

6.3.1 For the construction phase the study area for assessing dust risk will be limited to 200 metres from the scheme footprint in accordance with DMRB LA 105.

6.3.2 The study area to assess vehicle emissions during the construction and operation phase for the air quality assessment covers human health receptors and ecologically designated sites within 200 metres of roads that are expected to be affected by the scheme.

6.3.3 For the local air quality assessment, DMRB LA 105 defines the affected road network (ARN) for the air quality assessment as all roads that trigger the traffic screening criteria and adjoining roads within 200 metres. The traffic screening criteria are:

- annual average daily traffic (AADT) will change by $\geq 1,000$; or
- heavy duty vehicle (HDV) AADT will change by ≥ 200 ; or
- a change in speed band; or
- a change in carriageway alignment by $\geq 5\text{m}$

6.3.4 Traffic forecasts are currently unavailable as they are being updated. However, the ARN based on traffic data prepared for the scheme at the options appraisal stages covered areas to the north-west of Newark, sections of the A1 around Newark (from North Muskham to Fernwood) and the A46 as far north as Brough and as far south as Ratcliffe on the Wreake. It is anticipated that the ARN for the scheme, based on the updated traffic forecasts, will cover a similar extent to that assessed at options appraisal stages. This will be confirmed within the ES.

6.4 Baseline conditions

6.4.1 Information on air quality in the UK can be obtained from a variety of sources including local authorities, national network monitoring sites and other published sources. For this assessment, data has been obtained from Newark and Sherwood District Council (NSDC), South Kesteven District Council (SKDC), National Highways and the Department for Environment, Food and Rural Affairs (Defra).

6.4.2 The effects associated with the coronavirus (Covid-19) pandemic during 2020 and 2021, when England was subject to full lockdowns for periods, may have an influence on the monitoring data during these periods and therefore the data may not be representative of normal conditions at the monitoring sites and should be appraised with caution. To account for this,

2019 data has been used to determine baseline conditions within this scoping report.

Air quality management areas

- 6.4.3 There are no current or historical air quality management areas (AQMA) declared within the administrative area of Newark and Sherwood, indicating NSDC have not monitored or modelled any exceedances of the air quality objectives at locations where there is relevant human exposure.
- 6.4.4 The closest AQMA to the scheme are the Nottingham City Council (NCC) AQMA located approximately 22 kilometres south-west of the scheme which encompasses the entirety of the NCC administrative area, and the SKDC No 6 AQMA located in the centre of Grantham, approximately 21.5 kilometres south-east of the scheme. Both of these AQMA are declared for exceedances of nitrogen dioxide (NO₂) air quality objectives. The ARN for the scheme at the options appraisal phase did not extend into either of these AQMA.

Automatic monitoring

- 6.4.5 NSDC does not undertake any automatic monitoring within the study area within their administrative boundary. Particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀) were monitored in the area at one location in the centre of Newark until 2018. There were no monitored exceedances of PM₁₀ at this site during the monitoring period and concentrations were well below annual and daily air quality objective levels.

Local authority diffusion tube monitoring

- 6.4.6 NSDC undertake diffusion tube monitoring at 13 sites within their administrative area. Of these sites, 12 are located within 0.7 kilometres of the scheme or to the ARN that was identified during options appraisal stages. The monitoring data collected at these locations are presented below in Table 6.3.
- 6.4.7 The data for 2020 and 2021 has been presented as it is available, but as discussed in paragraph 6.4.2, this data appears to have been affected by national lockdowns implemented during the Covid-19 pandemic as there is a large decrease from concentrations monitored in 2019. Therefore, the 2019 monitoring data will be used to determine the baseline conditions.
- 6.4.8 There were no exceedances of the NO₂ annual mean air quality objective in 2019. The highest concentration of 35.4µg/m³ was monitored at location 16N, which is located on Brunel Drive/Lincoln Road. This tube is located

less than 10 metres away from the scheme alignment and 20 metres away from the closest receptor.

Table 6.3: Local authority diffusion tube monitoring

Site ID	British National Grid Coordinates		Site Type	Data Capture 2019 (%)	Annual Mean NO ₂ Concentration (µg/m ³)			
	X	Y			2018 ^(b)	2019 ^(a)	2020 ^(c)	2021 ^(d)
1N	479851	353692	Roadside	100.0	31.4	31.2	24.3	24.5
3N	481681	351500	Suburban	100.0	17.6	16.4	12.3	12.9
4N	477200	351900	Suburban	100.0	14.8	14.4	10.8	10.8
5N	480400	355000	Roadside	100.0	29.9	29.0	21.0	22.9
6N	480006	353892	Urban centre	100.0	21.6	21.2	16.0	16.9
7N	480153	353320	Kerbside	79.2	30.3	28.5	21.8	25.9
9N	479778	353621	Roadside	100.0	28.6	27.9	19.7	22.7
10N	479859	354223	Urban Background	100.0	21.2	20.6	14.7	16.6
11N	481460	355900	Urban Background	100.0	32.5	30.3	21.0	24.3
12N	479676	354016	Urban Centre	83.3	18.6	18.5	12.0	13.0
16N	481152	355589	Roadside	91.7	35.3	35.4	23.3	27.9
21N	480276	354029	Roadside	91.7	26.8	25.1	18.7	21.1

Source: 2022 Annual Status Report, Newark and Sherwood District Council.

Note: Results have been bias adjusted by NSDC.

^(a) Bias adjustment factor of 0.93.

^(b) Data capture for 2018 was unavailable.

^(c) Data capture for 2020 was between 33.2% and 66.8%, data capture affected by Covid-19 pandemic.

^(d) Data capture for 2021 was between 82.1% and 100%.

National Highways diffusion tube monitoring

6.4.9 A scheme specific diffusion tube monitoring survey was undertaken in 2016 to support the scheme. Monitoring was undertaken at 22 locations along the scheme alignment and surrounding areas. An update of this monitoring survey is currently being undertaken to support the ES. Monitoring commenced in May 2022 and is due to complete in November 2022. The results will be included in the baseline of the ES.

6.4.10 The results from the 2016 survey were bias adjusted and annualised to 2017 to support the assessment during options appraisal. The results from this survey are presented below in Table 6.4. There were no exceedances of the NO₂ annual mean air quality objective, and concentrations were generally low.

Table 6.4: National Highways scheme specific monitoring data

Site ID	British National Grid Coordinates		Site Type	Survey Period Data Capture	2017 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) ^(a)
	X	Y			
A46NNB_001_1215	481086	355814	Roadside	83.3	22.9
A46NNB_002_1215	481091	356285	Kerbside	100	21.5
A46NNB_005_1215	482404	356780	Roadside	83.3	20.2
A46NNB_006_1215	482245	356868	Roadside	100	24.6
A46NNB_007_1215	483280	357915	Roadside	83.3	14.1
A46NNB_008_1215	481111	355551	Roadside	100	28.1
A46NNB_009_1215	480620	355992	Roadside	100	17.4
A46NNB_012_1215	480896	355321	Roadside	100	22.2
A46NNB_014_1215	480670	354846	Kerbside	100	16.8
A46NNB_015_1215	480350	354727	Kerbside	100	22.3
A46NNB_016_1215	479781	354525	Roadside	100	15
A46NNB_017_1215	479321	354501	Roadside	100	16.6
A46NNB_018_1215	479177	354337	Roadside	83.3	15.9
A46NNB_020_1215	480070	354229	Roadside	100	20.9
A46NNB_021_1215	479551	353829	Roadside	100	21.8
A46NNB_022_1215	479212	353376	Roadside	83.3	15.8
A46NNB_023_1215	478240	352829	Roadside	83.3	15.1
A46NNB_024_1215	478211	352569	Roadside	83.3	20.9
A46NNB_025_1215	477807	352217	Roadside	100	15.6
A46NNB_026_1215	477295	351780	Roadside	100	11.8
A46NNB_027_1215	477014	351649	Roadside	100	11.2
A46NNB_028_1215	476463	354507	Kerbside	83.3	10.3

Source: Atkins (2021) Assessment – A46 Newark Northern Bypass.

Note: Results have been bias adjusted and annualised.

^(a) Bias adjustment factor of 0.93.

Defra projected background concentrations

6.4.11 Defra provides mapped future year projections of background pollution concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} for each 1 kilometre grid square across the UK for all years between 2018 to 2030⁴². The maps include a breakdown of background concentrations by emission source, including road and industrial sources, which have been calibrated against 2018 (the baseline year) UK monitoring data. The maximum concentrations from across the grid squares of the scheme alignment are presented below in Table 6.5. There are no exceedances of air quality objectives.

⁴² Defra Background maps (2018) [Online] Available at: <https://uk-air.defra.gov.uk/data/laqm-background-maps>

Table 6.5: Defra projected background concentrations across the scheme area

Year	Pollutant			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}
2022	23.8	18.6	23.1	16.0

Source: Defra (2018)

Note: The background concentrations shown are for the 1 kilometre square centred on 481500, 355500.

Limit value compliance

6.4.12 Defra uses the Pollution Climate Mapping (PCM) model to report compliance with limit values as transposed into UK Law from Directive 2008/50/EC⁴³. PCM projections are available for all years from 2018 to 2030 from the base year of 2018. The most recent PCM model was published in 2020.

6.4.13 There are no PCM links in the vicinity of the scheme. The nearest PCM link is a section of the A4134 in North Hykeham located approximately 12.4 kilometres north-west of the scheme. The concentration on this PCM link in 2022 is 16.1µg/m³ which is well below the limit value. PCM projections also predict that concentrations are likely to reduce into the future.

Summary

6.4.14 There are no AQMAs in close proximity to the scheme and the available monitoring data for the area show no exceedances of air quality objectives. A scheme specific monitoring survey was undertaken in 2016 which showed that air quality concentrations in the schemes surroundings is generally low. An update to this monitoring survey is being undertaken to support the EIA and will be reported in the ES.

6.5 Potential impacts

Construction

6.5.1 The construction period for the scheme is currently expected to last approximately 3 years. The main risks to sensitive receptors during the construction phase include the generation of dust arising from construction activities which can lead to nuisance at nearby receptors. Dust can be mechanically transported, either by wind or re-suspension via vehicles. It can also arise from wind erosion on material stockpiles and earth moving activities.

⁴³ European Union. (April 2008). Directive on Ambient Air Quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044 [online] available at: [Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe \(legislation.gov.uk\)](#) (last accessed November 2021).

6.5.2 In addition, the construction phase will introduce additional construction vehicle movements to the road network and traffic management which have the potential to affect traffic flows and speeds. This has the potential to directly affect ambient concentrations of NO₂ and PM₁₀ (for human health receptors) and NO_x (for ecological receptors).

6.5.3 Construction can require the use of different equipment such as excavators, cranes and on-site generators. All construction plant has an energy demand; with some plant resulting in direct emissions to air from exhausts.

Operation

6.5.4 The operational phase of the scheme has the potential to directly affect ambient concentrations of NO₂ and PM₁₀ (for human health receptors) and NO_x (for ecological receptors) through:

- Changes in emissions associated with changes in traffic flows and speeds on the affected road network.
- Changes in road layout which may bring road traffic emission sources closer to, or further away from, sensitive receptors.

6.6 Design, mitigation and enhancement measures

Design measures

6.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104. The first principle being to avoid potential effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report.

Mitigation measures - Construction

6.6.2 To mitigate against construction dust effects at receptors, the construction works will be carried out in accordance with Best Practicable Means (BPM), as described in Section 79(9) of the Environmental Protection Act 1990, to reduce emissions which may affect air quality. Mitigation measures will be proportionate to the level of construction dust risk identified within the assessment and could include, but are not limited to, the following:

- Avoid double handling of materials.
- Minimise height of stockpiles and profile to minimise wind-blown dust emissions and risk of pile collapse.

- Locate stockpiles out of the wind (or cover, seed or fence) to minimise the potential for dust generation.
- Ensure that all vehicles with open loads of potential dusty materials are securely sheeted or enclosed.
- Provide a means of removing mud and other debris from wheels and chassis of vehicles leaving the site. This may involve a simple coarse gravel running surface or jet wash, or in the case of a heavily used exit point, wheel washers.
- Maintain a low speed limit on site to prevent the generation of dust by fast moving vehicles.
- Damp down surfaces in dry conditions.
- Spray water during cutting / grinding operations (for example, cutting kerbs).
- Switch off all vehicle engines and plant motors when not in use.

6.6.3 Full details of all mitigation measures will be included within the Second Iteration Environmental Management Plan.

Mitigation measures - Operation

6.6.4 Air quality operational mitigation measures would be dependent on identified traffic impacts, which are yet to be determined. Based on the results from the assessments undertaken at options appraisal stages and on a review of the baseline conditions within the study area as part of this scoping assessment, it is considered unlikely that operational mitigation measures will be required.

Enhancement measures

6.6.5 Enhancement measures will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

6.7 Description of the likely significant effects

Construction

6.7.1 Significant adverse construction phase effects are unlikely to occur with mitigation measures implemented through the Second Iteration Environmental Management Plan. However, details of the construction methodology are yet to be developed and will be included within the ES once they have been established. An assessment of construction impacts, such as dust generation, in accordance with the requirements of DMRB LA 105 will be undertaken to determine the level of mitigation required such that effects are not significant.

6.7.2 Although information on changes in traffic during the construction phase are not available it is unlikely that these will lead to a significant effect. Whilst the construction period is expected to be approximately three years

the additional traffic generated by construction is unlikely to trigger the assessment criteria set out in DMRB LA 105. In addition, based on previous schemes, traffic management measures can have a positive effect on air quality by reducing speed limits and smoothing out the flow of traffic so it flows more freely reducing overall emissions. These assumptions will be confirmed in the ES in accordance with the requirements of DMRB LA 105.

Operation

6.7.3 For human receptors, the scheme has the potential to directly affect ambient concentrations of NO₂ and PM₁₀ during the operational phase. For ecological receptors, the scheme has the potential to directly affect concentrations of NO_x, nitrogen deposition and acid deposition. Considering the existing information available from the options appraisal stage and the existing baseline, it is unlikely that changes in ambient concentrations as a result of the operation of the scheme would be significant. This will be confirmed in the ES in accordance with the requirements of DMRB LA 105.

6.8 Assessment methodology

Construction phase

- 6.8.1 Key stages of the construction phase and the locations and types of sensitive receptors will be identified in accordance with DMRB LA 105. Appropriate mitigation measures will be identified in accordance with Best Practicable Measures (BPM) which would be incorporated into the Second Iteration Environmental Management Plan.
- 6.8.2 This will be assessed by identifying the construction dust risk potential of the scheme and the distance of receptors from construction activities using distance buffers of 50 metres, 100 metres and 200 metres. The construction dust risk will be calculated in line with paragraph 2.58 of DMRB LA 105.
- 6.8.3 The construction period is predicted to be approximately three years, therefore construction traffic information will be screened using the ARN criteria in DMRB LA 105 once data becomes available. If required, a detailed level assessment will be undertaken in accordance with DMRB LA 105, taking into account Defra Local Air Quality Management Technical Guidance 2021 (TG(16))⁴⁴ and its associated assessment tools.

⁴⁴ Defra (2021), Local Air Quality Management – Technical Guidance (16). Accessible at: <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf>

Operation phase

6.8.4 A detailed level assessment will be undertaken in accordance with DMRB LA 105, this has been determined following the flow chart at paragraph 2.10 of DMRB LA 105. The assessment will also take into account Defra Local Air Quality Management Technical Guidance 2021 (TG(16))⁴⁵ and its associated assessment tools.

6.8.5 The detailed level assessment will include:

- An assessment of air quality effects using the advanced dispersion modelling software (ADMS Roads).
- Verification of model outputs with local monitoring data.
- Prediction of NO₂ concentrations in the base year, do-minimum and do-something scenarios at sensitive human health receptors and ecological designated sites.
- As per DMRB LA 105, base year concentrations of PM₁₀ will be assessed to confirm there is no risk of PM₁₀ concentrations exceeding relevant thresholds. These results will be used to justify why no further modelling of PM_{2.5} is required as part of the ES.
- Prediction of NO_x, nitrogen deposition and acid deposition and designated sites located within 200m of the ARN. As per DMRB LA 105 designated sites considered in the assessment will include Ramsar sites, special protection areas, special areas of conservation, sites of special scientific interest, local nature reserves, local wildlife sites, nature improvement areas, ancient woodlands and veteran trees.

6.8.6 The assessment will be desk based, it will be based upon traffic data generated specifically for the scheme to inform the ES and use baseline data collected by local authorities and National Highways.

6.8.7 The assessment will determine significance of effect based upon:

- The assessment of the effects on human health through the determination of changes in pollutant concentrations at sensitive receptors where the air quality objectives apply.
- The assessment of compliance risk by determining if the scheme could affect the UK's reported ability to comply with the Air Quality Directive.
- The assessment of the impacts on designated sites.

Human health

6.8.8 DMRB LA 105 provides advice for evaluating significant local air quality effects at receptors. Receptors that have a reasonable risk of exceeding an air quality threshold will be assessed in both a do minimum and do

⁴⁵ Defra (2021), Local Air Quality Management – Technical Guidance (16). Accessible at: <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf>

something scenario. The difference in pollutant concentrations between the two scenarios is used to describe the magnitude of change which will be determined in line with Table 6.7 as per DMRB LA 105.

Table 6.7: Magnitude of change criteria

Magnitude of change in concentration	Value of change in annual average NO ₂ and PM ₁₀
Large (>4)	Greater than full Measure of Uncertainty (MoU) value of 10% of the air quality objective (4µg/m ³)
Medium (>2)	Greater than half of the MoU (2µg/m ³), but less than the full MoU (4µg/m ³) of 10% of the air quality objective
Small (>0.4)	More than 1% of objective (0.4µg/m ³) and less than half of the MoU i.e. 5% (2µg/m ³). The full MoU is 10% of the air quality objective (4µg/m ³)
Imperceptible (<= 0.4)	Less than or equal to 1% of objective (0.4µg/m ³)

6.8.9 The number of receptors where changes are greater than imperceptible, and where concentrations exceed the air quality objectives in the do minimum or do something scenario will be compared to the guideline bands from Table 2.91 of DMRB LA 105, presented below in Table 6.8.

Table 6.8: Guideline to number of receptors constituting a significant effect

Magnitude of change in concentration	Number of receptors with:	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4)	1 to 10	1 to 10
Medium (>2 to 4)	10 to 30	10 to 30
Small (>0.4 to 2)	30 to 60	30 to 60

6.8.10 Table 6.8 presents guideline bands, setting an upper level of likely non-significance and the lower level of likely significance, for the number of receptors affected by the scheme.

6.8.11 Between these two levels are the ranges where likely significance is more uncertain, therefore professional judgement would be required. Where the total number of receptors are less than the lower guideline band for all of the six magnitude of change categories, the scheme is unlikely to trigger a significant air quality effect for human health. Where the total number of receptors are greater than the upper guideline band in any of the

magnitude categories the scheme shall trigger a significant air quality effect.

6.8.12 If a scheme results in effects where the number of receptors falls between the lower and upper guideline bands for any of the magnitude of change criteria, the information in Table 6.8 will then be used along with the following key criteria to determine the overall evaluation of local air quality significance:

- The absolute concentration at each receptor, for example is the modelled concentration $40 \mu\text{g}/\text{m}^3$.
- How many receptors are there in each of the magnitude of change criteria, for example does the project create more worsening than improvements.
- The magnitude of change in concentration at each receptor, for example $0.6 \mu\text{g}/\text{m}^3$ vs $1.8 \mu\text{g}/\text{m}^3$.

Limit Value Compliance risk

6.8.13 DMRB LA 105 sets out the approach to assessment of compliance risk in Figure 2.79 which will be followed.

6.8.14 The assessment shall conclude there is no risk to the UK's reported ability to comply with the Air Quality Directive in the shortest timescale possible where:

- There is no modelled exceedances of the air quality thresholds for any PCM link, or
- There are modelled exceedances of the air quality thresholds for any PCM link, but the change in annual mean NO_2 concentrations between the do minimum and do something is less than or equal to $\pm 0.4 \mu\text{g}/\text{m}^3$.
- The project does not materially impact on measures within local air quality or national plans for the achievement of compliance.

Ecologically designated sites

6.8.15 For ecologically designated sites, the determination of significant effects will be undertaken in line with the flow chart at paragraph 2.98 of DMRB LA 105. If the change in N deposition is greater than $0.4 \text{kg N}/\text{ha}/\text{yr}$ at any designated sites as a result of the scheme, the competent expert for biodiversity will determine overall significance and this will be reported within the biodiversity chapter.

6.9 Assessment assumptions and limitations

6.9.1 Air quality modelling predictions are based on the most reasonable, robust and representative methodologies in accordance with best practice

guidance. However, there is an inherent level of uncertainty associated with the model predictions, including:

- Uncertainties with previous and future traffic forecasts (see section 5.4 for general assumptions and limitations associated with traffic).
- Uncertainties with vehicle emission predictions.
- Uncertainties with background air quality data.
- Simplifications made within screening tool calculations or post processing of the data that represent atmospheric dispersion or chemical reactions.

6.9.2 In order to best manage these uncertainties, the air quality assessment undertaken for the ES will be verified using the air quality measurements from the National Highways monitoring survey due to complete in November 2022, as well as any local authority data that is within the ARN study area and has suitable data capture. The verification process will be undertaken in line with best practice guidance produced by Defra.

6.10 Consultation

6.10.1 Non-statutory public consultation took place between 9 December 2020 and 2 February 2021. Stakeholders relevant to air quality who were contacted as part of the consultation included:

- Nottinghamshire County Council and Lincolnshire County Council.
- Newark and Sherwood District Council.
- Nottingham City Council .
- Landowners and local residents.
- Local businesses (where appropriate).
- Developers (where appropriate).

6.10.2 Environmental themes that arose out of the public consultation included, but were not limited to, concerns regarding possible increases in the levels of air pollution as a result of the scheme and associated proposed mitigation.

6.10.3 Consultation with local authority Environmental Health Officers will be progressed through the key stakeholder engagement exercises as part of the ES (refer to Chapter 4 for further details).

6.11 Summary

6.11.1 In line with DMRB LA 105, responses to the following scoping questions in Table 6.9 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 6.9: Proposed scope of the air quality chapter of the ES

Scoping question	Answer
<p>1) Does the project trigger any of the traffic scoping criteria for any road in the traffic reliability area where there are receptors within 200m?</p>	<p>Construction traffic forecasts are currently unavailable. Whilst the construction period is expected to be approximately three years, the additional traffic generated by construction is unlikely to trigger the assessment criteria set out in DMRB LA 105. In addition, based on previous schemes, traffic management measures can have a positive effect on air quality, by reducing speed limits and smoothing out the flow of traffic so it flows more freely, reducing overall emissions. These assumptions will be confirmed in the ES in accordance with the requirements of the DMRB LA 105. Therefore, construction phase traffic is scoped in for further assessment within the ES and will be rescoped against the DMRB traffic scoping criteria when more traffic information is available.</p> <p>Whilst updated operation traffic forecasts are currently unavailable, previous assessments undertaken in the options appraisal stage indicate that the relevant criteria will be triggered and therefore assessment of operation phase traffic is scoped into the ES for further assessment.</p>
<p>2) Is there sufficient baseline air quality data to undertake an assessment?</p>	<p>There are 12 local authority diffusion tube monitors located within 0.7 kilometres of the scheme or the ARN generated at options appraisal stages. A National Highways survey undertaken in 2016 is also currently being updated to support the ES. Monitoring commenced in May 2022 and is due to complete in November 2022. Therefore, it is considered that there will be sufficient baseline air quality data for the assessment.</p>
<p>3) Assess the potential for the project to impact on traffic (see Table 2.11a of DMRB LA 105) and the sensitivity of the receiving environment (see Table 2.11b of DMRB LA 105).</p>	<p>The project risk potential is assessed to be 'High' in line with Table 2.11a of DMRB LA 105, with the receiving environment sensitivity assessed to be 'Medium' in line with Table 2.11b of DMRB LA 105. A detailed level assessment will be undertaken for the operation phase, including consideration of the DMRB criteria.</p>

Proposed scope

6.11.2 The proposed scope of the ES is contained within Table 6.10.

Table 6.10: Proposed scope of the air quality chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Dust Traffic emissions	Construction plant emissions	Guidance from the Institute of Air Quality Management notes that effects from on-site plant exhausts would likely not be significant. Given the nature of the site plant, effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore been scoped out as the impacts would be <i>de minimis</i> and not significant.
Operation	Traffic emissions	N/A	N/A

7 Cultural Heritage

7.1 Introduction

- 7.1.1 This chapter presents the cultural heritage baseline within the vicinity of the scheme including listed buildings, scheduled monuments, registered parks and gardens, and conservation areas, along with non-designated buildings, historic landscapes, and buried archaeological features and deposits, and describes the proposed approach for the assessment of the impact of the scheme on these heritage features.
- 7.1.2 This chapter aims to identify the potential for significant effects of the scheme upon surrounding cultural heritage receptors. This chapter has been prepared in accordance with DMRB LA 106 – Cultural heritage assessment⁴⁶, in order to establish the potential requirement for further assessment. Any further assessment required will be presented within the Environmental Statement.

7.2 Legislation and policy

- 7.2.1 The following sets out the national and local policies relevant to the historic environment.

Legislation

- 7.2.2 Planning (Listed Buildings and Conservation Areas) Act 1990: This act sets out the protection given to buildings of special architectural or historic interest through listing. It also sets out the process for designation of conservation areas. The scheme could have potential effects on Listed Buildings and Conservation Areas.
- 7.2.3 Ancient Monuments and Archaeological Areas Act 1979: This act relates to the investigation, preservation and recording of matters of archaeological and historic interest. The scheme could have potential effects on scheduled monuments and important archaeological deposits.

National Policy

- 7.2.4 National Policy Statement for National Networks, 2014: The National Policy Statement for National Networks (NPSNN) sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England.

⁴⁶ National Highways (2020) DMRB LA 106 – Cultural heritage assessment [online] available at: [8c51c51b-579b-405b-b583-9b584e996c80 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk) (last accessed June 2022).

Chapter 5, Paragraphs 5.120 to 5.142 set out the approach for impact assessment, decision making and recording for the Historic Environment.

7.2.5 National Planning Policy Framework 2021: Chapter 16 (paragraphs 194-208) of this policy sets out a framework for the management of the historic environment and provides guidance for proposals affecting heritage assets.

Local policy

7.2.6 Newark & Sherwood Plan Review – Amended Core Strategy, 2019: The Amended Core Strategy sets out the District Council’s spatial policy framework for delivering the development and change needed to realise the District Council’s vision for the District up to 2033. The document sets out Spatial and Core strategies for the protection of Heritage in particular Spatial policies 3 and 9 and Core policies 5, 7 and 14: Guidance and standards.

Guidance and Standards

7.2.7 The assessment methodology for this chapter has been established in accordance with the following guidance and standards:

- Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2020): This guidance seeks to define good practice for the execution and reporting of historic environment desk-based assessment in line with the regulations of ClfA, in particular the Code of conduct.
- Conservation Principles, Policies and Guidance (Historic England, 2008): This guidance seeks to support the quality of decision-making, with the ultimate objective of creating a management regime for all aspects of the historic environment that is clear and transparent in its purpose and sustainable in its application.
- Good Practice Advice in Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment (Historic England, 2015): The purpose of this guidance is to provide information on good practice to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy in the National Planning Policy Framework and the related guidance given in the National Planning Practice Guide.
- Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (Historic England, 2017): This document sets out guidance, against the background of the National Planning Policy Framework and the related guidance given in the Planning Practice Guide, on managing change within the settings of heritage assets, including archaeological remains and historic buildings, sites, areas, and landscapes.

- Historic England Advice Note 12: Statements of Heritage Significance: Analysing Significance in Heritage Assets (Historic England, 2019): This advice note covers the National Planning Policy Framework requirement for applicants for heritage and other consents to describe heritage significance to help local planning authorities to make decisions on the impact of proposals for change to heritage assets. Understanding the significance of heritage assets, in advance of developing proposals enables owners and applicants to receive effective, consistent and timely decisions.
- Principles of Cultural Heritage Impact Assessment in the UK (Institute of Environmental Management and Assessment, Chartered Institute for Archaeologists and Institute of Historic Building Conservation, July 2021): Guiding principles to supplement existing guidance and give a consistent framework for cultural heritage impact assessment in a variety of settings. The application of these principles and good practice will enable practitioners to improve the standard of their assessments, regardless of their specialism within the discipline.
- Planning Practice Guidance – Historic Environment (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019): Advises on enhancing and conserving the historic environment.
- DMRB LA 106 Cultural Heritage sets out the requirements for environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects.

7.3 Study area

- 7.3.1 DRMB LA 106 Cultural heritage assessment (Revision 1) states that the assessment shall define a study area according to the sensitivity of the environment and the potential impacts of the project. Where a new road or road improvement is proposed, the study area shall include the footprint of the scheme plus any land outside that footprint which includes any heritage assets which could be physically affected. The study area should also include the settings of any designated or other cultural heritage resource in the footprint of the scheme or within the zone of visual influence.
- 7.3.2 The following study areas will be used to gather information on the heritage receptors (assets) which have the potential to be affected by the scheme:
- 7.3.3 Designated heritage assets, such as Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Battlefields, and Registered Parks and Gardens will be assessed within the footprint of the red line boundary, plus a 1 kilometre radius buffer around the scheme footprint. The 1 kilometre study area is considered proportionate as the potential for designated assets to be impacted through changes to setting, beyond 1 kilometre from the scheme is considered low; this is because woodland to

the north and east, dense settlement to the west, general vegetation cover and rising topography to the north and south, limits visibility of the scheme within the surrounding landscape. Therefore, the level of potential change to the setting of designated assets over 1 kilometre from the scheme is unlikely to result in significant effects to the heritage value of these assets (subject to paragraph 7.3.6 below).

- 7.3.4 Non-designated heritage assets such as archaeological remains and locally listed buildings will be assessed within the red line boundary, plus a 500 metre radius buffer around the scheme footprint. This study area allows a consideration of all known archaeological remains within 500m of the scheme, which may indicate the potential for further unrecorded archaeological remains to survive within the scheme footprint. The 500m study area is also considered a wide enough area to take into account any changes and alterations to the setting of locally listed and non-designated buildings.
- 7.3.5 Further refinement of the study area may be undertaken, following the findings of field studies and any inputs from key stakeholders. The emphasis would be on a proportionate and reasonable approach to the area over which the effects of the scheme are considered likely to occur.
- 7.3.6 Further to this a Zone of Theoretical Visibility (ZTV) will be produced to inform the Landscape and Visual Impact Assessment. The ZTV will also be used to identify sensitive cultural heritage assets beyond the 1 kilometre study area that may be affected by the scheme due to an impact upon setting. This extended study area allows a full understanding of the context and setting of the heritage assets identified, facilitating an assessment of the potential effects of the scheme during construction and operation.

7.4 Baseline conditions

Archaeological and historical background summary

- 7.4.1 A full report on the archaeological and historical background will be produced to accompany the ES. The below summary highlights key assets and is taken from Historic England's National Heritage List, with information on non-designated heritage assets from the local Historic Environment Record (HER) provided for previous stages of work, and additional information from Heritage Gateway where the draft red line boundary extends beyond the red line boundary.

Designated assets

- 7.4.2 Designated assets are archaeological or built heritage features with statutory protection due to their heritage value. These can include Listed

Buildings, upstanding and buried Scheduled Monuments, Registered Parks and Gardens and Conservation Areas. A large number of designated assets are recorded within the study area which includes most of the historical town of Newark and the Kelham and Averham Conservation Areas which hold multiple listed buildings.

7.4.3 Within the 1 kilometre study area the following designated heritage assets have been identified, and are available on the Environmental Constraints Drawing contained in Appendix A:

- 17 Scheduled Monuments:
 1. 1003474 Newark Castle.
 2. 1003479 Crococalana Roman town.
 3. 1003488 Newark town wall (Lombard Street).
 4. 1008258 Hawton moated site, fishpond, Civil War redoubt and ridge and furrow.
 5. 1012880 Standing cross known as Beaumont Cross.
 6. 1016020 Civil War town defences within the Friary Garden.
 7. 1016046 Civil War redoubt 550m south east of Valley Farm.
 8. 1016047 Gun platform 440m south east of Muskham Bridge.
 9. 1016048 Civil War redoubt 680m north west of Dairy Farm.
 10. 1016049 Civil War fieldwork on Crankley Point.
 11. 1016050 Civil War redoubt on Crankley Point.
 12. 1016051 Moated site 750m north west of Dairy Farm.
 13. 1016150 Queen's Sconce.
 14. 1016152 Civil War redoubt 580m east north east of sugar refinery.
 15. 1017402 Civil War sconce 650m north west of Devon Bridge.
 16. 1017687 Averham moat and enclosure.
 17. 1017739 Langford medieval village, including moat and open field system, 450m north west of Elmtree Farm.
- Seven Grade I Listed Buildings:
 1. 1045982 Kelham Hall.
 2. 1046008 Church Of St Michael.
 3. 1196278 Remains Of Newark Castle.
 4. 1196430 Town Hall.
 5. 1279450 Church Of St. Mary Magdalene And Attached Railing.
 6. 1297633 Governor's House.
 7. 1302213 Church Of St Wilfrid.
- 15 Grade II* Listed Buildings:
 1. 1045983 Gazebo And Garden Wall At Kelham Hall.
 2. 1046033 Langford Hall.

3. 1178886 Winthorpe Hall.
4. 1196076 Club Room And Stables At Rear Of Ossington Hotel.
5. 1196098 Martin Forster House.
6. 1196290 Kiln Warehouse.
7. 1196426 Former White Hart Hotel.
8. 1215654 "Shalem House The Friary 1 To 4".
9. 1278230 43, Market Place.
10. 1287626 Ossington Hotel and Adjoining Garden Walls And Summerhouse.
11. 1288060 Former Magnus School and Adjoining Headmaster's House And English School.
12. 1297635 27 And 28, Market Place.
13. 1297637 40 And 41, Market Place.
14. 1297721 Concrete Footbridge Across River Trent .
15. 1323680 Winthorpe Bridge Carrying Bypass Over River Trent.

- 387 Grade II Listed Buildings.
- One Grade II Registered Park and Garden.
- Five Conservation Areas.

Non-designated assets

7.4.4 Non-designated assets are those heritage features and artefacts which are recorded but are not considered to meet the requisite criteria for statutory protection. These can include historic buildings, upstanding and buried archaeological features and artefacts as well as geoarchaeological deposits.

7.4.5 The Historic Landscape Character (HLC) types of the area are defined within the Nottinghamshire Historic Landscape Characterisation⁴⁷ and will be assessed in the ES. While it is considered there will be minimal impact upon the HLC from the scheme, a full understanding of the HLC will be required to fully understand and assess any changes and impacts upon the HLC from the scheme.

7.4.6 Within the 500 metre study area approximately 150 non-designated archaeological heritage assets and a further 82 non-designated built heritage assets are recorded within the Nottinghamshire Historic Environment Record data (HER) (acquired in 2020). Updated HER data will be obtained to inform the development of the scheme design and cultural heritage chapter of the ES. Further assets are anticipated to be included within the updated HER data in particular around the Kelham area

⁴⁷ The Character of Nottinghamshire's Historic Landscape 2005 available at: <https://www.nottinghamshire.gov.uk/media/106679/historiclandscapecharactermap.pdf>

where a significant number of features are identified on Heritage Gateway⁴⁸.

- 7.4.7 Within the 500 metre study area a Paleolithic flint working site was identified at Farndon. Evidence of Neolithic to Iron Age activity is also recorded across the route including a Bronze Age Barrow at South Muskham. Possible Iron Age settlement sites are identified through cropmarks at Kelham.
- 7.4.8 The Roman period is heavily represented in the archaeological record of the study area, with the Fosse Way Roman Road running south-west to north-east through Newark. A settlement site was identified during excavations at Northgate.
- 7.4.9 A high status early medieval burial has been identified west of Winthorpe. Documentary evidence demonstrates the presence of a settlement at Newark from at least this period and archaeological evidence from excavations at Northgate and Farndon demonstrate activity during this period.
- 7.4.10 The medieval period is represented within the study area with the Scheduled and Grade I Listed Newark Castle being the most prominent evidence. Further evidence of the period is found incorporated into existing structures as well as the route of a north south medieval road at Cattle Market roundabout and the medieval settlement identified at Osmundthorpe.
- 7.4.11 The Post medieval period is the most well represented with many of the Listed Buildings and Scheduled Monuments dating to this period as well as similar non designated assets. In particular the period of the English Civil Wars which form part of the ‘Wars of the Three Kingdoms’, is well represented by both Scheduled and non-designated remains of defensive and offensive structures relating to the sieges of Newark. Further evidence from this period includes buildings related to 19th Century industry.
- 7.4.12 Royal Air Force (RAF) Winthorpe was open from 1940 to 1959 and is the most prominent heritage feature of the Modern period. Other features such as Pillboxes are present within the study area.

⁴⁸ Heritage Gateway [online] available at: <https://www.heritagegateway.org.uk/> (Last accessed June 2022).

7.5 Potential impacts

Construction

7.5.1 Potential adverse impacts on the heritage value of cultural heritage assets during the construction phase of the scheme would result from the following:

- Temporary changes to setting due to the presence of construction machinery, traffic and construction work compounds including lighting.
- Temporary changes to setting due to increased noise, vibration and dust generated during construction.
- Temporary changes to setting due to the diversion or alteration of existing utility services and installation of new utility services.
- Permanent demolition or removal of heritage assets due to excavation, ground disturbance and compaction.

7.5.2 Permanent changes to the setting of heritage assets due to the construction of new and modification of existing infrastructure. Potential beneficial impacts on the heritage value of cultural heritage assets may result from:

- The advancement of knowledge and understanding of known and unknown heritage assets through discovery and recording.

Operation

7.5.3 Potential adverse impacts on the heritage value of cultural heritage assets during the operational phase of the scheme would be due to:

- Changes in their setting as a result of increased noise.
- Increases in vibration associated with changes in traffic movements.

7.5.4 Potential beneficial impacts on the heritage value of cultural heritage assets may result from:

- A potential reduction in noise, vibration or traffic would have a positive beneficial impact on the heritage value of an asset due to the enhancement of its setting.
- Landscape design and planting that, once established, would enhance the setting of assets.

7.6 Design, mitigation and enhancement measures

7.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere the principles of the design and mitigation hierarchy outlined in LA104. The first principle being to avoid potential adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-

developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report.

7.6.2 Construction and operation cultural heritage design objectives shall be developed for the project in accordance with national, regional and local policies. The cultural heritage design objectives should provide a clear statement of how the project, through mitigation and offsetting, is expected to contribute to the value of, or the understanding and dissemination of, the cultural heritage resource, and how this is to be achieved, monitored and validated. This should be guided by the East Midlands Archaeological research framework⁴⁹.

7.6.3 There are a number of opportunities for further embedded mitigation that will be considered during the development of the ongoing scheme design. These include:

- The design of bridges, retaining walls and any other structure provide an opportunity to introduce good design into the overall scheme and reduce impacts on the historic environment. Invariably structures are very prominent parts of the project and through careful and thoughtful design, can provide identity and sense of place to the scheme. For instance, the grade separated junctions will introduce a new large-scale series of structures into the landscape, with an overbridge structure and associated retaining walls. The form and treatment of these could be enhanced through the planting of trees and woodland blocks, hedgerows with trees, and linear belts of trees and shrubs to reinforce the existing landscape framework, and/or the installation of noise barriers' which overall reduces the potential impacts on heritage assets, their setting and interconnectivity.
- Limiting the increase of vertical alignments of new routes including junctions, structures and associated infrastructure as far as practicable to minimise landscape and visual impacts to the historic environment and its setting, including avoiding the location of fence lines at the top of any embankment slopes where they could dominate the skyline.
- Lighting columns, should be kept to a minimum height and be directional to minimise impact of light spill on the setting of heritage assets, whilst still meeting operational safety requirements.

Mitigation measures – Construction

7.6.4 DMRB LA 106 'Cultural heritage assessment' defines mitigation as follows: "measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects".

⁴⁹ The East Midlands Archaeological research framework (2012) [online] available at: <http://archaeologydataservice.ac.uk/researchframeworks/eastmidlands/wiki/>. (Last accessed May 2022).

7.6.5 Archaeological investigation and recording cannot be construed as mitigation, as per paragraph 5.139 of the NPSNN and paragraph 205 of the NPPF. Where physical effects upon heritage assets are unavoidable, excavation and recording will be undertaken to offset the loss of these assets.

7.6.6 Mitigation measures of relevance during construction, to be included within an Archaeological Mitigation Strategy include the following:

- A draft Archaeological Management Plan will be updated at each phase of archaeological works to ensure best practice and limit impacts on heritage assets.
- Avoidance, preservation by burial, or investigation in the case of archaeological remains.
- Management of noise and vibration in the vicinity of heritage assets during construction (see Section 12.6 for details).
- Installation of physical protection measures, or temporary removal of heritage assets for reinstatement following the completion of construction works.
- The use of noise fencing or maintenance of access routes to a heritage asset to maintain its viability during construction.
- Photographic or drawn surveys in the case of historic buildings.
- Adding to the knowledge and understanding of heritage assets through the desk and field-based investigation which will take place as part of the works as well as the creation of information panels.

Mitigation measures - Operation

7.6.7 Mitigation measures of relevance during operation, to be included within the Second Iteration Environmental Management Plan, include the following:

- Use of minimal or sympathetic design to reduce changes within the settings of heritage assets.
- Management of noise and vibration in the vicinity of heritage assets during operation through the use of noise fencing.
- Maintenance of access routes to a heritage asset to maintain its viability.
- Reduction to impact on setting through screening or landscape design.

7.7 Description of the likely significant effects

Construction

7.7.1 During construction, there is potential for significant adverse effects to designated and non-designated heritage assets through the temporary and permanent degradation of their setting.

- 7.7.2 Construction activities would result in potential permanent direct significant adverse effects on below ground archaeological remains from the prehistoric period onwards as they would be removed or truncated by any excavation work. This includes potential locations for the first and second circumvallation's⁵⁰ of Newark. Additionally, there is potential for a significant adverse effect upon the Grade II Listed Smeatons Arches including Causeway Arches from the potential widening of the carriageway from the Cattle market roundabout and Causeway Culvert. The potential for significant effects on below ground archaeological remains will be better understood following the planned program of pre-determination archaeological investigation including geophysical, metal detector and walkover surveys and geoarchaeological assessment.
- 7.7.3 The use of construction plant, materials, machinery, construction compounds and the provision of construction lighting would potentially adversely impact the setting of both designated and non-designated assets and have a temporary direct significant adverse effect on their heritage value during construction. These include Scheduled Monuments relating to the English Civil Wars, and the Grade II Listed Farndon Windmill which lie within the 500 metre study area and Winthorpe Conservation Area, which lies partially within the red line boundary. Detailed analysis will allow a greater understanding of the potential for any temporary significant effect on designated and non-designated assets through the degradation of their setting during construction.
- 7.7.4 There is potential for permanent impacts through the alteration of the setting of designated and non-designated heritage assets as a result of the construction of new infrastructure in particular in the area of Cattle Market roundabout and the junction with the A1. There is potential to reduce the magnitude of these impacts through additional embedded mitigation opportunities (as described in Section 7.6).
- 7.7.5 While areas of Newark, and Winthorpe Conservation Areas fall within the draft red line boundary, any significant adverse effects are anticipated to be due to temporary degradation of setting rather than direct physical impacts.
- 7.7.6 The details of any monitoring required for anticipated significant adverse effects will be included as part of the ES.

⁵⁰ Defensive bank/rampart ringing a settlement or encampment

Operation

7.7.7 Below-ground archaeological remains would not be affected by the operation of the scheme, and therefore no operational effects would be anticipated and will be scoped out of the ES.

7.7.8 It is considered that during operation there is the potential for significant effects on designated built heritage assets. It is likely that these would be limited to those structures where the scheme is closer to such heritage assets through increasing noise, vibration and pollution from traffic in these areas or due to changes in the vertical road alignment which could impact the setting of these assets. In the absence of specific design information at this stage, this will be considered further in the ES.

7.8 Assessment methodology

7.8.1 This section sets out the proposed methodology for the assessment of the potential effects of the scheme, upon the historic environment resource. For the purpose of this assessment, the historic environment resource encompasses three types of heritage asset or receptors as defined by DMRB:

- Archaeological remains, which include scheduled monuments, and non-designated archaeological heritage assets.
- Historic buildings, which include listed, locally listed, and non-designated buildings.
- Historic landscapes, which include Conservation Areas, Registered Battlefields and Registered Parks and Gardens.

7.8.2 The assessment methodology will be in line with the methodology and significance criteria outlined in DMRB (LA106) ‘Cultural heritage assessment’⁵¹.

Baseline and surveys

7.8.3 The following steps will be followed to develop an understanding of the heritage assets surrounding the scheme and the impacts upon them from its construction and operation.

- Production of a detailed historic environment desk-based assessment (DBA) in line with DMRB, to determine the nature, extent, and significance of the historic environment within the scheme study area. This will include archaeological remains, historic buildings and historic landscapes.

⁵¹ National Highways (2020) LA 106 – Cultural Heritage [online] available at: <https://www.standardsforhighways.co.uk/prod/attachments/8c51c51b-579b-405b-b583-9b584e996c80?inline=true> (last accessed May 2022)

- Field work surveys to further determine the potential for and extent of any unknown archaeological features. These will include geophysical survey, geoarchaeological survey and metal detector and fieldwalking survey.

7.8.4 More in depth analysis of the design of the scheme will be required in order to understand the potential impacts on listed buildings, Conservation Area and known and unknown archaeological remains. This will include consulting the ZTV produced by the Landscape team.

Assessment of value / sensitivity

7.8.5 The value and sensitivity of historic environment assets will be based on Table 7.1 below. The assessment of value / sensitivity will be based on a combination of designated status and professional judgement. It will consider the Secretary of State's non-statutory criteria for the scheduling of ancient monuments and principles of selection criteria for listed buildings.

7.8.6 It will also recognise that occasionally some sites have a lower or higher than normal sensitivity within a local setting. The assessment of sensitivity therefore needs to take into account the part of the site that is being affected and the ability of the site to absorb change without compromising the understanding or appreciation of the historic environment.

Table 7.1: Criteria for assessing value / sensitivity

Value	Typical criteria
Very High	Very high importance and rarity, international scale and very limited potential for substitution. These include World Heritage sites, assets of acknowledged international importance, assets that can contribute significantly to acknowledged international research objectives.
High	High importance and rarity, national scale, and limited potential for substitution. Scheduled monuments, Grade I, II* and II Listed Buildings, Registered Parks and Gardens, Conservation Areas and Registered Battlefields where the asset and its setting retain archaeological, architectural and artistic, and historic interest which contributes to their value. Non-designated monuments, sites or landscapes that can be shown to have specific nationally important qualities and assets that can contribute significantly to national research objectives.
Medium	Medium importance and rarity, regional scale, limited potential for substitution. Registered Parks and Gardens, Conservation Areas and Registered Battlefields where the asset and its setting retain less archaeological, architectural, artistic and/or historic interest which contributes to a lesser extent of their value. Non-designated sites of regional importance identified through research or survey, monuments or sites that can be shown to have important qualities in their fabric or historical association.
Low	Low or medium importance and rarity, local scale. Non-designated assets – buildings, structures, monuments, or archaeological sites with a local importance for education or cultural appreciation, and which add to local archaeological and historic research. Very badly damaged assets that are of such poor quality that they cannot be classed as high or medium, parks and gardens of local interest
Negligible	Very low importance and rarity, local scale. Heritage resources identified as being of little historic, archaeological, architectural and artistic interest, resources whose importance is compromised by poor preservation or survival or by contextual associations to justify inclusion into a higher grade.

Source: Adapted from DMRB LA 104

Assessment of magnitude of impact

7.8.7 The magnitude of impact on the heritage asset from the scheme will be assessed in accordance with the criteria presented in Table 7.2 below.

Table 7.2: Criteria for assessing the magnitude of impact

Magnitude		Criteria
Major	Adverse	Total loss or fundamental alteration to a heritage asset's value or setting. Addition of new features that substantially and detrimentally alter the setting of a heritage asset.
	Beneficial	Changes that are extremely beneficial to the heritage value of the asset. Comprehensive changes to the setting of the asset which greatly reveal and enhance its heritage value.
Moderate	Adverse	Partial loss or alteration to a heritage asset or its setting. Addition of new features that form largely inconspicuous elements in the setting of a heritage asset to the extent that its significance is slightly impacted.
	Beneficial	Changes that are beneficial to the heritage value of the asset. Changes that result in the setting of the asset being noticeably enhanced and improving the ability to understand the asset and its historic context and setting.
Minor	Adverse	Minor loss of an element of a heritage asset or its setting. Addition of new features that form largely inconspicuous elements in the setting of a heritage asset to the extent that its significance is slightly impacted.
	Beneficial	Changes that have a limited benefit to the heritage value of the asset. Changes to the setting of the asset which have a slight beneficial impact on heritage value and enhance the ability to understand the asset its historic context and setting.
Negligible	Adverse	Very minor loss of elements of a heritage asset or its setting. Addition of new features that do not alter the setting of a heritage asset.
	Beneficial	Very minor enhancements to the heritage asset or its setting that help slightly to better reveal the asset's heritage value.
No change		No change to the heritage asset.

Source: Adapted from DMRB LA 104

Significance of effect

7.8.8 Significance of effect upon the historic environment will be assessed by combining the value / sensitivity of the heritage asset with the magnitude of change. The effects may be either adverse or beneficial. A description of the significance of effect categories is contained in Table 5.1 and the criteria for assessing significance of effect is set out in Table 5.2.

Standards and Guidance

7.8.9 The method for determining and appraising baseline conditions will involve both desk study and baseline survey. The assessment will be undertaken in accordance with the published standards and guidance set out below:

- Chartered Institute for Archaeologists (CIfA), Standards and Guidance (updated 2020).
- CIfA, IHBC and IEMA (2021) Principles of Cultural Heritage Impact Assessment.
- Transport Analysis Guidance (TAG) Environmental Impact Appraisal (TAG Unit A3).
- Design Manual for Roads and Bridges (DMRB), LA 104 'Environmental assessment and monitoring' and LA 106 'Cultural Heritage' (updated 2020).
- Historic England, Conservation Principles (2008).
- Historic England, Good Practice Advice in Planning Note 2: Managing Significance in the Decision-Taking in the Historic Environment (2015).
- Historic England, Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (2017).
- Historic England Statements of Heritage Significance: Note 12 Analysing Significance in Heritage Assets (2019).

7.9 Assessment assumptions and limitations

7.9.1 No surveys for buried archaeology have taken place to date and there is therefore limited information as to the presence or absence of archaeological assets. A programme of non-intrusive and intrusive surveys for buried archaeology are planned to inform the ES.

7.9.2 Designated data is up to date as of June 2022. Non designated data is from the HER data acquired in 2020, data for additional areas was acquired from Heritage Gateway⁵² and Archaeological Data Service (ADS)⁵³. New HER data will be requested to inform the scheme development and will inform the ES.

7.9.3 It is currently unclear as to the survival of the Grade II Listed Causeway Culvert beneath the current Cattle Market roundabout. The entrance/egress of the heritage asset has not been identified during any visual inspection and as such it is assumed it is either entirely covered and no longer in use or has been removed during previous works. Discussions will be held with the local Conservation Officer and Historic England to discuss a methodology for identifying the survival of this heritage asset.

⁵² Heritage Gateway [online] available at: <https://www.heritagegateway.org.uk/> (Last accessed June 2022).

⁵³ Archaeology Data Service [online] available at: <https://archaeologydataservice.ac.uk/> (Last accessed June 2022).

7.10 Consultation

- 7.10.1 Consultation during the optioneering stages took place as part of the non-statutory consultation, with Historic England and Nottinghamshire County Council. Consultation meetings in early 2021 with the Nottinghamshire County Archaeologist identified the need for continuity in the treatment of the early prehistoric remains found at Farndon, as well as the need to understand the contributions of setting to the significance of the Scheduled Monuments, particularly as relating to the Civil War monuments. This includes understanding how the Scheduled Civil War Monuments relate to the non-designated assets from the same era, all of which combine to create a distinctive heritage for Newark associated with the English Civil War.
- 7.10.2 In March 2022, following the preferred route announcement, engagement continued with the County Archaeologist including a meeting to discuss planned surveys, and also to gain feedback and comment on the draft Archaeological Management Plan and non-intrusive survey specification. Engagement has since commenced with Newark & Sherwood District Council's Archaeological Advisor who will shortly be sent the draft Archaeological Management Plan for review and non-intrusive survey specification and associated WSI for approval, prior to commencement of surveys.
- 7.10.3 In relation to built heritage, a meeting with Historic England took place in July 2022 to re-introduce them to the scheme and outline plans for engagement during the design development of the scheme. Engagement has also commenced in July 2022 with Newark and Sherwood District Council's Senior Conservation Officer in relation to built heritage assets and historic setting. Discussions centered around direct impacts upon the Grade II listed Smeaton's Arches and on the wider setting impacts particularly in regard to the approach to Newark from the great North Road.
- 7.10.4 Consultation will continue throughout the development of the scheme with the District and County Archaeologist as survey work progresses, in addition to consultation with Historic England and the Senior Conservation Officer at Newark and Sherwood District Council.
- 7.10.5 These stakeholders will also be invited to be part of the Environmental Technical Working Group (see Section 4.2 for further details).

7.11 Summary

- 7.11.1 In line with LA 106, responses to the following scoping questions in Table 7.3 have been provided in Table 7.3 to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 7.3: Cultural heritage scoping questions

Scoping question	Answer
4) Is any designated or other cultural heritage resource in the footprint of the scheme or outside that footprint but still potentially physically affected by it?	Yes a number of designated and non-designated assets are present within the study area as defined in Section 7.3
5) Is the setting of any designated or other cultural heritage resource in the footprint of the scheme, within the zone of visual influence or potentially affected by noise (see LA 111 [Ref 13.I])?	Yes a number of designated and non-designated assets are present within the study area as defined in Section 7.3
6) Is there new land take associated with the project?	Yes, whilst most of the scheme follows the existing line of the scheme some areas of new land take are required for construction and flood compensation.
7) Could potential archaeological remains be concealed?	Yes, there is high potential for previously unknown archaeological remains across the scheme.

7.11.2 The proposed scope of the ES is contained within Table 7.4.

Table 7.4: Proposed scope of the cultural heritage chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Built heritage. Upstanding designated and non-designated assets. Buried archaeology. Historic Landscape.	N/A	N/A

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Operation	Built heritage. Upstanding designated and non-designated assets. Historic Landscape	Buried archaeology	Buried archaeology will be unaffected during operation.

8 Landscape and Visual Effects

8.1 Introduction

- 8.1.1 Landscape encompasses many more elements than the common association which focuses merely upon the view or appearance of the land. The term 'landscape' applies to capture the appraisal of environmental factors such as topography, drainage, land use and management, vegetation and ecology, as well as historical and cultural associations (in accordance with DMRB LA 107 paragraph 1.3, Note 1). The notion of landscape can be applied to both rural and urban environments with the term 'townscape' frequently adopted within the urban context (in accordance with DMRB LA 107 paragraph 1.3, Note 2).
- 8.1.2 This chapter aims to identify the potential for significant effects of the scheme upon surrounding landscape character and visual amenity. This chapter has been prepared in accordance with DMRB LA 107 Landscape and Visual Effects⁵⁴, in order to establish the potential requirement for further assessment. Any further assessment required will be presented within the ES.

8.2 Legislation and policy

Legislation

- 8.2.1 The European Landscape Convention (ELC) promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues⁵⁵. The UK government became a signatory to the ELC in 2006, introducing it in March 2007. The ELC is a convention of the Council of Europe and is therefore not affected by Brexit. The ELC contains 18 articles which, collectively, promote landscape protection, management and planning and organising European cooperation on landscape issues. Articles 5 and 6 commit signatory states to a number of actions which are designed to help compliance with the overarching aims of the ELC. These include the need to recognise landscapes in law, to establish policies aimed at landscape planning, protection and management, and the integration of landscape into other policy areas. The ELC does not advocate the same measures and policies for all landscapes. Instead, it encourages approaches that are

⁵⁴ National Highways (2020) DMRB LA 107 – Landscape and visual effects, Revision 2 [online] available at: [bc8a371f-2443-4761-af5d-f37d632c5734](https://standardsforhighways.co.uk/standards/la107-landscape-and-visual-effects-revision-2/) (standardsforhighways.co.uk) (last accessed June 2022)

⁵⁵ GOV.UK (November 2010) Corporate report, European Landscape Convention: guidelines for managing landscapes [online] available at: [European Landscape Convention: guidelines for managing landscapes - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/44444/european-landscape-convention-guidelines-for-managing-landscapes.pdf) (last accessed June 2022).

adaptable to particular landscape types and which respond to their unique characteristics⁵⁶.

8.2.2 The Environment Act 2021⁵⁷ sets out measures intended to protect and improve the UK’s environments, including biodiversity, water, and habitats. The Act also introduces local nature recovery strategies (LNRS), a system of spatial strategies in England. Appointed authorities will be tasked with creating opportunities to improve local habitats and aid their recovery.

National Policy

National Policy Statement for National Networks

8.2.3 Paragraphs 4.28-4.35 of the NPSNN⁵⁸ set out the principles of good design for national network infrastructure, outlining the importance of integrated design, with visual appearance “a key factor in considering the design of new infrastructure, as well as functionality, fitness for purpose, sustainability and cost.”

8.2.4 Paragraphs 5.143-5.1⁶¹ of the NPSNN consider how landscape and visual impact assessments should be undertaken and how landscape impacts should be considered within the decision-making process in order to “avoid adverse effects on landscape or to minimise harm to the landscape, including by reasonable mitigation”. Paragraphs 5.120 to 5.142 set out the approach for impact assessment, decision making and recording for the historic environment.

National Planning Policy Framework

8.2.5 The NPPF⁵⁹ sets out the Government’s planning policies for England within Section 15, Paragraphs 174-188 setting out the framework with respect to conserving and enhancing the natural environment. Section 16, Paragraphs 194-208, sets out a framework for the management of the historic environment.

8.2.6 Section 13, Paragraphs 137-151 of the NPPF relate to Protecting Green Belt land, with paragraph 138 outlining the five purposes of Green Belt. Paragraphs 147 to 151 address proposals affecting the Green Belt and set

⁵⁶ Landscape Institute (2022) The European Landscape Convention (ELC) [online] available at: [The European Landscape Convention \(ELC\) | Landscape Institute](#) (last accessed June 2022).

⁵⁷ UK Government (2021). Environment Act 2021 [online] available at: [Environment Act 2021 \(legislation.gov.uk\)](#) (last accessed June 2022).

⁵⁸ Department for Transport (2014) National Policy Statement for National Networks [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/NNNPS-web.pdf (last accessed June 2022).

⁵⁹ Communities and Local Government (2021) National Planning Policy Framework [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf (last accessed June 2022).

out the parameters for appropriate and inappropriate development. Paragraph 150 states that “*Certain other forms of development are also not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it.*” The list of these developments include: “*local transport infrastructure which can demonstrate a requirement for Green Belt location*”.

National Highways’ policy and guidance

8.2.7 Landscape is one of the environmental topic areas where the six strategic levers of National Highways’ Environment Strategy⁶⁰ will be applied. The strategic levers will make a contribution towards the organisation’s environment vision.

8.2.8 National Highways’ ‘People, places and processes: A guide to good design at National Highways’ (2022)⁶¹ sets out a vision, which aims to put people at the heart of National Highways’ work, by designing an inclusive, resilient and sustainable road network. This road network should be appreciated for its usefulness but also its elegance, reflecting in its design the beauty of the natural, built and historic environment through which it passes, and enhancing it where possible. The accompanying set of principles for good road design follow the themes of people, places and processes. The focus on good design seeks to make a difference to both road users and the communities through which the roads pass, while being sensitive to the context of a road’s surroundings. The road should contribute to higher quality of life, greater economic vitality and a more efficient use of resources.

25 Year Environment Plan

8.2.9 The Department for Environment, Food & Rural Affairs (Defra) 25 Year Environment Plan (2018)⁶² is a policy paper setting out what government will do to improve the environment, including restoring and safeguarding wildlife habitats. This plan is being treated as the first Environmental Improvement Plan required under the Environment Act 2021. Chapter 2: *Recovering nature and enhancing the beauty of landscapes* relates to the development of a Nature Recovery Network to protect and restore wildlife, as well as a review of nationally designated landscape areas. The plan also introduces a new environmental land management system (ELMS) to incentivise land managers to restore and improve natural capital and rural

⁶⁰ National Highways (2015) National Highways Environment Strategy [online]. Available at: [Environment Strategy 21 .pdf \(publishing.service.gov.uk\)](#) (last accessed April 2022).

⁶¹ National Highways (2022) People, places and processes: A guide to good design at National Highways [online] available at: [People, places and processes \(nationalhighways.co.uk\)](#) (last accessed August 2022).

⁶² HM Government (2018) A Green Future: Our 25 Year Plan to Improve the Environment [online] available at: [25 Year Environment Plan - GOV.UK \(www.gov.uk\)](#) (last accessed April 2022).

heritage. The three ELMS schemes include a Local Nature Recovery scheme and a Landscape Recovery scheme, both piloting in 2022 and launching in 2024.

Local policy

8.2.10 The scheme and surrounding context fall within the administrative areas of Newark and Sherwood District Council. Relevant policies and strategy documents include:

Newark and Sherwood Plan Review - Amended Core Strategy⁶³

8.2.11 Core Policy 12 Biodiversity and Green Infrastructure states the following:

8.2.12 '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, the Green Infrastructure Strategy and the Nature Conservation Strategy'.

8.2.13 Core Policy 13 Landscape Character states the following:

8.2.14 'Based on the comprehensive assessment of the District's landscape character, provided by the Landscape Character Assessment Supplementary Planning Document, the District Council 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'.*

8.2.15 Core Policy 14 Historic Environment states that the following should be secured:

8.2.16 'The continued conservation and enhancement of the character, appearance and setting of the District's heritage assets and historic environment, in line with their identified significance as required in national policy'

8.2.17 'The preservation and enhancement of the special character of Conservation Areas including that character identified through Conservation Area Character Appraisals which will form the basis for their

⁶³ Newark and Sherwood District Council (2019) Amended Core Strategy Development Plan. Accessible at: <https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-core-strategy-dpd/amended-core-strategy-DPD.pdf>

management. Important open spaces and features identified through the Conservation Area Appraisal process will be protected through subsequent allocation in the Allocations & Development Management DPD’.

Newark and Sherwood Green Infrastructure Strategy

8.2.18 The strategy⁶⁴ ‘will allow for the expansion of settlements whilst ensuring that the District, its assets and landscapes suffer no negative effects and instead prosper from new development.....the need to respond to the threats and challenges of climate change for communities and wildlife has also shaped the Strategy’s development’.

8.3 Study area

8.3.1 In accordance with the DMRB LA 107⁶⁵ (paragraphs 3.11 and 3.31), the study area for the scoping of landscape and visual effects considers the following:

1. Areas anticipated to be used for the scheme and its construction works and their visual footprint.
2. The wider landscape setting and visual envelope which may be influenced by the scheme.
3. The extents of the area visible by the scheme and the extent of representative viewpoints visible of the scheme.
4. Where applicable, the full extent of adjacent or affected landscape receptors of special value where the setting may be influenced by the scheme.
5. The extent of adjacent or affected visual receptors and the visual amenity of the area that may be influenced by the scheme.

8.4 Baseline conditions

Data sources

8.4.1 The relevant baseline conditions of the scheme and study area have been established using the following sources of information:

- Previous assessments of landscape and visual effects during options appraisal stages of the scheme.
- Environmental Constraints Plan (contained in Appendix A).

⁶⁴ Newark & Sherwood District Council (2010) A Green Infrastructure Strategy for Newark & Sherwood [online] available at: [Microsoft Word - 2134.023 contents pages etc.doc \(newark-sherwooddc.gov.uk\)](#) (last accessed July 2022).

⁶⁵ National Highways (2020) DMRB LA 107 – Landscape and visual effects, Revision 2 [online] available at: [bc8a371f-2443-4761-af5d-f37d632c5734 \(standardsforhighways.co.uk\)](#) (last accessed June 2022)

- Newark & Sherwood Core Strategy – Newark & Sherwood Local Development Framework (Adopted March 2019⁶⁶).
- A Green Infrastructure Study for Newark & Sherwood⁶⁷.
- Natural England’s National Character Area (NCA) profiles⁶⁸.
- Newark and Sherwood Landscape Character Assessment⁶⁹.
- Natural England’s MAGIC interactive map⁷⁰.
- Conservation Areas are identified on Newark and Sherwood District Council’s map and Character Appraisals⁷¹.
- Nottinghamshire County Council’s Definitive Map⁷².

Landscape designations

8.4.2 Relevant designations to the assessment of landscape and visual effects are illustrated on the environmental constraints drawing contained in Appendix A. Table 8.1 below highlights key designations within the study area and their distance from site. Further information is provided in Chapter 7 Cultural Heritage, Section 7.4.2.

Table 8.1: Relevant designations within the study area*

Designations within the study area	Distance from the scheme
Winthorpe Conservation Area	Within the draft red line boundary to the northern extents of scheme at Winthorpe.
Newark Conservation Area	Within the draft red line boundary to the east of the A46.
Averham Conservation Area	Immediately adjacent to the draft red line boundary (flood compensation area only).
Kelham Conservation Area	Immediately adjacent to the draft red line boundary (flood compensation area only).
Farndon Conservation Area	1 kilometre west of draft red line boundary at Farndon junction.

⁶⁶ Newark and Sherwood District Council (2019) Newark & Sherwood Plan Review – Amended Core Strategy [online] available at: [amended-core-strategy-DPD.pdf \(newark-sherwooddc.gov.uk\)](#) (last accessed June 2022).

⁶⁷ Newark and Sherwood District Council (2010) A Green Infrastructure Strategy for Newark & Sherwood [online] available at: [Microsoft Word - 2134.023 contents pages etc.doc \(newark-sherwooddc.gov.uk\)](#) (last accessed June 2022).

⁶⁸ Natural England (2014) National Character Area profile: 48. Trent and Belvoir Vales [online] available at: NCA Profile: 48: Trent and Belvoir Vales - NE429 (naturalengland.org.uk) (last accessed June 2022).

⁶⁹ Newark and Sherwood District Council (2013) Landscape Character Assessment Supplementary Planning Document [online] available at: [Landscape character assessment SPD | Newark & Sherwood District Council \(newark-sherwooddc.gov.uk\)](#) (last accessed June 2022).

⁷⁰ Natural England (2017) MAGIC Interactive Map [online] available at: <http://magic.defra.gov.uk/MagicMap.aspx> (last accessed June 2022).

⁷¹ Newark and Sherwood District Council (2017) Conservation Areas [online] available at: Conservation areas | Newark & Sherwood District Council (newark-sherwooddc.gov.uk) (last accessed June 2022).

⁷² Nottinghamshire County Council (2017) Definitive Map [online] available at: PRoW data | Nottinghamshire County Council (last accessed June 2022)

Designations within the study area	Distance from the scheme
Listed Buildings - various	Numerous within the study area: 387 Grade II, 15 Grade II* and seven Grade I (within 1 kilometre), closest within the draft red line boundary - Grade II listed.
Scheduled Monuments - various	17 within 1 kilometre; closest within 10 metres of the draft red line boundary at Cattle Market junction.
Newark Castle Gardens Grade II listed Registered Park and Garden	580 metres south of A46.
Veteran and notable trees	4 veteran and 10 notable trees have been identified within, or directly adjacent to, the draft red line boundary (the majority of which, 1 veteran and 9 notable trees, are located at Kelham). 3 veteran trees are currently in conflict with the scheme footprint.
TPOs	4 group TPOs have been identified within the draft redline boundary (TPOs 56, 116, 152 and 153). 3 of which will be in partial conflict with the scheme footprint (TPOs 116, 152 and 153).

* The inclusion of designated sites within the assessment of landscape and visual effects will inform the justification of value attributed to a given view or landscape character area.

8.4.3 There are no Areas of Outstanding Natural Beauty (AONB) or National Parks, nor any local designations, located within or adjacent to the study area of the scheme.

Landscape character

National level

8.4.4 At a national level, the scheme and study area is located within National Character Area (NCA) 48 Trent and Belvoir Vales.

8.4.5 NCA 48 is characterised by *'undulating, strong rural and predominantly arable farmland, centred on the River Trent. A low-lying rural landscape with relatively little woodland cover, the NCA offers long open views.*

8.4.6 *Newark lies at the centre with Grantham, Nottingham, Lincoln and Gainsborough on the peripheries. The southern and eastern edges of the Vales are defined by the adjoining escarpments of the Lincolnshire Edge and the Leicestershire and Nottinghamshire Wolds NCA 74. To the west,*

the escarpment of a broad ridge of rolling landscape defines the boundary with the neighbouring Sherwood and Humberhead Levels NCAs.

8.4.7 *The area's generally fertile soils and good quality agricultural land have supported a diversity of farming over a long period but, because of this, little semi-natural habitat remains.....The powerful River Trent and its flood plain provide a strong feature running through the landscape.....It is the greatest biodiversity resource, being a major corridor for wildlife moving through the area and supporting a variety of wetland habitats. It also provides flood storage as well as large amounts of cooling water for local power stations.'*

County level

8.4.8 At a county level, the study area sits within three character areas outlined in the Newark and Sherwood Landscape Character Assessment:

- Trent Washlands Landscape Character Area (LCA) which covers Landscape Character Types River Meadowlands and Village Farmlands.
- East Nottinghamshire Sandlands LCA, which covers the Landscape Character Type Village Farmlands.
- South Nottinghamshire Farmlands LCA, which covers the Landscape Character Type Meadowlands and Village Farmlands.

8.4.9 Key characteristics as described within the Newark and Sherwood Landscape Character Assessment (LCA) include:

Trent Washlands LCA

- Broad flat river terraces with meandering river channels.
- Predominantly arable with permanent pasture around settlements and roads. Flood meadow in some parts.
- Regular pattern of medium-to large-sized fields, breaking down and becoming open in many areas.
- Sparsley populated with few buildings or with nucleated villages of traditional red brick and pantile roofed buildings.
- Long sinuous hedgerows, with hedgerow trees forming main component of tree cover.
- Willow pollards and holts.
- Sand and gravel quarries.
- Steep wooded bluffs.

East Nottinghamshire Sandlands LCA

- Free-draining sandy soils.
- Variable pattern of land use and land holding.
- Mixed small-scale geometric plantations with birch, oak and Scots pine.
- Acidic grassland and grass heaths.

- Bracken, gorse and broom along hedgerows and roadside verge.

South Nottinghamshire Farmlands LCA

- Flat low-lying topography.
- Seasonally wet alluvial and peaty soils.
- Open, spacious views, sometimes enclosed by rising ground.
- Remnant pattern of large hedged fields defined by thorn hedges or ditches.
- Small broad leaved plantations.
- Absence of farmsteads or other buildings.
- Gently rolling topography.
- Simple pattern of large arable fields
- Neatly trimmed hawthorn hedges.
- Nucleated villages with traditional red brick and pantile roofed buildings.
- Suburbanised commuter villages and small towns.
- Small-scale pastoral landscapes along village edges.

Landscape baseline – the local landscape

8.4.10 The existing A46, single carriageway, runs through the centre of the study area, generally elevated on embankment due to the low-lying alluvial floodplain of the nearby River Trent. There is a mixed geology of river terrace sand and gravel in Newark, and Riverine Clay, Sands and Gravels to the west, overlying various mudstone strata.

8.4.11 Several roundabouts form key junctions along the A46, linking with a number of A roads locally. The Nottingham to Lincoln Railway Line traverses the area, bringing further infrastructure to the landscape. It crosses the existing A46 twice, once at the south-western extent and the second at the north-east end of the scheme extent.

8.4.12 Road infrastructure is softened by roadside vegetation in places along the A46. The River Trent is a strong natural influence within an otherwise manmade landscape, flowing sinuously in two channels located either side of the A46. To the north of the A46, farmland of irregular field patterns dominate, interspersed with small-scale settlement. To the south of the road, the town of Newark has developed from a long and rich history to form a notable urban settlement. The CPRE interactive map which presents England's Light Pollution and Dark Skies⁷³, identifies Newark as having some of the brightest night lighting levels, gradually reducing away from Newark, moving into a more rural landscape.

⁷³ CPRE (2016) Interactive Map [online] available at: [England's Light Pollution and Dark Skies \(cpre.org.uk\)](https://www.cpre.org.uk) (last accessed July 2022).

Visual baseline

8.4.13 The detailed Landscape and Visual Impact Assessment (LVIA) to be produced as part of the ES will address all visual receptors with the potential of experiencing effects of the scheme. Receptors include residential properties, PRow, road users, businesses and recreational facilities. At this scoping stage, the potential visual receptors have been identified through desk top study. Visual receptors currently proposed for inclusion within the assessment are presented in Appendix C. The scope of the visual receptors will be reviewed during further assessment, taking into consideration scheme design development and the findings of field studies.

8.5 Potential impacts

8.5.1 Potential construction and operation impacts applicable to the scheme are summarised in the following sections.

Construction

8.5.2 Construction impacts may be short-term, long term, temporary or permanent in nature. The sources of potential impacts considered in relation to landscape and visual amenity during construction include:

- Presence and movement of construction traffic, plant and equipment.
- Construction compounds and haul routes, particularly if sited within areas of farmland.
- Temporary fencing and hoardings.
- Demolition and site clearance, including vegetation clearance.
- Introduction of temporary structures and signage.
- Earthworks and changes in the landform of the site.
- Storage of earth and other materials.
- Presence and views of lighting for works during low daylight levels or for night work, as well as compounds.
- The progressive construction of the permanent built elements including above grade structures.
- Vegetation removal including that which currently offers character and visual screening value, some trees of which have TPO status.
- Bare soil of newly formed earthworks

8.5.3 The detracting elements of construction that would be introduced into the landscape and urban areas are expected to be located in close proximity to the existing road infrastructure as far as practicable. This is with the exception of possible requirements for flood compensation areas which would be approximately 1400 metres from the scheme alignment. Current proposals for flood compensation at Kelham would likely bring temporary detracting features to the area during construction. However, the exact

areas required to construct the scheme, hours of working and extent of vegetation clearance have yet to be determined.

Landscape character

8.5.4 The presence of construction plant, materials, machinery, construction compounds and the provision of construction lighting could have a direct impact on the local landscape character for a temporary period. These elements would alter the existing setting of the road which comprises a predominantly open, rural, undeveloped landscape. Similarly, the removal of vegetation where required to facilitate the works, such as along the existing A46, has the potential to impact directly on key characteristics of the local landscape character within the study area. Earthworks required for the construction of off-site flood compensation would also lead to the introduction of detracting features in an otherwise rural landscape, 1400 metres northwest of the main scheme alignment. Any construction impacts arising from the temporary addition of detracting features within the landscape would however, be set in the context of the existing A46 and wider road network, whilst also forming a backdrop to the urban edge of Newark. Indirect impacts upon the setting of the townscape of Newark are also likely during construction, given the intervisibility of neighbouring detracting construction elements in and around the A46 to the northwest which have the potential to reduce both audible and visual tranquility in the area.

Visual amenity

8.5.5 Short distance views are likely to be afforded from a number of properties in close proximity to the scheme construction works, including those capturing at height works associated with the construction of new bridge structures along the route, and the grade separated junction at Cattle Market. Receptors would include a number of residential properties and PRow users, with the potential for short term views to construction activity and compounds. In addition, the removal of any existing trees and screening vegetation may result in the opening up of views of the A46 as well as of construction activity, bringing further visual change to local receptors. There would be the potential for short term impacts upon views from the following areas:

- Residential properties on the northern and western edges of Newark between Newark Crossing (of the two mainline railway tracks) and the A46/B6166 junction, including properties within Sandhills Park with open views across adjacent temporary works areas to the construction of Cattle Market junction, and most notably, those properties on Crees Lane which would afford direct impacts within residential boundaries as a result of the scheme.

- Residential properties at villages of Winthorpe, Kelham and Averham.
- Users of the PRoW network, including Trent Valley Way Long Distance Footpath and National Cycle Route 64.
- Users of recreational facilities including Newark Showground: Newark Rugby Club and Newark Cricket Club.
- Visitors enjoying the areas historical heritage, most notably at Newark Castle.
- Users of the A46 and nearby roads during construction.

Operation

8.5.6 Sources of potential impacts considered in relation to landscape character and visual amenity during operation include:

- Additional road infrastructure, notably paved surfacing as well as new at height structures such as the grade separated junction at Cattle Market, increasing the overall scale and perception of the highway network.
- Potential increase in the number, or scale of related infrastructure such as signs, traffic signals, lighting, CCTV, technology elements, servicing or power units; also, any new maintenance access platforms / routes and associated hard surfacing and pedestrian guardrails.
- Permanent loss of vegetation within and outside the existing highway boundary, which in turn may reduce physical containment and open up views to the A46.
- New or modified earthworks and drainage elements that may require additional land take, including ponds, swales and flood compensation areas.

Landscape character

8.5.7 During operation, the widened A46 and associated highway features, including a number of at height bridge structures and retaining walls, would increase the prominence of the A46 within the receiving landscape. This would be particularly the case to the north of the existing A46, where a more rural open landscape with greater intervisibility is afforded. The loss of existing landscape features such as established vegetation, including a small amount of woodland, would further the impact upon local landscape character. The introduction of the flood compensation area at Kelham may also bring a change in local topography and land use, albeit the site would not be hard surfaced and would be landscaped upon completion of construction. There is potential for short term impacts upon the conservation area in this location. Indirect effects upon Conservation Areas at Winthorpe, Averham and Newark are also likely in the early years of operation prior to the establishment of mitigation planting.

Visual amenity

8.5.8 Visual amenity would also be impacted as a result of the increased visual prominence of the widened A46. This would arise from impacts associated with an additional lane of traffic movements, new or enlarged structures and junctions, particularly the grade separated Cattle Market junction, signage, and lighting at junctions including headlights during hours of darkness. The A46 will consequently appear more dominant in views, particularly from those receptors afforded short distance open views towards the scheme, and those affording views to at height structures across the skyline. Vegetation removal is planned to be kept to a minimum on the southern side of the A46, allowing the retention of existing screening planting between the A46 and visual receptors in Newark. However, where current open views are afforded, or vegetation clearance is unavoidable, views would be opened up to the operational newly widened A46, potentially increasing detracting features within local views. Views to the new flood compensation area at Kelham are also likely to be afforded from local residential receptors on the edge of Averham and local PRoW during operation.

8.6 Design, mitigation and enhancement measures

Design measures

8.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104. The first principle being to avoid potential adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed essential mitigation strategy. The landscape design strategy for the scheme will seek to respond to the local landscape character and physical topography of the area, aiding the settlement of the scheme within the receiving environment, limiting visual clutter and detracting features as far as possible, whilst mitigating impacts and enhancing biodiversity as part of a holistic design approach. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report. There are a number of opportunities for further embedded mitigation that will be considered during the development of the ongoing scheme design. These include:

- Careful integration of earthworks into the landscape, shaping of the proposed new landform sympathetically to integrate the scheme into the receiving landscape and minimising lengths of embankments that cut across the natural topography of the area. This will entail the use of flowing slopes at a range of gradients, depending on the space available and the design intentions.

- The use of earth landscape bunds to aid landscape integration and reduce the prominence of the scheme as appropriate.
- Earthworks to be designed to minimise conflicts of existing vegetation and the PRoW network.
- Rounding off the crests and toes of all embankments and flood compensation areas to achieve a more natural appearance for slope profiles, allowing greater integration with the surrounding landform.
- Slope profiles graded out and returned to agriculture use to retain the open character of the area.
- Limit increase of vertical alignment of new route including junctions, structures and associated infrastructure far as practicable to minimise landscape and visual impacts, including avoiding location of fence lines at the top of any embankment slopes where they could dominate the skyline.
- Lighting columns, should be kept to a minimum height and be directional to minimise impact on nearby properties and the wider night sky, whilst still meeting operational safety requirements.
- New structures should be designed with a low solid to void ratio wherever practicable, with consideration given to colour, form, and materials to minimise the visual prominence of these new features.

8.6.2 Potential mitigation measures applicable to the construction and operation phases are provided below. Whilst these measures are not confirmed mitigation at this stage, the potential benefits have been used to inform the conclusions of likely significant effects and the need for further assessment. Every effort will be made to incorporate these measures within the scheme mitigation strategy and associated development of the scheme engineering and environmental design.

Mitigation measures - Construction

8.6.3 Mitigation measures of relevance during construction, to be included within the Second Iteration Environmental Management Plan, include the following:

- Keeping a well ordered and tidy site, including keeping stockpiles to a minimum, with delivery of goods on an as needed basis.
- Limiting works to daylight hours in the most part, with any night works to be kept to a minimum where practicable.
- Using minimal, low level and directional lighting for compound security and night works, whilst successfully meeting safety requirements.
- Retention and avoidance of impact upon existing trees and vegetation wherever possible, including the sensitive consideration of trees protected by TPOs and other notable trees within and adjacent to the works boundary.
- Protecting existing trees and vegetation to be retained with protective fencing, where deemed necessary, in accordance with BS 5837:2012.

- Restoration of land used temporarily to construct the scheme, as soon as practicable.
- Constructing screening mounds, where they are proposed as part of the permanent works, as early as is practicable to provide screening to the construction work.

Mitigation measures - Operation

8.6.4 Mitigation measures of relevance during operation, to be included within the Second Iteration Environmental Management Plan, include the following:

- New and replacement planting should be native, whilst being cognisant of climate change resilience, and reflect the local vernacular, including those species listed in the Newark and Sherwood Landscape Character Assessment.
- Retention and enhancement of hedgerows and linear belts of vegetation along the highway boundary where appropriate, to ensure that existing field boundaries remain intact and wildlife corridors are not severed.
- Where drainage ditches, balancing ponds and attenuation areas are required, opportunities for habitat creation will be incorporated into the environmental design with an aim to increase biodiversity.

Enhancement measures

8.6.5 Enhancement measures will seek to improve and/or restore local landscape character and visual amenity where possible. These measures will be identified during the landscape and visual impact assessment prepared as part of the ES and be considered during the integrated scheme design development in preparation for the DCO submission.

8.7 Description of the likely significant effects

Construction

Landscape character

8.7.1 Significant effects at a National Character level are unlikely given the scale and nature of the works in relation to the scale of the NCA. However, when considering the likely impacts described in Section 8.5, with mitigation measures in place as described in Section 8.6, there remains potential for significant adverse effects upon local landscape character immediately surrounding the works, for a temporary period during construction. This is due to the presence of construction works, associated traffic movements, temporary fencing, lighting and structures beyond the current highway boundary, bringing detracting features into the landscape as well as a decrease in tranquility levels. Further assessment will be undertaken as part of the ES.

Visual amenity

8.7.2 During construction, with mitigation measures in place as described in Section 8.6, there is the potential for significant adverse visual effects to receptors within the study area. These effects would arise from the impacts described in Section 8.5. Effects are likely to include, but not be limited to, an alteration in visual amenity for residential receptors, PRow, including the Trent Valley Way, visitors to recreational facilities including Newark Castle, and road users. Further assessment to understand which specific receptors might experience significant effects as a result of the scheme construction will be undertaken as part of the ES.

Operation

Landscape character

8.7.3 Once operational, there is the potential for significant adverse effects upon landscape character arising from the impacts described in Section 8.5. These impacts would most likely bring significant effects within the immediate landscape surrounding the scheme rather than more broadly at a national scale. Mitigation described in Section 8.6, such as screening planting and the introduction of carefully positioned planted earth bunds, may go some way to integrating the scheme within the local landscape. However, the increase in highways infrastructure within the receiving environment would be a permanent alteration in current land use, albeit generally within or adjacent to the existing A46 highway boundary. Significant adverse effects are not currently predicted as a result of the flood compensation area during operation. Any significant adverse effects as a result of the initial years of scheme operation would reduce over time as mitigation planting establishes, supporting the integration of the scheme within the receiving landscape and strengthening character through green-blue infrastructure wherever possible. Further assessment to understand which specific receptors might experience significant effects as a result of the scheme operation will be undertaken as part of the ES.

Visual amenity

8.7.4 Once operational, there is the potential for significant adverse effects to visual receptors arising from the impacts previously described. Significant adverse effects are most likely for those visual receptors in close proximity to the scheme, where short distance, direct views to the widened A46 and associated structures would be afforded. Over time, mitigation such as screening planting and earth bunds (as described in Section 8.6) may go some way to minimise visual effects for some receptors. It is not considered that vegetation would provide adequate screening until Year 15 when planting has matured. In addition, even with the use of roadside

planting, it may not be possible to fully screen all aspects of the scheme and associated traffic movements at Year 15. Further assessment to understand which specific receptors might experience significant effects as a result of the scheme operation will be undertaken as part of the ES.

8.8 Assessment methodology

Proposed level and scope of assessment

- 8.8.1 Significant effects upon both landscape character and visual amenity are likely during both construction and operation, and therefore it is considered necessary to undertake further assessment.
- 8.8.2 The assessment will use structured, informed and reasoned professional judgement, taking into account data derived from desk study and walkover surveys to review and update the baseline information gathered in previous assessments.
- 8.8.3 The assessment methodology will be in line with the methodology and significance criteria outlined in DMRB LA107 Landscape and Visual Effects. Industry best practice will also be followed, with particular reference to:
- Guidelines for Landscape and Visual Impact Assessment Third Edition⁷⁴.
 - An Approach to landscape character assessment⁷⁵.

Proposed methodology including significance

- 8.8.4 The assessment will use structured, informed and reasoned professional judgement, taking into account data derived from desk study and walkover survey, to review and update the baseline information gathered in previous assessments. This will include visits to each visual receptor identified, to establish baseline views and descriptions. Photography will be used to record baseline views and local landscape character. Summer and winter baseline photography will be captured to help inform the assessment.
- 8.8.5 A digital zone of theoretical visibility (ZTV) produced at a previous stage has been used to help inform the selection of viewpoints initially identified within this scoping assessment. An updated ZTV will be run prior to commencing the LVIA to inform the ES, based on the latest available design proposals and scheme alignment. The ZTV will be modelled in GIS using topographical LiDAR data and assumed heights of intervening vegetation and built form, to identify the likely area affected when

⁷⁴ Landscape Institute and the Institute for Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA 3).

⁷⁵ Natural England Guidance 2014: An approach to Landscape Character Assessments [online] available at: [landscape-character-assessment.pdf](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/261112/landscape-character-assessment.pdf) (publishing.service.gov.uk) (last accessed July 2022).

considering intervening features including topography, built form and blocks of established vegetation. The ZTV will enable the clarification of both the study area and likely areas from which the scheme may be visible. The ZTV will be established using GIS viewshed analysis and accord to the standards set out in LA107. This will allow the project Landscape Architect to undertake a review of views from identified visual receptors within the study area. A review of local character will also be undertaken to understand the landscape value and associated sensitivity to change of each character area. Landscape Character Checklists will be completed and appended to the LVIA.

8.8.6 Assessment of the project's potential effects against the baseline situation will examine and assess:

- Seasonal differences with or without the project including summer with foliage and winter without foliage.
- Both day and night time situations with or without the project.
- A winter scenario in the year of opening, and a summer scenario – Year 15 of operation to traffic.
- Landscape character types and/or landscape character areas.
- The opinions and consensus of the local public and different interest groups, their perception of the landscape, the value they place it and assessment of the change the project will incur.

8.8.7 The assessment will be undertaken from publicly accessible areas, with representative viewpoints provided to capture views from the closest publicly accessible location at the curtilage of property boundaries, unless specifically agreed otherwise in isolated cases.

8.8.8 Not every individual residential property will be addressed in its own right, instead residential receptors will be captured in groups where appropriate, and where similar views are afforded.

8.8.9 Whilst numerous receptors fall within the study area, only those receptors identified as falling within the visual envelope of the scheme will be assessed.

Sensitivity (susceptibility and value) of resource

Landscape

8.8.10 The value and susceptibility of landscape receptors is based on the descriptions in Table 8.2. The assessment of value is based on a combination of factors including importance and quality/condition, as well as professional judgement. The assessment of susceptibility takes into account the ability of this area to accommodate change without fundamentally changing key landscape characteristics.

Table 8.2: Landscape sensitivity (susceptibility and value) and typical descriptions

Landscape sensitivity (susceptibility and value) of receptor/resource	Typical Description
Very High	Landscapes of very high international / national importance and rarity or value with no or very limited ability to accommodate change without substantial loss / gain (for example: national parks, internationally acclaimed landscapes - UNESCO World Heritage Sites).
High	Landscapes of high national importance containing distinctive features / elements with limited ability to accommodate change without incurring substantial loss/gain (for example: designated areas, areas of strong sense of place - registered parks and gardens, country parks).
Medium	Landscapes of local or regional recognition or importance, able to accommodate some change (for example features worthy of conservation, some sense of place or value through use / perception).
Low	Local landscape areas or receptors of low to medium importance with ability to accommodate change (for example non-designated or designated areas of local recognition or areas of little sense of place).
Negligible	Landscapes of very low importance and rarity able to accommodate change.

Source: LA 107, DMRB, 2020 (Table 3.22)

Visual

8.8.11 The value and susceptibility of visual receptors is based on the descriptions in Table 8.3. The assessment of susceptibility is based on a combination of the type of visual receptors experiencing the view, activity they are engaged in and the degree to which their attention is focused on the view. Value takes into account designations or value attached to a view by visitors, condition of the elements and presence of detracting/valued features. Value and susceptibility are then considered together to make judgements about visual sensitivity. It is also recognised that receptors may have a lower or higher sensitivity within a localised area, taking into account local conditions that may influence existing views.

Table 8.3: Visual sensitivity (susceptibility and value) and typical descriptions

Sensitivity	Typical descriptions
Very High	<ul style="list-style-type: none"> • Static views from and of major tourist attractions. • Views from and of very important national / international landscapes, cultural / historical sites (for example National Parks, UNESCO World Heritage sites). • Receptors engaged in specific activities for enjoyment of dark skies .
High	<ul style="list-style-type: none"> • Views by users of nationally important Public Rights of Way (PRoW) / recreational trails (for example national trails, long distance footpaths). • Views by users of public open spaces for enjoyment of the countryside (for example country parks). • Static views from dense residential areas, longer transient views from designated public open space, recreational areas. • Views from and of rare, designated landscapes of national importance.
Moderate	<ul style="list-style-type: none"> • Static views from less populated residential areas, schools and other institutional buildings and their outdoor areas. • Views by outdoor workers. • Transient views from local / regional areas such as public open space, scenic roads, railways or waterways, users of local / regional designated tourist routes of moderate importance. • Views from and of landscapes of regional importance
Low	<ul style="list-style-type: none"> • Views by indoor workers. • Views by users of main roads (for example, trunk roads) or passengers in public transport on main arterial routes. • Views by users of recreational facilities where the purpose of that recreation is not related to the view (for example, sports facilities). • Views by users of local public open spaces of limited importance with limited variety or distinctiveness.
Negligible	<ul style="list-style-type: none"> • Quick transient views such as from fast moving vehicles. • Views from industrial areas, land awaiting re-development. • Views from landscapes of no importance with no variety or distinctiveness.

Source: LA 107, DMRB, 2020 (Table 3.41)

Magnitude of effect (change)

Landscape

8.8.12 In accordance with DMRB LA 107 (paragraph 3.19), assessment of magnitude of effect (change) on the landscape consider a combined judgement of the following:

- the size and scale of effect.
- year 1 (opening year) and year 15 (design year) including summer and winter.
- geographical extent of the area to be affected.
- the duration of the effect and its reversibility.

8.8.13 The magnitude of landscape effect (change) is reported in accordance with the typical descriptions in Table 8.4.

Table 8.4: Magnitude and nature of the effect (change) on the landscape and typical descriptions

Magnitude of effect (change)		Typical Descriptions
Major	Adverse	Total loss or large-scale damage to existing landscape character or distinctive features or elements; and/or addition of new uncharacteristic, conspicuous features or elements (for example road infrastructure).
	Beneficial	Large scale improvement of landscape character to features and elements; and/or addition of new distinctive features or elements, or removal of conspicuous road infrastructure elements.
Moderate	Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements (for example road infrastructure).
	Beneficial	Partial or noticeable improvement of landscape character by restoration of existing features or elements; or addition of new characteristic features or elements or removal of noticeable features or elements.
Minor	Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements
	Beneficial	Slight improvement of landscape character by the restoration of one (maybe more) key existing features and elements; and/or the addition of new characteristic features.

Magnitude of effect (change)		Typical Descriptions
Negligible	Adverse	Very minor loss, damage or alteration to existing landscape character of one or more features and elements.
	Beneficial	Very minor, but noticeable improvement of character by the restoration of one or more existing features and elements.
No change	-	No noticeable alteration or improvement, temporary or permanent, of landscape character of existing features and elements.

Source: LA 107, DMRB, 2020 (Table 3.43)

Visual

8.8.14 Visual receptors will be visited during the site survey to identify the nature of existing views and the likely magnitude of change upon that receptor as result of the scheme. In accordance with DMRB LA 107 (paragraph 3.42), the establishment of the magnitude of visual impacts will be informed by the following criteria:

- scale, nature and duration of change.
- Distance.
- Screening.
- Direction and focus of the view.
- Year 1 (opening year) and year 15 (design year) including summer and winter.
- Removal of past mitigation or existing vegetation.
- Whether the receptor is static or moving.

8.8.15 The magnitude of visual effect (change) is reported in accordance with the criteria in typical descriptions in Table 8.5.

Table 8.5: Magnitude (change) of visual effect and typical descriptions

Magnitude (change) of visual effect	Typical descriptions
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.

Negligible	Only a very small part of the project would be discernible, or being at such a distance that it would form a barely noticeable feature or element of the view.
No Change	No part of the project, or activity would be discernible.

Source: LA 107, DMRB, 2020 (Table 3.43)

Assessment of significance

8.8.16 The assessment of the significance of effect is undertaken by combining sensitivity to change of a receptor with an assessment of the magnitude of change put upon it. These effects can be beneficial or adverse, and temporary or permanent, depending on the nature of the development and the mitigation and any enhancement measures proposed. The output of this function is detailed within Table 5.2 in Chapter 5.

8.9 Assessment assumptions and limitations

8.9.1 Full details of the final design, construction methods, timescales and spatial requirements including the needed for haul routes and construction compounds have yet to be confirmed.

8.9.2 The assessment of likely significant effects is therefore currently predicated on limited information and preliminary designs only at this time. It is however considered sufficient to capture the relevant landscape and visual baseline, informed by the draft red line boundary, and the likely significant effects as a result of the scheme.

8.10 Consultation

8.10.1 A meeting was held on 16 March 2021 with representatives from Newark and Sherwood District Council where the potentially affected TPOs and Conservation Areas were discussed. It was established that the TPO status was applied to safeguard trees along the original A46 relief road scheme constructed in the 1990s to retain screening for local residents.

8.10.2 The importance of mitigation measures was reinforced throughout the meeting with the focus on retaining as much as possible and at worst replacing any affected TPO with like for like species or suitable alternatives, noting that many of the trees were ash and would potentially be lost through ash die-back. This will be based on a BS 5378 assessment of all trees within the DCO boundary and will be required to define construction exclusion zones to protect existing trees.

8.10.3 A meeting was held on 21 July 2022 with the Senior Conservation Officer at Newark and Sherwood District Council to discuss the proposed visual receptors. The inclusion of additional receptors was discussed and an

agreement was reached on the visual receptors to inform the LVIA. The Tree Officer at Newark and Sherwood District Council was also in attendance and a discussion on trees within the scheme footprint, as well as a discussion on proposed tree surveys to inform the ongoing EIA and design, took place. Further consultation with the Tree Officer will take place as the arboricultural surveys progress.

8.10.4 Consultation with Newark and Sherwood District Council will continue throughout the design and EIA process, to be undertaken as part of the ES, to develop a robust landscape design and mitigation strategy for the scheme.

8.11 Summary

8.11.1 In line with LA 107, responses to the following scoping questions in Tables 8.6 and 8.7 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 8.6: Landscape scoping questions

Scoping question	Answer
1) is the project likely to affect designated landscapes (statutory or local designation)?	No impacts to National Parks or Areas of Outstanding Natural Beauty, however impacts are likely upon heritage designations within the study area including local Conservation Areas at Winthorpe, Newark, Averham and Kelham; Newark Castle Registered Park and Garden; and Tree Preservation Orders.
2) is the project likely to affect the distinctiveness of a landscape character area or type?	Yes, albeit in the context of existing A46 and other local transport infrastructure. Localised impact upon landscape character are also likely in respect to change in landscape elements and characteristics associated with Flood Compensation Areas.
3) is the project likely to affect national, regional or local characteristics or distinctive features?	No direct effects upon national and regional characteristics, although effects upon local characteristics are likely.
4) Is the project likely to affect the condition or quality of a landscape?	Yes, locally in the short term during construction and early phases of operation.
5) is the project likely to affect the intrinsic character, qualities and local identity of the urban environment (sense of place)?	The project, particularly the grade separated junction at Cattle Market, has the potential to impact upon the setting of the urban environment

Scoping question	Answer
	and intervisibility with distinctive features within the surrounding rural landscape.

Table 8.7: Visual impact scoping questions

Scoping question	Answer
1) is the project likely to affect receptors (individuals or range of people) views and the visual amenity of the area?	Yes, including high sensitivity receptors with short distance views.
2) is the project likely to affect the sensitivity of views to and from designated and/or valued landscapes, or from public rights of ways, public open spaces or from national trials?	Yes, including the Trent Valley Way Path and broader PRow network including National Cycle Route 64, and historic views from Newark Castle, a designated Scheduled Monument, and its grounds designated as a Registered Park and Garden.
3) is the project likely to affect a range of viewpoints and nature of views from which the project is visible?	Yes, including views from PRowS, residential receptors, public amenities and recreational facilities, businesses and road users.
4) is the project likely to generate significant visual effects (daytime and night time)?	Yes, particularly for near distance receptors in close proximity to the scheme alignment, and those with open views to elevated structures or vertical elements altering visual connectivity across the skyline.

8.11.2 Significant effects upon landscape character are likely during both construction and operation, with the project having the potential to affect local character including changes to the setting of an open, rural landscape as well as to conservation areas. Significant effects are also predicted upon views and visual amenity of the area, including from sensitive receptors and designated sites.

8.11.3 As such, further assessment is considered necessary to better understand the potential effects of the proposed scheme. This assessment will be presented within the ES. The proposed scope of the ES is contained within Table 8.8.

Table 8.8: Summary of requirement for further assessment in the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Visual Effects	N/A	N/A

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
	Landscape Character		
Operation	Visual Effects Landscape Character	N/A	N/A

9 Biodiversity

9.1 Introduction

9.1.1 This chapter aims to identify the potential for significant effects upon biodiversity as a result of the scheme during both construction and operation.

9.1.2 This chapter has been prepared in accordance with the DMRB LA 108⁷⁶, DMRB LA 115⁷⁷ and DMRB LD 118⁷⁸. Where necessary, further assessment will be presented within the ES.

9.2 Legislation and policy

Legislation

9.2.1 The construction and operational activities for the scheme must comply with international legislation. The following international conventions are relevant to the ecological assessment:

- Convention on Biological Diversity 1992.
- Ramsar Convention on Wetlands 1971.

9.2.2 The construction and operational activities must comply with UK nature conservation legislation, and with national and local biodiversity policies. The key national legislation and policies which influence the ecology and nature conservation assessments are:

- Conservation of Habitats and Species Regulations 2017 (as amended)⁷⁹.
- Wildlife and Countryside Act (WCA) 1981 (as amended).
- UK Biodiversity Action Plan (UKBAP). The relevant local biodiversity action plan is the Nottinghamshire Local Action Plan.
- UK Post-2010 Biodiversity Framework.
- Hedgerow Regulations 1997.
- Protection of Badgers Act 1992.

The Environment Act 2021

9.2.3 The Environment Act provides a legal framework for environmental governance and makes provisions about targets, plans and policies for

⁷⁶ National Highways (2020) DMRB LA 108- Biodiversity Revision 1 [online] available at: [af0517ba-14d2-4a52-aa6d-1b21ba05b465 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk/af0517ba-14d2-4a52-aa6d-1b21ba05b465).

⁷⁷ National Highways (2020), DMRB LA 115 – Habitats Regulations assessment Revision 1 [online], available at: [e2fdab58-d293-4af7-b737-b55e08e045ae \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk/e2fdab58-d293-4af7-b737-b55e08e045ae).

⁷⁸ National Highways (2020). DMRB LD 118 Biodiversity design [online] available at: [9317652b-4cb8-4aaf-be57-b96d324c8965 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk/9317652b-4cb8-4aaf-be57-b96d324c8965) (last accessed July 2022).

⁷⁹ The Conservation of Habitat and Species Regulations, 2017, available at: [The Conservation of Habitats and Species \(Amendment\) \(EU Exit\) Regulations 2019 \(legislation.gov.uk\)](https://legislation.gov.uk/uk/legislation/regulations/2017/1112/made).

improving the natural environment. Part 6 of the Act relates to Nature and Biodiversity, Schedule 14 of the Act makes provision for biodiversity gain to be a condition of planning permissions in England. The government is introducing a mandatory requirement for developers to provide 10% biodiversity net gain in respect of development as would be required under the Town and Country Planning Act 1990 (TCPA). There is a two-year transition period following the passing of the Environment Act 2021, during which time the TCPA will be amended and 10% biodiversity net gain will become mandatory. The Environment Act 2021 will require all Nationally Significant Infrastructure Projects to provide at least 10% biodiversity net gain from November 2025.

The Natural Environmental and Rural Communities (NERC) Act 2006

9.2.4 The NERC Act 2006 requires public bodies, including local authorities, ‘to have regard to the conservation of biodiversity in England’ when carrying out their normal functions. Under this Act a list of species of ‘principal importance to biodiversity within England’ was drawn up which acts as an aid to guide public bodies in implementing their duty.

National policy

National Policy Statement for National Networks (NPSNN)

9.2.5 The NPSNN sets out the biodiversity policies against which decisions on major road projects will be made. This policy is due for review by spring 2023.

9.2.6 The policy takes measures to:

- Halt biodiversity loss.
- Support healthy well-functioning ecosystems and establish coherent ecological networks.
- Benefit wildlife and people by generating more and better places for nature.

9.2.7 As a general principle, and subject to specific policies outlined in 5.27 – 5.35 of the NPSNN, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. In taking decisions, the Secretary of State should ensure that appropriate weight is attached to designated sites of international, national and local importance, protected species, habitats (including irreplaceable habitats such as ancient woodland and veteran trees) and other species of principal importance for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment.

National Planning Policy Framework (NPPF) 2021

9.2.8 The NPPF requires local authorities in England to take measures to:

- Conserve and enhance biodiversity.
- Protect the habitats of these species from further decline.
- Protect the species from the adverse effect of development.
- Refuse planning permission for development, if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for.

9.2.9 In addition, NPPF 174 states that “Planning policies and decisions should contribute to and enhance the natural and local environment by: [...]

9.2.10 d. minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures

9.2.11 NPPF 180 states that “When determining planning applications, local planning authorities should apply the following principles: [...]

9.2.12 d. development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate.”

National Highways policy

9.2.13 Biodiversity is entrenched within the Government’s Road Investment Strategy and National Highways’ Strategic Business Plan. In particular, the Road Investment Strategy states that by 2020, the company must deliver no net loss of biodiversity, and that by 2040 it must deliver a net gain in biodiversity

9.2.14 Our Plan to Protect and Increase Biodiversity (2015) sets out how National Highways will work with service providers to halt overall biodiversity loss, and to maintain and enhance habitats and ecological networks.

Local Policy

Nottinghamshire Local Biodiversity Action Plan

9.2.15 The Nottinghamshire Biodiversity Action Plan outlines the approach to biodiversity in Nottinghamshire and sets the habitats and species of conservation concern in the county.

9.3 Study area

9.3.1 The following study areas were used to gather information on ecological receptors with the potential to be affected by the scheme, known as the zone of influence (ZOI). Consideration has been given to the sensitivity of receptors to environmental change and the likely potential impacts.

9.3.2 The following study areas for designated sites have been used:

- 2 kilometres from the scheme boundary for sites within the National Site Network⁸⁰, (including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), 'candidate' cSACs, 'possible' pSACs, 'potential' pSPAs), and Ramsar sites in line with the DMRB LA 115.
- 30 kilometres from the scheme boundary for SACs designated for bat populations in line with the DMRB LA 115.
- 2 kilometres from the scheme boundary for nationally designated nature conservation sites, including Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), National Parks, Marine Protected Areas (MPAs) and Marine Conservation Zones (MCZs).
- Designated nature conservation sites with hydrological links to the scheme including:
 - Sites which intersect, are adjacent to, or lie upstream or downstream of a watercourse that is impacted by the scheme.
 - Sites with hydrological or hydrogeological linkage to sites within the National Site Network and Ramsar sites containing a groundwater terrestrial ecosystem.
- For surface water quality and hydrological connectivity, a study area of 1 kilometre from the scheme is considered appropriate for identifying both statutory and non-statutory designated conservation sites. Following the simple assessment to establish potential hydrological or hydrogeological linkage to biodiversity resources supporting a groundwater terrestrial ecosystem, a study area of 1 kilometre from the scheme is also considered appropriate.
- 1 kilometre from the scheme boundary for locally designated nature conservation sites, including Local Nature Reserves (LNRs) and Local Wildlife Sites (LWS).
- 1 kilometre from the scheme boundary for ancient woodland.
- 250 metres from the scheme boundary for the extended phase 1 habitat survey and priority habitats. This information informs the forthcoming protected species surveys, including habitat suitability index (HSI)

⁸⁰ SACs (originally designated under EC Habitats Directive 92/43/EEC) and SPAs (originally designated under the EC Wild Birds Directive 2009/147/EC) are also referred to as sites within the National Site Network. Designated Wetlands of International Importance known as Ramsar Sites do not form part of the National Site Network but remain protected in the same way as SACs and SPAs.

assessments of waterbodies for great crested newts (GCN), badgers, water vole, breeding and wintering birds.

- 2 kilometres upstream and downstream along the River Trent from scheme boundary for otter.
- 1.5 kilometres from the scheme boundary for barn owl.
- 200 metres from the scheme Affected Road Network (ARN) (refer to section 6.3.3 for a definition) for sites within the National Site Network, Ramsar sites, SSSIs, LNRs, LWSs, ancient woodland and veteran trees with the potential to be impacted by increases in nitrogen deposition.

9.3.3 This Biodiversity chapter uses the ARN for the assessment undertaken at options appraisal stages, while traffic forecasts for the Environmental Statement are currently being updated. The ARN used in this Biodiversity chapter is consistent with the ARN used in the Air quality, Noise and Vibration and Climate chapters. It is anticipated that the updated ARN for the scheme will cover a similar extent to that assessed at options appraisal stages. The above study areas have been determined based on a proportionate and reasonable approach to the area in which the scheme will influence.

9.4 Baseline conditions

9.4.1 Information regarding statutory and non-statutory sites has been informed by Natural England's MAGIC Interactive Map⁸¹, with further information available from Natural England and the Joint Nature Conservation Committee (JNCC). Information on LWSs, protected and notable habitats and species within the study area has been obtained from a data request from Nottinghamshire Biological and Geological Record Centre in February 2022. Bird species data has been obtained from a data request from British Trust for Ornithology (BTO) Data Report in February 2022. Information relating to habitats and species have been obtained from ecological surveys that have been undertaken by Mott MacDonald since January 2022 until present.

Designated sites

Sites within the National Site Network and Ramsar sites

9.4.2 No sites within the National Site Network or Ramsar sites have been identified within 2 kilometres of the scheme or within 200m of the ARN. No sites within the National Site Network where bats are one of the qualifying features have been identified within 30 kilometres of the scheme.

⁸¹ Natural England (2017) MAGIC Interactive Mapping [online] available at: <http://magic.defra.gov.uk/MagicMap.aspx> (last accessed June 2022).

Sites of Special Scientific Interest

9.4.3 There are no SSSIs within 2 kilometres of the scheme. One SSSI has been identified within 200 metres of the ARN, Twenty Acre Piece SSSI which is designated for its lowland neutral grassland. The SSSI is located adjacent to the existing A46 approximately 35 kilometres south-west of the scheme.

Local Nature Reserves

9.4.4 Two LNRs have been identified within 1 kilometre of the scheme and are summarised in Table 9.1 below.

Table 9.1: Summary of LNRs within 1 kilometre of the scheme

Site Name	Reason for Designation	Size (ha)	Approximate distance from scheme
Devon Park Pastures	Declared by Newark and Sherwood District Council, the site covers a range of habitats including grassland, marginal river vegetation and an area of deciduous woodland.	3.61	500 metres east of Farndon junction
Farndon Ponds	Declared by Farndon Parish Council, the area provides an opportunity for fishing, bird watching, walking and generally enjoying being outdoors. Farndon Ponds is a great asset to the village and visitors frequently comment on the beauty of this doorstep nature reserve.	4.55	800 metres west of Farndon junction.

Local Wildlife Sites

9.4.5 There are 32 LWSs called Sites of Importance for Nature Conservation (SINCs) within 1 kilometre of the scheme (summarised in Table 9.2 below). If the LWS is designated for habitat that is sensitive to nitrogen deposition and within the ARN, this is also recorded by stating it is within the ARN in the table below.

Table 9.2: Summary of LWSs within 1 kilometre of the scheme

Site name	Reason for designation	Size (ha)	Approximate distance from scheme
Kelham Hall Shingle Bank	A point bar in the River Trent with developing scrub and ruderal communities	3.76	Within scheme footprint and ARN

Site name	Reason for designation	Size (ha)	Approximate distance from scheme
Valley Farm Grassland	Designated for its botanical interest: 'damp grassland with notable species'.	3.76	Within scheme footprint and ARN
Kelham Road Grassland II	Designated for its botanical interest: 'a notable horse grazed species-rich neutral grassland'.	3.06	Within scheme footprint and ARN
Trent Banks/Wharves, Newark	Designated for its botanical interest: 'a mosaic of emergent, ruderal and tall herb communities along the banks of the River Trent'.	7.18	Within scheme footprint and ARN
River Trent, Staythorpe	Designated for its botanical interest: 'a good representative stretch of the River Trent with broad aquatic margins'.	25.72	Within scheme footprint and ARN
Great North Road Grasslands	Designated for its botanical interest: 'a series of diverse meadows with damp hollows'.	3.01	Within scheme footprint and ARN
Newark Dismantled Railway	Designated for its botanical interest: 'a dismantled railway line with a characteristic flora'.	0.71	Within scheme footprint and ARN
Newark (Beet Factory) Dismantled Railway	Designated for its botanical interest: 'noteworthy track-side communities along a disused railway line'.	1.18	Within scheme footprint and ARN
Dairy Farm Railway Strip, Newark	Designated for its botanical interest: 'a notable damp community of woodland, scrub and wetland species'.	1.69	Within scheme footprint and ARN
Kelham Road Redoubt Grassland	Designated for its botanical interest: 'a hay meadow with a diverse grassland community'.	1.21	Within scheme footprint and ARN
Newark Grassland	Designated for its botanical interest: 'species-rich unimproved grassland on river gravel'.	2.32	Within scheme footprint and ARN

Site name	Reason for designation	Size (ha)	Approximate distance from scheme
Old Trent Dyke	Designated for its botanical and water beetles/ bugs interest: 'a species-rich aquatic community in a secondary channel of the River Trent'.	1.14	Adjacent to scheme footprint
Newark Trent Grassland	Designated for its botanical interest: 'a grazed pasture with several depressions supporting notable inundation communities'.	4.73	Adjacent to the scheme and within the ARN
River Trent – Kehlam	A section of the River Trent of interest for Water Beetles	6.78	8 metres from the scheme
River Devon, North of Cotham	Designated for its botanical interest: 'a historically interesting water course with valuable riparian features and a locally diverse aquatic flora'.	7.40	120 metres east
Kelham Hills	Designated for mature, deciduous woodland, largely of zoological interest	24.08	170 metres from the scheme
The Fleet, Winthorpe	Designated for its botanical interest: 'a notable mosaic of aquatic, marginal and marshy grassland habitats'.	5.70	170 metres north-west of scheme
Long Lane Grassland, Farndon	Designated for its botanical interest: 'a good association of common grassland species'.	1.12	185 metres west of scheme
South Muskham Gravel Pits	Designated for its botanical interest: 'an excellent complex of pools, scrub and ruderal habitats among old gravel workings, of particular ornithological value'.	34.41	220 metres west
Devon Grasslands, Newark	Designated for its botanical interest: 'a sequence of notable wet riverside pastures'.	5.20	245 metres east
Trentside Meadows Grassland	Designated for its botanical interest: 'a characteristic neutral floodplain meadow'.	1.06	255 metres west of scheme

Site name	Reason for designation	Size (ha)	Approximate distance from scheme
Kelham Road Grassland	Designated for its botanical interest: 'a herb-rich grassland'.	2.03	395 metres west of scheme and within ARN
Kehlam Trent and Island	A valuable community of scrub, ruderals and notable gravel colonists on a Trent river island	1.94	405 metres from the scheme
Devon Park, Newark	Designated for its botanical interest: 'a sequence of neutral grassland, marsh, woodland and scrub along the banks of the River Devon'.	2.17	410 metres east of scheme and within ARN
Queen's Sconce, Newark	Designated for its botanical interest: 'notable unimproved acidic and neutral grassland communities on a civil war earthwork'.	1.91	500 metres east of scheme and within ARN
Hawton Civil War Fort	A notable pasture community on an archaeological site	3.71	555 metres from the scheme
Fardon Gravel Pit and Marina	Designated for its botanical interest: 'mature gravel pits of botanical interest'.	4.67	585 metres west of scheme
Kelham Road Redoubt	Civil war redoubt supporting a notable flora	1.21	605 metres from the scheme
Kelham Pool	A seasonal pool of interest for Water Beetles and Water Bugs	0.49	835 metres from the scheme
Wyke Lane Grassland and Ponds	Meadows with dry and wet areas and old retting ponds of botanical interest	3.3	910 metres from the scheme
Farndon Willow Holt	An excellent wet woodland plant community	4.87	915 metres from the scheme
Ollerton Road Grasslands	Notable neutral grassland on a slope	3.36	950 metres from the scheme and within ARN
Beacon Hill Gypsum Workings	A mosaic of grassland and scrub on old gypsum workings	14.45	985 metres from the scheme and within ARN.

9.4.6 The ARN of the scheme extends along the A46 into Lincolnshire and Leicestershire. An additional 21 LWSs, which are assumed to support habitats sensitive to nitrogen deposition based on the LWS description, are within 200 metres of the ARN, as summarised in Table 9.3 below.

Table 9.3: Summary of additional non-statutory designated sites within 200 metres of the ARN

Site Name	Reason for Designation	Size (ha)
Balderton Dismantled Railway South	A dismantled railway with substantial areas of grassland and scrub	3.97
Lowfield Grassland, Balderton	A small species-rich remnant of a once notable grassland	0.84
Newark Golf Course	A good mixed habitat association of acidic grassland, heath and deciduous woodland	55.48
Langord Moor Area	Valuable plant and animal communities along rides and in drainage ditches throughout this coniferous forestry plantation'	93.59
The Fleet, South Muskham	A linear strip of open water and swamp with notable aquatic and emergent plant communities	1.02
Moorhouse Lane Drain	A drain with a notable pant community	0.26
South Scaffold Lane, Collingham	A green lane with a characteristic grassland flora and species-rich hedgerow	1.42
Flintham Park	A mature estate incorporating a variety of habitats of botanical and zoological interest	100.90
Coneygre Wood	Woodland	11.70
Saxondale Railway	A length of active railway and a disused side branch displaying an excellent calcareous flora along its tracksides and supporting a butterfly of conservation priority in Nottinghamshire	8.75
Grantham Canal (Hollygate Bridge to Kinoulton)	A long stretch of disused canal providing a good variety of aquatic, marsh, and dry grassland communities'	15.24
Borders Wood	A sizeable area of mature mixed woodland	59.99

Site Name	Reason for Designation	Size (ha)
Jerico Farm Grassland	A notable neutral grassland	5.86
Roehoe wood	A substantial wet deciduous woodland with a noteworthy flora	15.24
Roehoe Wood Grassland	Neutral grassland	2.80
Crossroads Meadow, Hickling	A large species-rich hay meadow	7.53
A606 Woodland	A noteworthy deciduous woodland	1.21
Stanton Railway (including Stanton Tunnel Top)	A valuable section of railway with calcareous grassland and scrub, and great zoological interest	13.37
Thrussington Wolds Gorse – Scrub/Woodland	Woodland	5.82
Old Dalby, Abattoir Hedgerow	Hedgerow	N/A
Six Hills Golf Course Hedgerows	Hedgerow	N/A

Ancient woodland and veteran trees

9.4.7 No ancient woodland has been identified within either 1 kilometre of the scheme extent or 200 metres of the wider ARN.

9.4.8 The Woodland Trust's Ancient Tree Inventory website⁸² has been reviewed to locate records of ancient and veteran trees within 200 metres of the ARN. A pedunculate oak of 'veteran status' is located approximately 170 metres north of the ARN at Coddington, east of Newark-on-Trent, at OS grid reference (GR) SK8258054455.

Habitats

9.4.9 Extended phase 1 habitat surveys have been undertaken between January and June 2022 inclusive. Priority habitats identified within the surveyed area consist of wood pasture, traditional orchard, eutrophic standing water, lowland meadows, coastal and floodplain grazing marsh. The complete list of habitats identified are presented in Appendix D.

⁸² Woodland Trust, 2022. Ancient Tree Inventory [online] available at: [Tree Search - Ancient Tree Inventory \(woodlandtrust.org.uk\)](https://www.woodlandtrust.org.uk/tree-search-ancient-tree-inventory).

9.4.10 Further surveys are underway, consisting of:

- NVC surveys of species-rich habitats including good quality semi-improved grassland. The output of these NVC surveys and the extended phase 1 habitat surveys will be converted into UKHabs Classification data.
- A habitat condition assessment (UKHab and Modular River Physical Survey (MoRPh survey)) to inform biodiversity net gain calculations, in line with the latest version of Natural England's guidance.

9.4.11 These surveys will be completed to inform the Environmental Statement (ES).

Protected and notable species

9.4.12 Surveys for the following species were undertaken in January and February 2022:

- GCN Habitat Suitability Index surveys (18, 19, 24, 25, 26, 28 January and 11 February).
- Wintering bird surveys (one visit in January and February).
- Badger Field Surveys (17, 18, 19, 20, 24, 25, 26, 27, 28, 31 January and 01, 17 February).
- Bat Preliminary Roost Assessments (31 January – 4 February).

9.4.13 A desk study for terrestrial invertebrates was undertaken in March 2022. The findings are presented within Appendix E.

9.4.14 Surveys currently being completed include the following:

- Further bat tree scoping and external building scoping surveys will be required for buildings and trees to identify bat potential roosting features. Features suitable for roosting bats will be subjected to further surveys, such as climb inspections by a suitably licensed person or a series of post-dusk/pre-dawn emergence/re-entry surveys to determine presence or likely absence of bat roosts.
- Bat activity surveys including transects and statics.
- Otter and water vole surveys, specifically an extensive search for suitable field signs in areas identified to have suitable habitat for these species.
- GCN HSI surveys and, where appropriate, eDNA and population surveys of additional waterbodies identified due to increased land access.
- Wintering bird surveys in areas where eutrophic standing water habitat has been identified (data collected in January and February 2022 to date).
- Aquatic invertebrate surveys at 12 points along linear features, seven pond surveys and eight rapid pond surveys.

- River habitat survey and Modular River Physical Survey (MoRPh) along the River Trent.
- Terrestrial invertebrate surveys on LWSs.
- Barn owl walkover surveys and nest verifications on sites where suitable habitat has been identified.
- Presence and likely absence surveys for reptiles.

9.4.15 These surveys will be completed to inform the ES.

Kelham and Averham Floodplain Compensation Area

9.4.16 The Kelham and Averham Floodplain Compensation Area has recently been incorporated into the draft red line boundary and therefore, to date no surveys have been undertaken in this area. A desk study of the area has been undertaken utilising MAGIC Interactive Map and aerial photography. A data request from Nottinghamshire Biological and Geological Records Centre (NBGRC) will be required to ascertain which non-statutory designated sites and protected species fall within the study area. The area primarily consists of arable fields, with sporadic areas of deciduous woodland. Multiple waterbodies have also been identified within the area. One veteran tree has been identified from the ancient tree inventory, approximately 60 metres north of the site. Further surveys will be required of the area to establish a detailed baseline. These will include:

- An extended phase 1 habitat survey.
- Badger walkovers for field signs.
- Initial assessments of trees and buildings present for potential bat roosts.
- GCN HSI of waterbodies in the area.

9.4.17 Further surveys may be required based on the findings of the baseline surveys and will be completed to inform the ES.

9.5 Potential Impacts

Construction

Designated sites

9.5.1 The scheme has the potential to cause damage and the loss of habitats within LWSs. Nine designated sites are located within the draft red line boundary. Construction activities could increase the risk of a pollution incident, such as contaminated land run off or spills / leaks of oils and fuels and increased airborne pollutants. This has potential to impact the primary reason for the sites designation through degradation of habitats and therefore protected species which they support.

Habitats

9.5.2 There is the potential for priority habitat to be damaged or lost as a result of the construction activities required for the scheme and vegetation clearance. Additional indirect impacts may also impact habitats through airborne pollution, run-off and compaction of root systems.

Protected and notable species

9.5.3 Vegetation clearance to facilitate construction and temporary construction compounds could result in the permanent and temporary loss, respectively, of aquatic or terrestrial habitats for protected and notable species. This could include habitat that provides shelter, an area for breeding or rearing young, a food resource or commuting corridors for badger, bats, barn owl, reptiles, birds, GCN, water vole and terrestrial invertebrates. Construction related run-off could indirectly impact the water quality of local water courses inhabited by species such as water vole, otter and GCN, if present. Night works would directly disturb nocturnal species such as bats, badger, barn owl and terrestrial invertebrates as a result of increased lighting pollution, noise and vibration. This disturbance could potentially contribute to the displacement of a number of species from the area, including the abandonment of badger setts, bat and bird roosts. Additional impacts on species include mortality or injury through construction activities and indirect impacts, for example changes to water quality that may affect prey abundance. Changes in water levels has the potential to alter how bankside habitat can be utilised for water vole burrowing and otter resting sites.

Operation

Designated sites

9.5.4 During operation potential impacts from traffic emissions could lead to increased levels of nitrogen deposition at the LWSs and adversely impact sensitive habitats and species.

Habitats

9.5.5 Once operational, the scheme would result in the permanent severance of habitats of biodiversity value. In the absence of mitigation, the permanent severance of habitat suitable to support protected and notable species has the potential to adversely affect individual species and their conservation status.

Protected and notable species

9.5.6 Any permanent increase in artificial lighting would adversely affect protected species including bats, barn owl and terrestrial invertebrates. Any potential changes in the drainage regime as a result of all options have the potential to damage GCN, otter and water vole habitat. The creation of a new flyover at height across a potential bat and barn owl commuting route could result in bat and barn owl mortality from collisions with traffic.

9.6 Design, mitigation and enhancement measures

9.6.1 The ‘mitigation hierarchy’ has been applied to avoid and minimise impacts to ecological features and harm to biodiversity wherever possible. At this stage, it is not possible to fully identify the design, mitigation and enhancement measures that are required, as survey data to inform the baseline is still ongoing. However, based on the results of the desk study and surveys to date, embedded design and mitigation measures have been identified. Further surveys, focusing on protected and priority habitats and species, and assessment will be required to identify all likely ecological constraints and associated mitigation and enhancement measures.

Design measures

9.6.2 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104. The first principle being to avoid potential adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report.

9.6.3 There are a number of opportunities for further embedded mitigation that will be considered during the development of the ongoing scheme design. These include:

- An environmental design that seeks to maintain and enhance habitat connectivity within the wider landscape, maximising biodiversity opportunities within the scheme extents, particularly in respect to LWSs and priority habitats.
- Where technically feasible, Sustainable Drainage Systems (SuDS) should be implemented to effectively manage pollution risk associated with road run-off.

- Drainage systems should be designed in accordance with industry standards, with particular emphasis on appropriate pollution prevention and control measures^{83,84}
- Provision of mammal tunnels or bridge under/over roads, such as otter passes within/alongside new culverts on watercourses, and safe routes for deer and badgers
- The retention of ancient or veteran trees that may be identified from further surveys.
- The provision of a sensitive lighting design that takes bats, otters and other nocturnal wildlife into account.
- The retention of features, where possible, that have potential to support roosting bats (for example mature trees and suitable built structures).
- Consideration of the interaction of the scheme with the River Trent and other watercourses, including bed and bank substrate. The design of river crossings that would have the least impact on fluvial systems where safe and practical to do so.

9.6.4 Further to these measures which will be embedded in the scheme design, National Highways have a target of Biodiversity Net Gain by 2040 according to their Biodiversity Plan⁸⁵. The scheme aims to achieve a biodiversity net gain [to be checked following VM workshop on 02/08 and updated accordingly] (see Section 2.3 Scheme objectives). To achieve this, the design should include the creation of an equal or greater area of similar habitat to that lost. If this cannot be accommodated within the final scheme (i.e. land within the new highway boundary) then compensatory habitats should be provided adjacent to, or as close to the affected habitats as possible. If suitable compensation areas are not available close to the affected habitats, then compensatory habitat should be created at alternative suitable sites. A plan and programme to ensure effective establishment and continued management of compensatory habitat should be implemented. Decisions taken on the location of land available for habitat compensation should consider the requirement for access for future maintenance.

9.6.5 Preliminary biodiversity net gain calculations, using the Biodiversity Metric 3.1 calculation tool⁸⁶, based on the assumption that all habitats within the assumed land take boundaries will be lost during construction and based on high level assumptions of which habitats will be created as part of the

⁸³ CIRIA (2015). The SuDS Manual. CIRIA, London

⁸⁴ The Highways England risk-based tool (HEWRAT) should be used as the basis for the design of road drainage. This tool allows the effect on the water environment of relevant WFD specific pollutants, priority substances and priority hazardous substances generated by road surfaces to be assessed.

⁸⁵ National Highways (2015) Our plan to protect an increase biodiversity [online] available at: [biodiversity-plan.pdf](https://www.nationalhighways.co.uk/biodiversity-plan.pdf) (nationalhighways.co.uk) (last accessed August 2022).

⁸⁶ Natural England (2021) The Biodiversity Metric 3.1 (JP039) [online] available at: [The Biodiversity Metric 3.1 - JP039](https://www.naturalengland.org.uk/biodiversity-metric-3-1-jp039) (naturalengland.org.uk) (last accessed August 2022).

landscape design, indicate that the scheme will need off-site habitat compensation to address the loss of habitat within the scheme and achieve at least 'No net loss of biodiversity'.

9.6.6 A number of areas for ecological mitigation have been incorporated within the red line boundary (see Appendix B). These will be used as potential receptor areas for species such as reptiles and GCN. Other areas will be used for habitat creation, providing areas of foraging and shelter for a number of species. The exact extent and design of ecological mitigation will be determined once the mitigation strategies have been finalised. Completion of surveys will further inform the mitigation methods and design. The findings of these surveys and the mitigation they have informed will be reported in the ES.

Mitigation measures – Construction

9.6.7 Based on the current understanding of the ecological constraints associated with the scheme, the following mitigation measures, including the adoption of construction good practice and measures required to avoid nuisance or to ensure wider legislative compliance, will be included within the Second Iteration Environmental Management Plan:

- Measures to reduce the significance of effects caused by changes to air quality as set out in Chapter 6.
- Measures to reduce the significance of effects caused by changes to water quality, as set out in Chapter 14 including the adherence to pollution prevention and construction best practice (for example EA Pollution Prevention Guidelines (PPGs) and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites).
- An Ecological Mitigation Strategy will be prepared, detailing proposals to manage and mitigate for ecological effects associated with the proposed scheme. Measures would include the presence of an ecological clerk of works, toolbox talks, the sensitive timing of works and phased, supervised vegetation clearance and covering of excavations or provision of means of escape such as a wildlife 'ladder'.
- European protected species (EPS) licences granted from Natural England with respect to protected species may also be required. These would contain a method statement giving details of appropriate mitigation to ensure no long-term effects on the species.
- If works are to take place during the night, any lighting required should be managed to avoid spill onto ecological features. The effects can be minimised through the use of hoods, cowls or shields to prevent back-spill.

Mitigation measures – Operation

- 9.6.8 To minimise the potential disturbance from lighting in operation, all lighting should be directional and hooded to minimise light spill and avoid lighting directly onto verge habitats.
- 9.6.9 Additional screening vegetation around areas of road at height should be implemented where practicable to minimise the chance of collisions between protected species and traffic.

Enhancement measures

- 9.6.10 Enhancement measures for biodiversity will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

9.7 Description of the likely significant effects

- 9.7.1 The following likely significant effects are anticipated on ecological receptors as a result of the proposed scheme.

Construction

Designated sites

- 9.7.2 The scheme will result in permanent habitat loss and fragmentation at multiple LWSs including Dairy Farm Railway Strip, Newark, Great North Road Grasslands, Newark Dismantled Railway, and Newark (Beet Factory) Dismantled Railway as a result of land take required for the scheme and temporary loss from works areas associated with construction. It is currently anticipated that approximately 0.95 hectares of LWS habitat will be lost as a result of the scheme, primarily from the Great North Road Grasslands (approximately 0.83 hectares lost). Further assessment will be undertaken as the scheme design and associated compensation habitat are refined.
- 9.7.3 There is the potential for changes to hydrology and water quality at LWSs including Old Trent Dyke, Dairy Farm Railway Strip, Newark, Great North Road Grasslands, Newark Trent Grassland, River Trent, Staythorpe, Trent Banks / Wharves, Newark, River Devon (North of Cotham), Devon Grasslands Newark, Devon Nurseries Grassland, Devon Park, Newark and The Fleet, Winthorpe as a result of construction activities on the scheme. Further assessment is required to determine the likelihood of significant effects on LWSs.

Habitats

- 9.7.4 The scheme will result in loss of priority habitat consisting of deciduous woodland, wood pasture, coastal and floodplain grazing marsh, lowland

meadow and lowland fen and has the potential to result in indirect effects on other priority habitats as a result of construction activities. Further assessment is required to determine the likelihood of significant effects on priority habitats with regards to nitrogen deposition.

Protected and notable species

9.7.5 The scheme has the potential to have an adverse effect on the protected species otters, water voles, aquatic invertebrates, barn owls, badgers and bats, through loss of commuting, foraging, breeding and rearing habitat due to site clearance and construction activities. Nightworks and associated lighting also have the potential to cause disturbance to bats, badgers and barn owls. Further surveys are required to assess the likelihood of significant effects on protected species.

Operation

Designated sites

9.7.6 There is the potential for changes to hydrology and water quality at LWSs including Old Trent Dyke, River Trent, Staythorpe, Trent Banks / Wharves, and Newark and Kelham Hall Shingle Bank as a result of additional traffic. Further assessment is required to determine the likelihood of significant effects on LWSs.

9.7.7 There is the potential for changes in air quality and increases in nitrogen deposition affecting LWSs. Increased emissions from traffic could lead to increased levels of nitrogen deposition at the sites. Further assessment is needed to determine the likelihood of significant effects on the sites.

Habitats

9.7.8 There is the potential for changes to hydrology and water quality at nearby grassland and woodland habitats as a result of additional traffic. Further assessment is required to determine the likelihood of significant effects on nearby habitats.

9.7.9 There is the potential for changes in air quality and increases in nitrogen deposition affecting nearby habitat including grassland and woodland. Increased emissions from traffic could lead to increased levels of nitrogen deposition at the sites. Further assessment is needed to determine the likelihood of significant effects on these habitats.

Protected and notable species

9.7.10 There is the potential for adverse effects on protected species through the incorporation of a new road at height with the risk of killing and

injuring species such as bats, otters and barn owls through collision with traffic along the flyover. There is also the potential for adverse effects on nocturnal species as a result of light disturbance. Increased traffic volume and speed during operation may also have adverse effects on the behavior of species sensitive to noise, particularly birds. Further surveys are needed to assess the status of populations and likelihood of significant effects on the relevant species.

9.8 Assessment Methodology

9.8.1 The scope of the works and the potential significance of direct and indirect effects to protected species, designated sites, and sensitive habitats warrants further assessment.

9.8.2 Further assessment will be carried out in accordance with the following:

- DMRB LA 108 Biodiversity⁸⁷ and LA 115 Habitats Regulations assessment⁸⁸.
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK⁸⁹.
- CIEEM Sources of Survey Methods⁹⁰.

9.8.3 Targeted surveys for protected species will also inform further assessment.

Proposed methodology

9.8.4 The survey and assessment to report the likely significance of effects will be undertaken in accordance with the DMRB LA 108, LD 118⁹¹ and LA 115, 'Transport Analysis Guidance' (Department for Transport (DfT)) which supplements the DMRB standard, and the Guidelines for Ecological Impact Assessment (EclA) produced by the Chartered Institute of Ecology and Environmental Management (CIEEM). This requires an assessment of the receptor or resource's environmental value (or sensitivity) and the magnitude of the scheme's impacts (change).

9.8.5 Valuing ecological features involves the use of professional judgement, based on available guidance and information, together with advice from

⁸⁷ National Highways (2020) DMRB LA 108- Biodiversity Revision 1 [online] available at: [af0517ba-14d2-4a52-aa6d-1b21ba05b465](https://standardsforhighways.co.uk/af0517ba-14d2-4a52-aa6d-1b21ba05b465) (standardsforhighways.co.uk)

⁸⁸ National Highways (2020) DMRB LA 115 – Habitats Regulations assessment [online] available at: [e2fdab58-d293-4af7-b737-b55e08e045ae](https://standardsforhighways.co.uk/e2fdab58-d293-4af7-b737-b55e08e045ae) (standardsforhighways.co.uk)

⁸⁹ Chartered Institute of Ecology and Environmental Management (CIEEM) (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland [online] available at: [EClA-Guidelines-Sept-2019.pdf](https://cieem.net/EClA-Guidelines-Sept-2019.pdf) (cieem.net)

⁹⁰ Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Sources of Survey Methods (SoSM) [online] available at: <https://www.cieem.net/sources-of-survey-methods-sosm/> (last accessed June 2022).

⁹¹ National Highways (2020). DMRB LD 118 Biodiversity design [online] available at: [9317652b-4cb8-4aaf-be57-b96d324c8965](https://standardsforhighways.co.uk/9317652b-4cb8-4aaf-be57-b96d324c8965) (standardsforhighways.co.uk) (last accessed July 2022).

experts who know the area in which the study area sits and / or the distribution and status of the features that are being considered.

9.8.6 The value (sensitivity) of ecological features and resources of nature conservation value will be assessed using the criteria outlined in Table 9.6, in accordance with LA 108 Table 3.9.

Table 9.6: Criteria for determining the conservation value of an ecological receptor

Resource importance		Typical descriptors
International or European value	Sites	SPAs; pSPAs; SACs; cSACs or pSACs; Sites of Community Importance (SCIs) and Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
	Habitats	N/A
	Species	Resident, or regularly occurring, populations of species which may be considered at an International or European level where: <ul style="list-style-type: none"> • the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale • the population forms a critical part of a wider population at this scale • the species is at a critical phase of its life cycle at this scale
UK or National value	Sites	Designated sites including: SSSIs; Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and NNRs. Areas which meet the published selection criteria e.g. Joint Nature Conservation Committee (JNCC) (1998) for those sites listed above but which are not themselves designated as such.
	Habitats	Areas of key / priority habitats identified in the UK Biodiversity Action Plan (BAP), including those published in accordance with Section 41 of the Natural Environment and Rural Communities Act

Resource importance		Typical descriptors
		(2006) and those considered to be of principal importance for the conservation of biodiversity. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory.
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: the loss of these populations would adversely affect the conservation status or distribution of the species at this scale the population forms a critical part of a wider population at this scale the species is at a critical phase of its life cycle at this scale
Regional value	Sites	Non-statutory designated sites, including heritage coasts.
	Habitats	Areas of key / priority habitats identified in the Regional BAP (where available); areas of key / priority habitat identified as being of Regional value in the appropriate Natural Area Profile (or equivalent); and areas that have been identified by regional plans or strategies as areas for restoration or re-creation of priority habitats (for example, South West Nature Map).
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level and key / priority species listed within the HABAP where: the loss of these populations would adversely affect the conservation status or distribution of the species at this scale the population forms a critical part of a wider population the species is at a critical phase of its life cycle Species identified in regional plans or strategies
County or Unitary Authority area value	Sites	Wildlife / nature conservation sites designated at a county (or equivalent) level, including: Sites of Nature Conservation Importance (SNCIs); County Wildlife Sites (CWSs); Local Wildlife Sites (LWSs); Local Nature Conservation Sites (LNCS); Sites of

Resource importance		Typical descriptors
		Importance for Nature Conservation (SINCs) and LNRs. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
	Habitats	Areas of key / priority habitats identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent).
	Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: the loss of these populations would adversely affect the conservation status or distribution of the species across the County or Unitary Authority Area the population forms a critical part of a wider population the species is at a critical phase of its life cycle Species identified in county or equivalent authority area plans or strategies.
Local value	Sites	Wildlife / nature conservation sites designated at a local level, including: SNCIs; LWS; LNCS; SINCs; Sites of Local Nature Conservation Importance (SLNCl) and LNRs.
	Habitats	Areas of habitat considered to appreciably enrich the habitat resource within the local context, including features of importance for migration, dispersal, or genetic exchange. Trees that are protected by Tree Preservation Orders (TPOs).
	Species	Populations / communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

9.8.7 The characterisation of each ecological impact will consider:

- The integrity and conservation status of the resource affected.
- The probability of the impact occurring.
- The complexity of the impact (direct, indirect, cumulative).

- The extent of the impact (e.g. the percentage of the resource affected).
- The size of the impact (e.g. complete loss or the proportion of a protected species population affected).
- The reversibility of the impact.
- The duration of the impact (permanent or temporary).
- The timing and frequency of the impact (considering seasonal / life cycle constraints).

9.8.8 The magnitude of impact (change) as a result of the scheme will be determined using the criteria in Table 9.7, in accordance with LA 108 Table 3.11⁹².

Table 9.7: Magnitude of impact and typical description

Magnitude of impact (change)		Typical descriptions
Major	Adverse	<ul style="list-style-type: none"> • Permanent/irreversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	<ul style="list-style-type: none"> • Permanent addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Moderate	Adverse	<ul style="list-style-type: none"> • Temporary/reversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	<ul style="list-style-type: none"> • Temporary addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Minor	Adverse	<ul style="list-style-type: none"> • Permanent/irreversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the

⁹² National Highways (2020) DMRB LA 108 - Biodiversity Revision 1 [online] available at: [af0517ba-14d2-4a52-aa6d-1b21ba05b465 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk/af0517ba-14d2-4a52-aa6d-1b21ba05b465).

Magnitude of impact (change)		Typical descriptions
		integrity or key characteristics of the resource.
	Beneficial	<ul style="list-style-type: none"> • Permanent addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible	Adverse	<ul style="list-style-type: none"> • Temporary/reversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	<ul style="list-style-type: none"> • Temporary addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity of key characteristics of the resource.
No change		No observable impact, either positive or negative.

9.8.9 The significance of effect upon each ecological resource will be ascertained using criteria set out in Table 5.2. The assessment will consider mitigation measures required and assess the significance of effects of residual impacts. CIEEM Guidance⁸⁹ will be used to help evaluate sites, habitats and species, and to assess the effects on ecological integrity to help apply the DMRB standard. For the purposes of this assessment, effects of Moderate Adverse or Beneficial and above are considered to be significant.

9.9 Assessment Assumptions and Limitations

9.9.1 The following assumptions and limitations apply to this Scoping Report:

- Some areas of land within the scheme are currently inaccessible for surveys on health and safety grounds. The stakeholder team are working with agents and landowners to resolve access restrictions. Ongoing discussion with Natural England are underway to agree an acceptable level of survey effort in areas where access issues cannot be resolved.
- Due to the requirements of the scheme, the phase 1 habitat survey was completed earlier in the season when some species may not have been in flower. However, the surveys targeted habitats of lower ecological

value and it is not considered the that key indicator species have been missed. This is therefore not considered to be a constraint.

- The Kelham and Averham Floodplain Compensation Area identified in Section 9.2.4 has only been reviewed from a desk study, therefore field surveys are required to establish baseline condition for this area. Further surveys may be required based on the presence and suitability for designated habitats and protected species.

9.10 Consultation

9.10.1 As shown in Table 4.1, consultation has been undertaken with Natural England on survey effort and limitations on survey areas due to land access.

9.10.2 Further consultation with Natural England and the Environment Agency will be required to inform the Environmental Statement.

9.11 Summary

9.11.1 In line with LA 108, responses to the following scoping questions in Table 9.8 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 9.8: Biodiversity scoping questions

Scoping question	Answer
1) Is the project likely to impact designated sites (statutory or non-statutory)?	Yes, the scheme will result in the partial loss of multiple LWSs during construction.
2) Is the project likely to impact protected or priority habitats?	Yes, the scheme will result in the loss of deciduous woodland during construction. During operation, the scheme may result in changes to hydrology, water quality and nitrogen deposition that have the potential to impact protected or priority habitats.
3) Is the project likely to impact protected or priority species?	Yes, the scheme has the potential to have an adverse effect on species through loss of commuting, foraging, breeding and rearing habitat due to site clearance and construction activities. Construction activities will likely cause disturbance to protected species. Nightworks and associated lighting also have the potential to cause significant effects during construction. Further surveys are required to assess the likelihood of significant effects on protected species. During operation, the introduction of a new road layout at height has a

Scoping question	Answer
	risk of killing and injuring species through collision with traffic along the flyover.
4) Is the project likely to impact the function or quality of habitats?	Yes, the scheme will result in the loss of commuting, foraging, breeding and rearing habitat due to site clearance and construction activities. During operation, the scheme may result in changes to hydrology, water quality and nitrogen deposition that may impact functionality and quality of habitats.
5) Is the project likely to impact the conservation status of habitats and species?	Yes, the scheme is likely to have an impact on the conservation status of protected species.

9.11.2 Table 9.9 below presents a summary of the receptors scoped in and out for further assessment based on the preceding sections of this chapter. The forecast traffic data modelling will inform the air quality assessment on impacts to designated sites for nature conservation, habitats and protected species. The significance of effect on any protected species recorded within the survey area, cannot be scoped out until simple level ecology surveys are completed.

Table 9.9: Proposed scope of the Biodiversity chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Designated sites Habitats Protected species	N/A	N/A
Operation	Designated sites Habitats Protected species	N/A	N/A

10 Geology and Soils

10.1 Introduction

10.1.1 This chapter assesses the potential impacts to geology and soils (including contaminated land) which may affect, or be affected by, the construction and operation of the proposed scheme. This chapter has been prepared in accordance with DMRB LA109 Geology and Soils⁹³.

10.2 Legislation and policy

Legislation

10.2.1 The overarching legislation in relation to geology and soils is provided by:

- The Town and Country Planning Act 1990 (as amended).
- The Building Regulations 2010.
- The Pollution Prevention and Control Regulations 2000 (as amended 2003).
- The Control of Pollution (Oil Storage) (England) Regulations 2001.
- The Control of Substances Hazardous to Human Health 2002 (as amended 2004).
- The Contaminated Land (England) Regulations 2006 (as amended).
- Environmental Quality Standards Directive 2008/105/EC.
- DEFRA: Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance.
- The Control of Asbestos Regulations 2012 Guidance.
- The Environmental Damage (Prevention and Remediation) Regulations 2015.
- The Waste Framework Directive 2008/98/EC.
- The Hazardous Waste (England and Wales) Regulations 2005 (as amended by The Waste (England and Wales) Regulations 2011).
- The Environmental Permitting (England and Wales) Regulations 2016 (as amended).
- The Industrial Emissions Directive 2010/75/EU.
- Groundwater Daughter Directive 2006/118/EC.
- The Groundwater Regulations 2009.
- The Environmental Damage (Prevention and Remediation) (England) Regulations 2015.

⁹³ Highways England (2019). LA 109 – Geology and Soils Revision 0 [online] available at [LA 109 - Geology and soils - DMRB \(standardsforhighways.co.uk\)](https://www.dmr.gov.uk/standardsforhighways.co.uk) (last accessed June 2022).

Policy

- 10.2.2 No formal policy exists that outlines how to undertake an assessment of contaminated or potentially contaminated land specifically for an EIA. The policy background is not intended to provide a full and exhaustive account of legislation relating to land contamination with the EU, or UK. However, it is intended to provide a thematic background to recent key policy and applicable regulations in force at the time of writing the scoping report.
- 10.2.3 The National Policy Statement for National Networks (NPSNN) sets out the policy which the scheme should comply with. Although it is also the basis for informing a judgement on the impacts of a scheme, for example is the scheme consistent with the needs of the NPSNN. The NPSNN includes the following in relation to soil and contaminated land:
- 10.2.4 Paragraph 5.168 – “Applicants should also identify any effects, and seek to minimise impacts, on soil quality, taking into account any mitigation measures proposed. Where possible, developments should be on previously developed (brownfield) sites provided that it is not of high environmental value. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination and how it is proposed to address this”.
- 10.2.5 Paragraph 5.168 makes reference to Model Procedures for Management of Land Contamination (CLR11), which has subsequently been withdrawn and replaced with Environment Agency Land Contamination Risk Management (LCRM)⁹⁴ guidance.
- 10.2.6 Paragraph 5.176 – “The decision-maker should take into account the economic and other benefits of the best and most versatile agricultural land. The decision maker should give little weight to the loss of agricultural land in grades 3b, 4 and 5, except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environment or the local economy”.
- 10.2.7 The NPPF includes the following in relation to contaminated land:
- 10.2.8 Paragraph 118 – “Planning policies should give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;

⁹⁴ Environment Agency (2020). Land Contamination Risk Management [online] available at: Land contamination risk management (LCRM) - GOV.UK (www.gov.uk) . (last accessed July 2022).

10.2.9 Paragraph 170 – “Planning policies and decisions should contribute to and enhance the natural and local environment by:

- Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and,
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate”.

10.2.10 Paragraph 178 – “Planning policies and decisions should ensure that:

- A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation).
- After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.
- Adequate site investigation information, prepared by a competent person, is available to inform these assessments”.

10.2.11 Paragraph 179 – “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”.

10.2.12 The glossary of the NPPF states the following in relation to “site investigation information”:

- “Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 Investigation of Potentially Contaminated Sites – Code of Practice”;

10.2.13 The glossary further states that a “Competent person” involved in the preparation of site investigation information is “a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of

pollution or land instability, and membership of a relevant professional organisation;” and,

10.2.14 In addition to national planning policies, the remediation design should take into account the requirements of local planning policies and planning conditions in the assessment and management of land contamination.

Local planning policy

10.2.15 The local planning framework comprises a number of documents, which include reference to geology, mineral resources and soils, that form the statutory development plans for the local planning authority area in which the scheme is located:

- Nottinghamshire County Council Nottinghamshire and Nottingham Local Aggregates Assessment 2021¹⁴⁰.
- Nottinghamshire County Council Nottinghamshire Minerals Local Plan (Adopted 2021)¹⁴³ with particular reference to the following policies:
 - Policy SP1 – Minerals Provision.
 - Policy SP5 - The Built, Historic and Natural Environment.
 - Policy SP7 – Minerals Safeguarding, Consultation Areas and Associated Minerals Infrastructure.
 - Policy MP1 – Aggregate Provision.
 - Policy MP2 – Sand and Gravel Provisions.
 - Policy MP5 - Secondary and Recycled Aggregates.
 - Policy DM3 – Agricultural Land and Soil Quality.
 - Policy DM15 – Borrow Pits.
- Nottinghamshire County Council Waste Core Strategy (Adopted 2013)¹⁴⁴.

10.2.16 The Newark and Sherwood Local Development Framework Core Strategy (adopted 2019)⁹⁵ Spatial Policy 3 – Rural Areas deals with agriculture, stressing the need to protect agriculture in developments within a rural setting.

10.2.17 Newark and Sherwood District Council’s contaminated land strategy is in the process of being updated at the time of writing. The Newark and

⁹⁵ Newark & Sherwood Local Development Framework Core Strategy Development Plan Document (adopted March 2019) available at <https://www.newark-sherwooddc.gov.uk/media/newark-and-sherwood/images-and-files/planning-policy/pdfs/core-strategy/ACS2019.pdf>

Sherwood District Council's website⁹⁶ states that a link to the new contaminated land strategy will be provided once it is complete.

10.3 Study area

10.3.1 DMRB LA 109 Geology and Soils⁹⁷ states that the study area shall be identified on a project basis, and therefore the study area used for this chapter and proposed for the ES has been defined through professional judgement, based on the type and scale of the scheme, and the context of the surrounding area.

10.3.2 This chapter provides a description of the geology and soils baseline conditions within 500 metres of the scheme. The study area for the assessment of geology and soils encompasses the area over which the scheme could be reasonably expected to have an effect. With respect to geology and soils this generally only relates to the areas anticipated to be directly disturbed by the proposed physical works and ground disturbance. However, consideration of the wider 500 metre study area outside the scheme extent is deemed necessary for the following reasons:

- The presence of potential off-site contamination sources which have the potential to migrate on-site (areas of landfill or historic potentially contaminative land use, for example) and any sensitive off-site receptors which may feasibly be affected by the uncontrolled migration of contaminants off-site. Methods of contaminant transport may include migration of soil / landfill leachates and ground gases. Therefore, 500 metres from the scheme extent is considered to be appropriate to capture the likely extent of impact pathways.
- BS 10175:2011+A2:2017, Investigation of Potentially Contaminated Sites Code of Practice states “the extent of research into the history of the site will depend upon a number of factors including the complexity of past potentially contaminative uses on and adjacent to the site, the vulnerability of the site geology and local water environment”. Therefore, the study area extends 500 metres from the scheme extent to encompass off-site sources, and sensitive off-site receptors, including important geological sites, underlying groundwaters and surrounding surface waters. This includes localised perched groundwaters, any aquifer units located below or down-gradient of the study area and any designated groundwater source protection zones (SPZs).

⁹⁶ Newark & Sherwood District Council website available at: <https://www.newark-sherwooddc.gov.uk/landpollution/> (last accessed July 2022).

⁹⁷ Highways England (2019). LA 109 – Geology and Soils Revision 0 [online] available at [LA 109 - Geology and soils - DMRB \(standardsforhighways.co.uk\)](https://www.standardsforhighways.co.uk/) (last accessed June 2022)

10.3.3 In line with DMRB LA 109⁹⁷, the following baseline conditions are considered:

- Geology – effects on bedrock geology and superficial deposits including geological designations and sensitive / valuable designated features.
- Soil – effects on soil resources.
- Contaminated Land – effects from contamination on human health, surface water and groundwater.

10.4 Baseline conditions

Approach to collection of baseline data

10.4.1 The relevant baseline conditions of the scheme and study area have been established using the following sources of information:

- British Geological Survey (BGS) Geology of Britain Viewer⁹⁸.
- The Coal Authority website⁹⁹.
- Defra's MAGIC website¹⁰⁰.
- Natural England Designated Sites View¹⁰¹.
- Nottinghamshire Insight Mapping¹⁰².
- Old Maps Online¹⁰³.
- Landmark Information Group, Envirocheck Report (order no:172582399_1_1 dated 9/07/2018, received June 2018).
- Natural England Agricultural Land Classification map East Midlands Region¹⁰⁴.
- Atkins (2021) A46 Newark Northern Bypass Preliminary Sources Study Report.
- Atkins (2021) A46 Northern Newark Northern Bypass Environmental Assessment Report Volume I Chapter 9 Geology and Soils.
- Atkins (2021) Technical Note GI: Summary of key Geological/Geotechnical Findings.
- Atkins (2021) A46 Newark Northern Bypass – Agricultural Land Classification Survey Technical Note.

⁹⁸ British Geological Survey Map available at: [Geology of Britain viewer | British Geological Survey \(BGS\)](#) (last accessed June 2022)

⁹⁹ Coal Authority Interactive Map available at: [Interactive Map Viewer | Coal Authority \(bgs.ac.uk\)](#) (last accessed June 2022)

¹⁰⁰ Defra, Magic (2021). Interactive Map [online] available at: [MAGIC \(defra.gov.uk\)](#) (last accessed June 2022)

¹⁰¹ Natural England Designated Sites View available at: [Site Search \(naturalengland.org.uk\)](#) (last accessed June 2022)

¹⁰² Nottinghamshire Insight Mapping available at: [Nottingham City Council - Insight Mapping GIS Mapping](#) (last accessed June 2022)

¹⁰³ Old Maps online available at: [Old Maps Online](#) (last accessed June 2022)

¹⁰⁴ Agricultural Land Classification Map East Midlands Region (ALC005) available at: <http://publications.naturalengland.org.uk/publication/143027?category=5954148537204736> (Last Accessed June 2022)

- TetraTech (2022) A46 North Newark Bypass Draft Factual Ground Investigation Report.
- Zetica UXO website (2022) risk mapping¹⁰⁵.
- Newark and Sherwood District Council website – Contaminated Land¹⁰⁶.

Scheme-specific baseline conditions

10.4.2 Baseline data specific to the scheme alignment can be found in Table 10.1.

¹⁰⁵Zetica UXO Risk Maps available at: [Risk Maps | Zetica UXO](#) (last accessed June 2022).

¹⁰⁶ Newark & Sherwood District Council website available at: <https://www.newark-sherwooddc.gov.uk/landpollution/> (last accessed July 2022).

Table 10.1: Baseline conditions

Aspect	Description
Geology	<p>Made Ground is not mapped within the scheme alignment⁹⁸, and is not recorded in historic boreholes. However, Engineered Fill for the existing A46 embankments was encountered within 43 boreholes and 4 trial pits during the 2021 ground investigation. The maximum recorded thickness of Engineered Fill was 14.90 metres at one location, but it was typically 4.00 metres to 6.00 metres thick at the other exploratory hole locations.</p> <p>According to the BGS⁹⁸, Alluvium, associated with the River Trent, is present across the majority of the south-western half of the study area. The Balderton Sand and Gravel Member underlies the majority of the north-eastern section of the study area. Small areas of Holme Pierrepont Sand and Gravel Member are also present mainly located just west of the A1, north of Cattle Market and at the south-western extent of the study area.</p> <p>During the ground investigation, Alluvium and the Balderton Sand and Gravel Member were encountered between 1.00 – 17.0 metres below ground level (bgl). Both granular and cohesive alluvium deposits were recorded across the scheme. The Balderton Sand and Gravel Member generally comprises dense reddish brown slightly gravelly fine to coarse sand. The Holme Pierrepont Sand and Gravel Member was not encountered in the ground investigation.</p> <p>According to the BGS⁹⁸ Mercia Mudstone is recorded underlying the northern half of the scheme. The Edwalton Member is recorded underlying the southwest extent of the scheme whilst the Gunthorpe Member underlies the south east extent.</p> <p>During the ground investigation the Mercia Mudstone Group was encountered between (1.00 – 17.00 metres bgl). Generally, Weathered Mercia Mudstone was recorded at shallow depths, generally comprising soft to firm reddish brown silty clay. Competent Mercia Mudstone was also recorded at greater depths and generally comprised weak to medium strong very thinly bedded reddish brown and bluish grey mudstone.</p>
Geology (within proposed borrow pit and flood	<p>No project specific ground investigation has been undertaken in the proposed floodplain compensation site/ borrow pit areas. Following a review of available BGS mapping and historical exploratory hole logs for these areas, the following geology is anticipated:</p> <p><u>Kelham and Averham Floodplain Compensation Area</u></p>

Aspect	Description
compensation area)	<p>According to the BGS map¹⁰⁷ the area is underlain by the Mercia Mudstone Group and overlain with the Holme Pierrepont Sand and Gravel Member. Made Ground is not mapped within the Kelham and Averham Floodplain Compensation Area.</p> <p><u>Borrow Pits West Floodplain Compensation Area</u></p> <p>According to the BGS Map¹⁰⁷, the area is underlain with the Edwalton Member Mudstone and is overlain by Alluvium Superficial Deposits. Made Ground is not mapped within the Borrow Pits West Floodplain Compensation Area. A large area of Made Ground is located approximately 300 metres to the west of the borrow pit location, at Staythorpe Power Station.</p>
Mining and Quarrying	<p>According to the Coal Authority Interactive Map Viewer⁹⁹, the scheme/study area is identified as not being located in a coal mining reporting area, a development high risk area, an area of past shallow coal mine workings, or an area of probable shallow coal mine workings. The Coal Authority Interactive Map Viewer does not identify any mine entries, or surface mining (past or present) on site.</p> <p>The BGS Mineral Map¹⁰⁸ for the area indicates that sand and gravel extraction has occurred in the area of Crankley Point, and Sand and Gravel deposits are present in the area. The BGS GeoIndex Mapping identifies several quarries to the northwest of the study area, referred to as Crankly Point, associated with the British Sugar site. The closest identified quarry is located approximately 300 metres to the west.</p>
Hydrogeology	<p>Superficial deposits: Environment Agency (EA) designated Secondary A Aquifer</p> <p>Bedrock: EA designated Secondary B Aquifer</p>

¹⁰⁷ British Geological Survey Map Available at: [Geology of Britain viewer | British Geological Survey \(BGS\)](#) (last accessed June 2022).

¹⁰⁸ British Geological Survey. Nottinghamshire Mineral Resources Map 1:100k dated 2002.

Aspect	Description
	<p>The area is not identified to be located within an EA designated groundwater source protection zone (SPZ), Drinking Water Protected Area or Drinking Water Safeguard Zone for groundwater (or surface water)¹⁰⁹. For further information on the groundwater of the area, refer to Chapter 14 Road Drainage and the Water Environment.</p>
Hydrology	<p>The River Trent flows through the centre of the study area flowing in a northerly direction. The A46 crosses the river near Crankley Point and Farndon Junction. The Old Trent Dyke also crosses the south-western part of the route in two locations, near Newark Cricket Ground and west of Hiram’s Paddocks. In addition, there are several field drains and smaller unnamed watercourses within the study area.</p> <p>There are several lakes located north of the A46, approximately 50 metres at their closest point, between the A1 and A616 Great North Road and adjacent to the railway line in the south-western part of the route. Kings Marina is located just west of Northgate Retail Park, south of the A46, approximately 70m at its closest point. For further information on the surface water of the area, refer to Chapter 14 Road Drainage and the Water Environment.</p>
Geological designations and sensitive/valuable designated features	<p>There are no designated or non-designated geological sites/features of interest within 500 metres of the scheme.</p> <p>No Regionally Important Geological Sites (RIGS) have been located within 500 metres of the scheme¹¹⁰.</p>
Soils (scheme alignment)	<p>The only available map covering the whole study area is the 1:250,000 soil map of Eastern England published by the Soil Survey of England and Wales in 1983¹¹¹. The soils in the scheme area belong to three broad groups:</p> <ul style="list-style-type: none"> • Coarse textured soils found on the terraces of the River Trent in the north of the survey area;

¹⁰⁹ Defra, Magic (2021). Interactive Map [online] available at: [MAGIC \(defra.gov.uk\)](https://defra.gov.uk/magic) (last accessed June 2022).

¹¹⁰ Nottinghamshire Insight Mapping Available at: [Nottingham City Council - Insight Mapping GIS Mapping](https://www.nottinghamcitycouncil.gov.uk/insight-mapping) (last accessed August 2022)

¹¹¹Soil Survey of England and Wales (1983). 1:250,000 scale Soil Map of Eastern England. Rothamsted Experimental Station, Harpenden

Aspect	Description
	<ul style="list-style-type: none"> • Where the terrace gravels thin out, the coarse loamy deposits overlie the red clay of Mercian Mudstone that occurs below 60cm; and • The low-lying Trent floodplain supports loamy and clayey alluvium. <p>Based on an intrusive agricultural land classification (ALC) survey conducted in spring 2021 and desktop information, the ALC grades identified in the study area include subgrade 3a (20% of study area), 3b (36% study area) and non-agricultural land (44% study area). Grade 3a is deemed 'best and most versatile'. Two areas were inaccessible for the survey, but available information was used to determine the ALC grade reliably.</p>
Soils (within proposed borrow pit and flood compensation area)	<p>No agricultural land classification (ALC) survey has been undertaken in the flood compensation/borrow pit areas.</p> <p><u>Kelham and Averham Floodplain Compensation Area</u></p> <p>According to Natural England's Agricultural Land Classification (ALC) maps, the land is a predicted grade 2, deemed 'best and most versatile'.</p> <p><u>Borrow Pits West Floodplain Compensation Area</u></p> <p>According to Natural England's Agricultural Land Classification (ALC) maps, the land is a predicted grade 3 (good to moderate). It is not possible to differentiate between subgrades 3a (deemed 'best and most versatile', BMV) and 3b (not deemed BMV) without a soil survey.</p>
Current land use	<p>The principal land use throughout the area of interest comprises the existing A46 highway network comprising carriageway, roundabouts and junctions, with surrounding agricultural, residential, commercial and industrial land.</p> <p>There are three fuel filling stations located in the study area: Esso Petrol Station and Shell Garage located on either side of the A46 just to the east of the A1 interchange; and Jet Garage on Farndon Road to the north-east of Farndon Roundabout, approximately 250 metres to the east of the A46.</p> <p>The Crankley Point Sewage Works is located approximately 80 metres west and north-west of the A46, near the centre of the scheme.</p>

Aspect	Description
	<p>Two railway lines are located within the study area: the East Coast Mainline crosses the A46 near the centre of the route; and the Nottingham-Grimsby line crosses the route in two locations, in the centre and southern part of the route.</p> <p>Several industrial sites are located within the study area including:</p> <ul style="list-style-type: none"> • The British Sugar Factory located immediately east of the Great North Road (A616) and west of the Newark Rail Crossing. A lagoon associated with the British Sugar Factory is located approximately 50m north of the A46 at its closest point. • Freight Service Centre adjacent to the east of the Newark Rail Crossing. • Briggs scrap metal merchants, located immediately west of the Great North Road, approximately 215m north-west of the A46. • Newark Lorry Wash, associated freight services and Newark Livestock Market, located approximately 100 metres south-east of Cattle Market Roundabout.
Landfill records	<p>There are two recorded active landfills within 500 metres of the scheme. They are dedicated for factory curtilage waste and are operated by British Sugar Plc, located to the west of the scheme.</p> <p>There is one small area noted as a historical landfill approximately 215 metres east of the Great North Road and approximately 0.164 hectares in area. The landfill is recorded as having accepted inert and industrial waste and was operated by the British Sugar Company. There are no other historical landfill sites recorded within the study area¹¹².</p>
Historical land use	<p>The following non-exhaustive list of historical land uses within and outside the scheme (within 500metres) have been identified¹¹²:</p> <p><u>Within the draft red line boundary</u></p> <ul style="list-style-type: none"> • (1884-1886) The Midland Railway: Nottingham to Lincoln line is shown crossing the western extent of the scheme, the Great North Road is shown crossing the route in the central section, a malthouse is mapped within the south

¹¹² Landmark Information Group, Envirocheck Report (order no:172582399_1_1 dated 9/07/2018, Atkins received June 2018).

Aspect	Description
	<p>west section, chemical manure works are mapped within the central section, unnamed building in central section of route.</p> <ul style="list-style-type: none"> • (1900 – 1901) A football ground has been constructed in the central section of the route options. • (1965 – 1970) Unnamed building is marked as works • (1985 – 1996) Road is now shown present within the scheme boundary, bridge is built over the River Trent, Football Ground no longer labelled, Viaduct is shown. <p>Historical land use within the scheme area is defined predominately by railway, roads with agricultural fields.</p> <p><u>Outside the draft red line boundary</u></p> <p>Notable developments outside of the scheme include:</p> <p>Flour mill located approximately 50 metres south east, brewery located 250 metres southwest, wellington foundry, malthouses located 200 metres southwest, old bleaching house located approximately 100 metres south, boiler works located 200 metres south west, residential houses located 200 metres south. Former airfield (now Newark Showground) located adjacent to the east of the A46, within the north of the scheme study area.</p>
Unexploded ordnance (UXO)	The study area has been identified as a Low Risk of encountering UXO (Zetica, 2022). ¹⁰⁵
Potential sources of contamination	<p>Newark and Sherwood District Council has not designated any land as contaminated under the definition in Part 2A of the Environmental Protection Act 1990 and as such does not have any entries on the Contaminated Land Register.</p> <p>Potential contamination sources identified within the study area include Made Ground, the railway lines, the active British Sugar factory, active sewage works, former chemical works, historic landfill, active fuel filling station, ADR automotive site, Newark lorry wash, old bleaching house and former petrol station. These potential sources were targeted as part of the ground investigation undertaken by TetraTech (2021). There are approximately 130 exploratory holes along the proposed scheme, which provide information on geo-environmental conditions.</p>

Aspect	Description
	<p>Due to the bedrock geology, there is potential for ground containing high levels of sulphates and acids to aggressively attack buried concrete and pose a risk to foundations/structures. The supplementary ground investigation and Ground Investigation Report will assess geotechnical risks.</p> <p>During the TetraTech (2021) ground investigation, visual and olfactory evidence of contamination was identified at the location of WS46 at the base of the Made Ground Layer in the Alluvium between 2.5 metres bgl and 3.65 metres bgl where a chemical odour was observed. No other exploratory hole locations noted visual or olfactory evidence of contamination.</p> <p>Preliminary screening of the geo-environmental data from the draft Factual Ground Investigation Report (October 2021), identified two significant contaminant concentrations, both at the location of WS46, for aromatic hydrocarbons and naphthalene. No other significant concentrations of contaminants were noted in soil, soil leachate and groundwater samples.</p> <p>No ground investigation has been undertaken in the areas identified for borrow pits and flood compensation. Following a review of available Ordnance Survey historical mapping, these areas have been identified as having had no contaminative use, and have remained undeveloped. Therefore, the risk of encountering contaminated soils and contaminated groundwater at these locations is very low.</p> <p>A potential risk may exist from unexpected contamination, which may be encountered during construction. Should any areas of previously unidentified visual and or olfactory evidence of contamination be encountered, this will be managed in accordance with the details specified within the First and Second Iteration Environmental Management Plan for the scheme.</p>

10.5 Potential impacts

Construction

Geology

10.5.1 Excavation works associated with the scheme, in particular the borrow pits and flood compensation areas, have the potential to result in the permanent removal/sterilisation of any areas of Superficial Alluvium/Sand and Gravel Deposits (and their future use as a potential resource), with the potential for adverse effects.

Contaminated land

10.5.2 Potential impacts associated with contamination are likely to relate to the existing level of ground contamination on site and its interaction with the scheme. Potential contamination impacts may relate to the following receptors:

- Potential direct impact on humans (construction and maintenance workers, site users/visitors).
- Potential direct impact, in the short and long term, on groundwater (Secondary A and B Aquifers) and surface water receptors (River Trent, lakes and unnamed watercourses).

10.5.3 Construction works could result in localised fuel spillages and leakages. There is the potential for the creation of contamination pathways/driving down of contaminants presenting a risk to groundwater along with the potential for increased turbidity and quality deterioration, which would result in adverse effects.

10.5.4 Given the nature of their work, construction and maintenance workers may come into contact with potentially contaminated soils/leachates and reduced oxygen conditions in excavations.

10.5.5 The removal or remediation of any areas of contaminated soils identified would have a potential benefit.

Soils

10.5.6 There is potential for permanent compaction or removal of anticipated BMV agricultural soils or topsoil/ sub soil material. Soil deterioration and compaction may occur due to vehicle movements and loading, leading to adverse impacts.

10.5.7 The scheme proposes an area of land take at Brownhills Junction in the north of the scheme adjacent to the A46 and A1, crossing agricultural land classified grade 3¹¹³ (good to moderate).

10.5.8 There is potential for removal of ALC grade 3 (good to moderate) soils for utilisation of a borrow pit area located south of Nottingham to Lincoln Railway.

10.5.9 There is potential for removal of grade 2, deemed 'best and most versatile' soils in the Kelham flood compensation area (FCA). The construction of the FCAs are likely to create a significant volume of materials which will need to be either reused or disposed of on or off-site.

Operation

Geology

10.5.10 No operational impacts on geology are anticipated.

Contaminated land

10.5.11 During operation there is potential for fuel leakage from vehicles and site run-off, although the risk is considered to be low. This may result in an impact on the following receptors:

- Potential direct impact on humans (site end users, maintenance workers) (which would be managed through National Highway's Operational Maintenance Plans).
- Potential direct impact, on groundwater (Secondary A and B Aquifers) and surface water receptors (River Trent, lakes and unnamed watercourses).

Soils

10.5.12 There will be no operational effects anticipated on soils and agricultural land.

10.6 Design, mitigation and enhancement measures

Design Measures

10.6.1 A phase of pre-construction intrusive ground investigation has been undertaken in accordance with regulatory standards and current best practice including but not limited to LCRM, BS5930 and BS10175 to inform the design and the appropriate mitigation measures.

¹¹³Agricultural Land Classification Map East Midlands Region (ALC005) Available at: <http://publications.naturalengland.org.uk/publication/143027?category=5954148537204736> (Last Accessed June 2022).

- 10.6.2 The assessment and possibly the remediation of land contamination will be a requirement of the DCO application process to ensure that the scheme is suitable for its proposed use. The LCRM guidance details the steps that will need to be followed as the scheme is progressed through the DCO process. These steps include the production of a Preliminary Risk Assessment and completion of an appropriate ground investigation, tiered stages of risk assessments together with an assessment of unacceptable pollutant linkages. Where such linkages are found then a remediation options appraisal and strategy will be produced, and would be documented within the First and Second Iteration Environmental Management Plans as required.
- 10.6.3 Any remediation works required to manage contamination risk will be agreed with Newark and Sherwood District Council and Environment Agency. Remediation will need to be completed and verified before completion of the scheme. Acute risks to construction and maintenance workers resulting from short-term exposure to potentially contaminated soils/groundwater will be mitigated by the contractor, through appropriate design of the works and compliance with health and safety legislation.
- 10.6.4 Design measures will consist of features inherent in the scheme design which will act as mitigation, such as the inclusion of surface water management / drainage systems to control surface water run-off and mitigating against potential leachate generation in the unsaturated zone. The majority of the scheme will be a carriageway on completion of the works, therefore a final hardstanding surface will be present. This would therefore break the source-pathway-receptor linkage. In areas of the scheme where soft landscaping is proposed, for example cuttings or embankments, excavated material previously assessed as environmentally and geotechnically suitable for reuse will be used.

Mitigation Measures – Construction

- 10.6.5 An ALC intrusive soil survey will be required at the flood compensation and borrow pit sites, in order to confirm existing baseline conditions and inform the construction soil management plan and materials management plan. The soil survey will be carried out in parallel with the supplementary ground investigation and undertaken in accordance with regulatory standards and current best practice including but not limited to LCRM, BS5930 and BS10175. Additional contamination testing is also required in the borrow pit and flood compensation areas to determine background concentrations and suitability for reuse on site.
- 10.6.6 All construction works should be carried out in accordance with a Second Iteration Environmental Management Plan detailing the reasonable and practicable steps to be undertaken to prevent pollution of the surrounding

environment including site soils, groundwaters, surface waters (oil interceptors) and air (dust suppression). The works should be monitored by a suitably qualified Site Environmental Engineer / Environmental Manager, to be responsible in identifying and approving all methods of pollution control. Should previously unidentified contamination be identified during construction works this will be managed through the planning process to ensure that the scheme is suitable for its proposed use under the NPPF. The methodology for dealing with unexpected contamination will be detailed in the Second Iteration Environmental Management Plan for construction. Measures for the protection of site soils will be required to be set out in a Soil Management Plan (SMP) included within the Second Iteration Environmental Management Plan. For example, stockpile management; topsoils and subsoils should be stripped first, segregated and stockpiled appropriately for re-use across the site where possible, in accordance with appropriate guidelines, such as the DEFRA 2009 'Code of Practice for the Sustainable use of Soils on Construction Sites' and BS 3882: 2015 'Specification for Topsoil'.

10.6.7 To minimise the generation of excess soils/geological materials, a robust Materials Management Plan (MMP), a Site Waste Management Plan (SWMP) and compliance with the CL:AIRE Definition of Waste: Development Industry Code of Practice document¹¹⁴ will be necessary. Where possible, the re-use of suitable excess soils/Superficial Materials/excavated bedrock across the site, or on nearby sites should be promoted to minimise the volume of resource sterilised. Land occupied or disturbed during the construction process, such as site compounds, that is not permanently acquired for engineering and landscaping, would be restored to a condition equivalent to its original.

10.6.8 For the protection of controlled waters, the Second Iteration Environmental Management Plan should cover all necessary requirements e.g. guidance on storage requirements of hazardous substances, the use of cut-off ditches and settling tanks where necessary. The discharge of potentially contaminated groundwater from dewatering should be appropriately managed and may require an Environmental Permit/Discharge Consent. To prevent the contamination of the Secondary A and B Aquifers the contractor must take precautions, in line with all associated pollution prevention guidelines. Where piling or penetrative ground improvement is required into aquifers, the works should be carried out in accordance with the latest guidance. A Piling Risk Assessment and Foundation Works Risk Assessment may need to be undertaken.

¹¹⁴ 79 CL:AIRE (2011) The Definition of Waste: Development Industry Code of Practice [online] available at: [https://www.360environmental.co.uk/documents/Definition of Waste. Development Industry Code of Practice.pdf](https://www.360environmental.co.uk/documents/Definition%20of%20Waste.%20Development%20Industry%20Code%20of%20Practice.pdf) (last accessed June 2022).

10.6.9 The works areas will be well delineated and kept secure to prevent public access and trespass. The acute risks to construction workers resulting from short-term exposure to soils will be mitigated by the contractor, through appropriate design of the works and compliance with health and safety legislation. Potential risk from ground gases to construction workers working in excavations and other confined spaces will be dealt with by the contractor, in accordance with current Confined Spaces Regulations. Determined Design Sulphate and Aggressive Chemical Environment for Concrete classes for each stratum are to be used to inform the design of appropriate concrete foundations / structures.

Mitigation Measures - Operation

10.6.10 Highways drainage will be designed in accordance with DMRB standards to ensure collection of potentially contaminated site run off from vehicle fuel leakage.

Enhancement Measures

10.6.11 The removal / remediation of any areas of contaminated soils would result in a slight beneficial effect from the scheme.

Enhancement measures for geology and soils will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

10.7 Description of the likely significant effects

Construction

10.7.1 There are not anticipated to be any likely significant effects as a result of the construction of the Scheme. However, as a precautionary approach, due to the absence of GI and Agricultural Land Classification survey results from the borrow pit areas, flood compensation areas and an identified contamination hotspot from the historic GI, it is recommended that Geology, Contaminated Land and Soils is scoped in for construction stage assessment to be presented within the ES.

Operation

10.7.2 The completed and operational scheme is not expected to result in any significant adverse effects on geology, contaminated land or soils, and this will therefore be scoped out of the ES.

10.8 Assessment methodology

Guidance and standards

10.8.1 The proposed assessment methodology is in line with the following guidance and standards: DMRB LA 109 Geology and Soils⁹⁷, DEFRA: Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance, Definition of Waste: Development Industry Code of Practice CL:AIRE, 2014, Unexploded ordnance (UXO) A guide for the construction industry (C681) 2009, and Land Contamination Risk Management (LCRM) guidance (Environment Agency 2020).

Sensitivity of receptors

10.8.2 The value (sensitivity) of receptors will be determined according to the descriptions provided within Table 10.2, reproduced from Table 3.11 of LA 109 Geology and Soils.

Table 10.2: Environmental value (sensitivity) and descriptions

Receptor value (sensitivity)	Description
Very High	<p>Geology: very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSIs and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such.</p> <p>Contamination:</p> <p>1) Human health: very high sensitivity land use such as residential or allotments;</p> <p>2) Surface water: relevant sensitivity criteria from Table 3.70 in Road Drainage and water environment LA 113</p> <p>3) groundwater: use sensitivity criteria in Road drainage and the water environment LA 113</p> <p>Soils:</p> <p>1) soils directly supporting a site within the National Site Network (e.g. SAC, SPA) or a Ramsar; and / or</p> <p>2) ALC grade 1 & 2 or LCA grade 1 & 2</p>
High	<p>Geology: rare and of national importance with little potential for replacement (e.g. geological SSSI, ASSI, National Nature Reserves (NNR)). Geology</p>

Receptor value (sensitivity)	Description
	<p>meeting national designation citation criteria which is not designated as such.</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) Human health: high sensitivity land use such as public open space; 2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and 3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113. <p>Soils:</p> <ol style="list-style-type: none"> 1) soils directly supporting a UK designated site (e.g. SSSI); and / or 2) ALC grade 3a, or LCA grade 3.
Medium	<p>Geology: of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation citation criteria which is not designated as such.</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) Human health: medium sensitivity land use such as commercial or industrial; 2) Surface water: use relevant sensitivity criteria in Table 3.70 of Road drainage and water environment LA 113; and 3).Groundwater: use relevant sensitivity criteria in Table 3.70 Road drainage and water environment LA 113 <p>Soils:</p> <ol style="list-style-type: none"> 1) soils supporting non-statutory designated sites (e.g. Local Nature Reserves (LNR), LGS's, Sites of Nature Conservation Importance (SNClS)); and / or 2) ALC grade 3b or LCA grade 3.2.
Low	<p>Geology: of local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarries / mining sites).</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) Human health: low sensitivity land use such as highways and rail;

Receptor value (sensitivity)	Description
	<p>2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and</p> <p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils:</p> <p>1) ALC grade 4 & 5 or LCA grade 4.1 to 7; and / or</p> <p>2) soils supporting non-designated notable or priority habitats.</p>
Negligible	<p>Geology: no geological exposures, little / no local interest.</p> <p>Contamination:</p> <p>1) Human health: undeveloped surplus land / no sensitive land use proposed;</p> <p>2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113 ; and</p> <p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils: previously developed land formerly in 'hard uses' with little potential to return to agriculture.</p>

Source: Table 3.11 of LA109 Geology and Soil

Magnitude of impacts

10.8.3 The magnitude of impact is determined by the predicted deviation from the baseline conditions and the scale of the effect. Quantifiable assessment of magnitude will be undertaken where possible. In cases where only qualitative impact assessment is feasible, the magnitude will be defined as fully as possible. The magnitude of each impact will be determined according to the descriptions provided within Table 10.3.

Table 10.3: Magnitude of impact and typical descriptions

Magnitude of impact	Description
Major	<p>Geology: loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) Human health: significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) with potential for significant harm to human health. Contamination heavily restricts future use of land; 2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and 3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113. <p>Soil: physical removal or permanent sealing of soil resource or agricultural land.</p>
Moderate	<p>Geology: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p>Contamination:</p> <ol style="list-style-type: none"> 1) Human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (e.g. category 4 screening levels). Significant contamination can be present. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use; 2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and

Magnitude of impact	Description
	<p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils: permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.)</p>
Medium	<p>Geology: minor measurable change in geological feature / designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.</p> <p>Contamination:</p> <p>1) Human health: contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels). Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health;</p> <p>2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and</p> <p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.)</p>
Low	<p>Geology: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected.</p> <p>Contamination:</p> <p>1) Human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels). No requirement for control measures to reduce risks to human health / make land suitable for intended use;</p> <p>2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and</p>

Magnitude of impact	Description
	<p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils: no discernible loss / reduction of soil function(s) that restrict current or approved future use.</p>
Negligible	<p>Geology: no temporary or permanent loss / disturbance of characteristics features or elements</p> <p>Contamination:</p> <p>1) Human health: reported contaminant concentrations below background levels;</p> <p>2) Surface water: use sensitivity criteria in Road drainage and water environment LA 113; and</p> <p>3) Groundwater: use sensitivity criteria in Road drainage and water environment LA 113.</p> <p>Soils: no loss / reduction of soil function(s) that restrict current or approved future use</p>

Source: Adapted from Table 3.12 of LA109 Geology and Soil

Significance of effect

Subsequent to identifying an appropriate receptor sensitivity and magnitude of impact using Table 10.2 and Table 10.3, the significance of effects will be assessed using the criteria set out in Table 5.2. Typical examples of effects within each significance category are provided within Table 10.4. For the purposes of the assessment, effects of Moderate Adverse or Beneficial and above have been considered to be significant.

Table 10.4: Significance categories and typical examples

Significance category	Criteria	Typical examples
Neutral	Not applicable	<ul style="list-style-type: none"> • Minimal effect on geological condition • Minor loss of urban soils • No discernible negative effect to buildings / infrastructure.
Slight	Adverse	<ul style="list-style-type: none"> • Changes to Made Ground deposits only, • Moderate/ major loss/ degradation of grade 4 or grade 5 Soils • Minor/ moderate loss/ degradation of grade 3 soils. • Easily preventable, non-permanent health effects on humans. • Minor low-level and localised contamination of on site soils. • Easily repairable damage to buildings / infrastructure.
	Beneficial	<ul style="list-style-type: none"> • Remediation of localised low levels of contamination. • Remediation of non-sensitive water resource contamination. • Minimal improvements to overall soil and water quality
Moderate	Adverse	<ul style="list-style-type: none"> • Superficial disturbance to near surface deposits • Change in geomorphology, large loss/degradation of grade 3 soils. • Minor loss/ degradation of grade 1 or 2 soils • Sterilisation of low quality mineral resources. • Easily preventable, permanent health effects on humans. • Pollution of non-sensitive water resource or Low • Long-term risk of pollution to sensitive water resource. • Localised damage to buildings/infrastructure (on or off site).
	Beneficial	<ul style="list-style-type: none"> • Remediation of localised moderate levels of contamination.

Significance category	Criteria	Typical examples
		<ul style="list-style-type: none"> Remediation of moderate, localised sensitive water resource contamination
Large	Adverse	<ul style="list-style-type: none"> Impacts upon / loss of section of designated geological feature. Moderate/ large loss/ degradation of grade 2 soils. Moderate loss / degradation of grade 1 soils. Sterilisation of high quality mineral resource. Medium / long-term (chronic) risk to human health. Medium long-term risk of pollution of sensitive water resources. Contamination of off-site soils.
	Beneficial	<ul style="list-style-type: none"> Remediation of localised high levels of contamination Remediation of significant localised sensitive water resource contamination
Very Large	Adverse	<ul style="list-style-type: none"> Complete loss of exposed designated geological features or large loss / degradation of grade 1 soils. Short-term (acute) risk to human health. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings / infrastructure.
	Beneficial	<ul style="list-style-type: none"> Remediation of significant, widespread elevated levels of soil contamination / sensitive water resource contamination

10.9 Assessment assumptions and limitations

10.9.1 This chapter is based on the current scheme alignment, known ground conditions and knowledge of any potential contamination. The findings may be subject to change during further GI and again during scheme development, should any previously unidentified contamination or unforeseen ground conditions become evident.

10.9.2 The assessment is based on ALC survey data for the main scheme alignment only at present, and an additional ALC survey is required at

supplementary areas including the borrow pit sites and flood compensation areas.

10.9.3 The supplementary GI and ALC survey will inform the production of the SMP, aid geotechnical design, and delineate a contamination hotspot, identified at one historic exploratory hole location.

10.9.4 The effects of materials import and export in relation to earthworks construction are considered in Chapter 11 Material Assets and Waste. The effects of the scheme upon surface water bodies and groundwater are considered in more detail in Chapter 14 Road Drainage and the Water Environment.

10.10 Consultation

10.10.1 Direct consultation with the Environment Agency and Newark and Sherwood District Council has currently not been undertaken regarding this topic. However, the purchase of an Envirocheck report has been completed, which contains information held by the Environment Agency and Newark and Sherwood District Council, pertinent to this chapter. In line with the Contaminated Land Risk Assessment, the Environment Agency and Newark and Sherwood District Council, will be consulted during preparation of the DCO application.

10.10.2 In line with DMRB LA 109 and Technical Information Note 049¹¹⁵, consultation must be undertaken with Natural England where more than 20 ha of BMV land is likely to be affected.

10.11 Summary

10.11.1 In line with LA 109, responses to the following scoping questions in Table 10.5 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 10.5: Geology and Soils scoping questions

Scoping question	Answer
1) Is the project likely to affect designated geological sites (statutory or non statutory)?	No, there are no designated or non-designated geological sites/features of interest, or any RIGS present within 500 metres of the scheme.
2) Is the project likely to affect the function or quality of soil as a resource?	Potentially yes, additional ALC survey is required at supplementary areas including the borrow pit sites and flood compensation areas. However, with soil

¹¹⁵ Technical Information Note 049, Agricultural Land Classification: protecting the best and most versatile agricultural land, Natural England, (2012) available at: <http://publications.naturalengland.org.uk/publication/35012?category=23033>.

Scoping question	Answer
	mitigation measures from the SMP, it should be minor, provided soils are reused.
3) Is the project likely to affect agricultural land classified as best and most versatile (BMV) or prime land?	Potentially yes, additional ALC survey is required at supplementary areas including the borrow pit sites and flood compensation areas. This will inform the production of the SMP and mitigation measures to be implemented.
4) Is the project likely to disturb historical contamination?	No, unlikely. The supplementary GI will seek to delineate a contamination hotspot, identified at >2m bgl within one historic exploratory hole location. Delineation of the contamination hotspot will inform potential mitigation/remediation measures prior to construction.
5) Is the project likely to introduce significant sources of contamination?	No, unlikely. The implementation of the Second Iteration Environmental Management Plan, adherence to DMRB standards and production of a CLRA will mitigate potential contamination sources.

10.11.2 The proposed scope of the ES is contained in Table 10.6.

Table 10.6: Proposed scope of the Geology and Soils chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Geology, Contaminated Land and Soils (inclusive of Agricultural Land Classification)	N/A	N/A
Operation	N/A	Geology, Contaminated Land and Soils (inclusive of Agricultural Land Classification)	No operational impacts are anticipated, and no further assessment is required. Refer to Chapter 14 Road Drainage and Water Environment for reasons why groundwater has been scoped in.

11 Material Assets and Waste

11.1 Introduction

11.1.1 This chapter aims to identify the potential for significant effects as a result of the scheme upon material assets and waste. This chapter has been prepared in accordance with DMRB LA 110 Material assets and waste¹¹⁶. Further assessment will be presented within the Environmental Statement (ES).

11.2 Legislation and policy

Legislation

11.2.1 The overarching legislation in relation to material assets and waste is provided by:

- Environment Act 2021¹¹⁷.
- The Environmental Protection Act 1990 (as amended)¹¹⁸.
- European Union (Withdrawal) Act 2018¹¹⁹.
- Waste (Circular Economy) (Amendment) Regulation 2020¹²⁰.
- The Waste and Environmental Permitting etc (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020¹²¹.
- Waste Framework Directive (2008/98/EC)¹²².
- The Waste (England and Wales) Regulations (2011) as amended¹²³.
- The Hazardous Waste (England and Wales) Regulations (2005) as amended¹²⁴.

¹¹⁶ Highways England (2019) Design Manual for Roads and Bridges, LA 110 Material assets and waste [online]. Available at: [6a19a7d4-2596-490d-b17b-4c9e570339e9 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk) (Last accessed June 2022).

¹¹⁷ Her Majesty's Government (2021) The Environment Act 2021 [online]. Available at: [Environment Act 2021 \(legislation.gov.uk\)](https://legislation.gov.uk) (last accessed June 2022).

¹¹⁸ Her Majesty's Government (1990) Environmental Protection Act 1990 [online]. Available at: [Environmental Protection Act 1990 \(legislation.gov.uk\)](https://legislation.gov.uk) (last accessed June 2022).

¹¹⁹ Her Majesty's Government (2018) European Union (Withdrawal) Act 2018 [online]. Available at: [European Union \(Withdrawal\) Act 2018 \(legislation.gov.uk\)](https://legislation.gov.uk) (last accessed June 2022).

¹²⁰ Her Majesty's Government (2020) The Waste (Circular Economy) (Amendment) Regulations 2020 [online]. Available at: [Legislation.gov.uk](https://legislation.gov.uk) (last accessed June 2022).

¹²¹ Her Majesty's Government (2020) The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 [online]. Available at [The Waste and Environmental Permitting etc. \(Legislative Functions and Amendment etc.\) \(EU Exit\) Regulations 2020 \(legislation.gov.uk\)](https://legislation.gov.uk) (last accessed June 2022).

¹²² Waste Framework Directive (2008/98/EC) [online]. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098> (Last accessed June 2022).

¹²³ Her Majesty's Government (2011) The Waste (England and Wales) Regulations 2011, No.988 [online]. Available at: <https://www.legislation.gov.uk/uksi/2011/988/contents> (Last accessed June 2022).

¹²⁴ Her Majesty's Government (2005) The Hazardous Waste (England and Wales) Regulations 2005, No. 894 [online]. Available at: <https://www.legislation.gov.uk/uksi/2005/894/contents/made> (Last accessed June 2022).

- The Environmental Permitting (England and Wales) Regulations (2016), as amended¹²⁵.
- Waste Electrical and Electronic Equipment (WEEE) (England and Wales) Regulations, 2013¹²⁶.
- Controlled Waste (England and Wales) Regulations 2012 (SI 2012/811)¹²⁷.

11.2.2 English and Welsh law was updated on 1 October 2020 to include changes to the Waste Framework Directive (WFD) made in 2018. This was implemented through the Waste (Circular Economy) (Amendment) Regulations 2020.

11.2.3 The draft Waste and Environmental Permitting, etc. (Legislative Functions and Amendment, etc.) (EU Exit) Regulations 2020 were laid before Parliament on 20 October 2020. They make amendments to ensure that the waste and environmental permitting regimes continue to operate effectively at the end of the transition period.

Policy

National planning policy

11.2.4 National planning policy of relevance to the scheme includes:

- National Policy Statement for National Networks (NPSNN), 2014:
 - Paragraph 5.39: States government policy on hazardous and non-hazardous waste and its intention to protect human health and the environment by reducing waste production and using waste as a resource.
 - Paragraph 5.40: sustainable waste management should be implemented through using the waste hierarchy, focusing on preventing waste as a priority and using disposal methods as a last resort.
 - Paragraph 5.42: Arrangements should be made for waste produced by a development with the aim of seeking to minimise the volume of waste produced and the volume of waste disposed of unless it can be demonstrated that the alternative is the best overall environmental outcome.

¹²⁵ Her Majesty's Government (2016) The Environmental Permitting (England and Wales) Regulations 2016 No. 1154 [online]. Available at: <https://www.legislation.gov.uk/ukSI/2016/1154/contents/made> (Last accessed June 2022).

¹²⁶ Her Majesty's Government (2013) Waste Electrical and Electronic Equipment (WEEE) (England and Wales) Regulations, 2013 [online]. Available at: <https://www.legislation.gov.uk/ukSI/2013/3113/made> (Last accessed June 2022).

¹²⁷ Her Majesty's Government (2012) Controlled Waste (England and Wales) Regulations 2012 [online]. Available at: www.legislation.gov.uk/ukSI/2012/811/contents/made (Last accessed June 2022).

- Paragraph 5.43: Effective processes and waste management of non-hazardous and hazardous waste must be established to manage waste arising from the construction and operation of a proposed development, including ensuring waste is managed both on and off-site, assessing waste infrastructure for sufficient facilities and taking steps to reduce volumes of waste produced and waste sent to disposal facilities.
 - Paragraph 5.44: Where required, any requirements or planning obligations should be abided by in regards to implementing appropriate measures of the management of waste.
 - Paragraph 5.45: All waste sent to an external facility for recovery or disposal must be compliant with Environment Agency permitting requirements¹²⁸
-
- National Planning Policy Framework (NPPF), 2021 with particular reference to Section 17 in relation to the sustainable use of minerals¹²⁹.
 - The Waste Management Plan for England, 2021, which fulfils the requirements of the Waste (England and Wales) Regulations 2011¹³⁰.
 - National Planning Policy for Waste, 2014 which sets out to identify the need for waste management facilities and the requirement for local authorities to identify in their Local Plans suitable sites and areas for waste management facilities¹³¹.
 - The Waste Prevention Programme for England 2013 was reviewed by the Waste and Resources Action Programme (WRAP) on behalf of Defra in 2020 as part of the ongoing work programmed for the Resources and Waste Strategy for England, 2018, which will be supplemented with a new waste prevention programme to help move to a more circular economy model¹³².
 - Our Waste, Our Resources: A Strategy for England, 2018 sets out how the Government plans to double resource productivity and eliminate avoidable waste of all kinds (including plastic waste) by 2050¹³³.

¹²⁸ Department for Transport (2014) National Policy Statement for National Networks [online]. Available at [National Policy Statement for National Networks \(publishing.service.gov.uk\)](#) (last accessed June 2022).

¹²⁹ Ministry of Housing, Communities & Local Government (2021) National Policy Planning Framework [online]. Available at: [National Planning Policy Framework \(publishing.service.gov.uk\)](#) (last accessed June 2022).

¹³⁰ Department for Environment Food & Rural Affairs (2021) Waste Management Plan for England [online]. Available at: [Waste Management Plan for England \(publishing.service.gov.uk\)](#) (last accessed June 2022).

¹³¹ Her Majesty's Government (2014). National Planning Policy for waste [online]. Available at: [National planning policy for waste - GOV.UK \(www.gov.uk\)](#) (last accessed June 2022).

¹³² WRAP (2020) Review of the waste prevention programme for England 2013: Summary report [online]. Available at: [WRAP-review-waste-prevention-programme-england-summary-report.pdf](#) (last accessed June 2022).

¹³³ Department for Environment Food & Rural Affairs (2019) Resources and waste strategy: at a glance [online]. Available at: [Resources and waste strategy: at a glance - GOV.UK \(www.gov.uk\)](#) (last accessed June 2022).

- A Green Future: Our 25 Year Plan to Improve the Environment – in particular Chapter 4 – Increasing resource efficiency and reducing pollution and waste and Section 8 on minimising waste¹³⁴.

11.2.5 Alongside the DMRB LA110 ‘Sustainability and Environment Appraisal - Material Assets and Waste, August 2019¹³⁵ standard, the following guidance would underpin the assessment and would be described in detail in the assessment:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites¹³⁶.
- CL:AIRE Definition of Waste: Development Industry Code of Practice¹³⁷.

Local planning policy

11.2.6 The local planning framework comprises a number of documents that form the statutory development plans for the local planning authority area in which the scheme is located:

- Nottinghamshire County Council Nottinghamshire and Nottingham Local Aggregates Assessment 2021¹⁴⁰.
- Nottinghamshire Country Council Nottinghamshire Minerals Local Plan (Adopted 2021)¹⁴³.
- Nottinghamshire County Council Waste Core Strategy (Adopted 2013)¹⁴⁴.

11.3 Study area

11.3.1 The DMRB LA110 standard defines two geographically different study areas to examine and assess the use of material assets (and resource use) and waste generation.

11.3.2 The first study area is based on the construction of the area within the draft red line boundary, as this constitutes the area within which construction materials would be consumed (used, reused and recycled) and waste would be generated.

¹³⁴ Her Majesty’s Government (2018) A Green Future: Our 25 Year Plan to Improve the Environment [online]. Available at: [25-year-environment-plan.pdf](#) (publishing.service.gov.uk (last accessed June 2022)).

¹³⁵ Highways England (2019) Design Manual for Roads and Bridges, LA 110 Material assets and waste [online]. Available at: [6a19a7d4-2596-490d-b17b-4c9e570339e9](#) (standardsforhighways.co.uk) (Last accessed June 2022).

¹³⁶ Department for Environment, Food and Rural Affairs (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [online]. Available at: [Construction Code of Practice for the Sustainable Use of Soils on Construction Sites](#) (publishing.service.gov.uk) (last accessed June 2022).

¹³⁷ Contaminated Land: Applications in Real Environments (2011) The Definition of Waste: Development Industry Code of Practice [online]. Available at: [Definition of Waste. Development Industry Code of Practice.pdf](#) (last accessed June 2022).

11.3.3 The second study area focuses on an area sufficient to identify the suitable waste infrastructure that could accept arisings or waste generated by the scheme, and feasible sources and availability of construction materials typically required for the works.

- **Construction materials:** For the purpose of this assessment the study area will focus primarily on Nottinghamshire County Council and where required the East Midlands region within which the scheme is located.
- **Waste generation and management:** To sufficiently identify suitable waste infrastructure including landfills, considering the proximity principle and value for money. Where sufficient capacity is not available the search area will be extended accordingly, based on professional judgment, but kept within the boundaries of the East Midlands region. An initial search area of 10 kilometres from the scheme has been assessed to support the proximity principle by highlighting appropriate waste management and disposal sites within a reasonable proximity to the scheme. Only two permitted landfills with remaining capacity have been identified within 10 kilometres of the scheme, consequently the range of the search area has been extended to 50 kilometres. The waste management and disposal facilities listed in tables 11.10 (10 kilometre search area) and 11.11 (50 kilometre search area) are presented in ascending order showing the closest facilities to the scheme first.

11.4 Baseline conditions

Use of material resources

11.4.1 Information on the demand for key construction materials within the UK and within the Nottinghamshire sub-region has been used to provide the baseline for material resources. This information has been determined through a desk-study using a number of readily available resources, in particular from the British Geological Society's (BGS) Minerals UK¹³⁸, World Steel Association¹³⁹, and Nottinghamshire County Council^{140, 143, 144}.

11.4.2 Table 11.1 outlines the demand within the UK, in terms of sales, of minerals and mineral products in 2020, unless otherwise stated. Table 11.2 outlines the production of minerals within England in 2020 and

¹³⁸ British Geological Society (2021) United Kingdom Minerals Yearbook 2021 [online]. Available at: [United Kingdom Minerals Yearbook 2021 \(bgs.ac.uk\)](https://www.bgs.ac.uk/minerals-yearbook-2021/) (Last accessed June 2022).

¹³⁹ World Steel Association (2022) Steel Statistical Yearbook 2021 [online]. Available at: [2021-World-Steel-in-Figures.pdf \(worldsteel.org\)](https://www.worldsteel.org/2021-World-Steel-in-Figures.pdf) (Last accessed June 2022).

¹⁴⁰ Nottinghamshire County Council (2021) Nottinghamshire and Nottingham Local Aggregates Assessment 2021 [online]. Available at: [nottinghamshire-laa-2020-sales-data.pdf](https://www.nottinghamshire-laa-2020-sales-data.pdf) (Last accessed June 2022).

available mineral workings. Table 11.3 references aggregate sales and reserves within the Nottinghamshire region for the period of 2020.

Table 11.1: UK demand of materials and minerals/mineral products

Mineral/ mineral product	UK demand (2020, unless otherwise stated)
Primary aggregates, of which:	174.8 million tonnes
Crushed rock	107.9 million tonnes
Sand and gravel	57.7 million tonnes
Recycled and secondary aggregates (2018)	71 million tonnes
Cementitious products (UK), of which:	15 million tonnes
Cement clinker	6.9 million tonnes
Cement finished	8.0 million tonnes
Ready-mixed concrete (UK)	19.4 million cubic meters
Asphalt (GB, 2019)	25.2 million tonnes
Dimension stone (2014)	1 million tonnes
China Clay (2018)	0.996 million tonnes
Slag (2018)	2.5 million tonnes
Apparent steel use	11.2 million tonnes

Source: British Geological Society (2021)¹³⁸ Mineral Products Association (2020)¹⁴¹ and World Steel Association (2020)¹³⁹

Table 11.2: England production of minerals in 2021

Mineral	UK Production in Tonnes	Number of Mineral Workings in England	Number of Mineral Workings in the East Midlands
Igneous rock	129.3 million*	34	7
Limestone and dolomite		229	58
Sandstone		156	16
Sand and gravel	57.7 million	267	36

British Geological Society (2021)¹³⁸

Note: *Includes marine-dredged landings at foreign ports

¹⁴¹ Mineral Products Association (2020) Profile of the UK Mineral - Products Industry [online]. Available at: [https://mineralproducts.org/MPA/media/root/Publications/2021/Profile of the UK Mineral Products Industry 2020 Sp read.pdf](https://mineralproducts.org/MPA/media/root/Publications/2021/Profile%20of%20the%20UK%20Mineral%20Products%20Industry%202020%20Sp%20read.pdf) (Last accessed June 2022).

11.4.3 The Nottinghamshire and Nottingham Local Aggregate Assessment 2021¹⁴² and Nottinghamshire Minerals Local Plan (adopted 2021)¹⁴³ assess the demand for and supply of aggregates in the region of the scheme.

11.4.4 The Nottinghamshire and Nottingham Local Aggregate Assessment covers the geographical areas of Nottinghamshire, including the Nottingham City unitary authority area.

Table 11.3: Aggregate sales and reserves in for 2020 for Nottinghamshire and Nottingham

Aggregate	2020 Sales (Mt)	Average 10-year sales 2011 – 2020 (Mt)	Average 3-year sales 2018 – 2020 (Mt)	LAA* Rate (Mtpa)	Permitted Reserves (Mt)	Land-bank (years)
Sand and gravel	0.91	1.41	1.31	1.7	17.97	12.74
Sherwood Sandstone	0.15	0.35	0.34	0.37	8.98	25.66
Crushed rock (limestone)	0.00	0.00	0.00	0.005	3.34	N/A

Source: Nottinghamshire and Nottingham Local Aggregates Assessment (2021)¹⁴⁰ Nottinghamshire Minerals Local Plan (2021)¹⁴³ Mt = million tonnes

11.4.5 Table 11.4 lists the available aggregate sites in Nottinghamshire for the period of 2020. There are currently eight sand and gravel quarries in Nottinghamshire, of which six were fully active sites in 2020. There is also four permitted Sherwood Sandstone quarries in Nottinghamshire, three out of the four were fully active in 2020.

11.4.6 Nottinghamshire County has a permitted site to extract crushed rock (limestone) however the site has been inactive since 2007 due to the seasonal working of the site and abundance of limestone worked in Derbyshire and Leicestershire.

11.4.7 There are six aggregate recycling sites in Nottingham, Mansfield, Sutton and Retford to provide capacity to recycle up to one million tonnes of aggregate materials¹⁴⁴.

¹⁴² Nottinghamshire County Council (2021) Local Aggregate Assessment [online]. Available at: [Local Aggregate Assessment | Nottinghamshire County Council](#) (Last accessed August 2022).

¹⁴³ Nottinghamshire County Council (2021) Nottinghamshire Minerals Local Plan 2021 [online]. Available at: [adopted-minerals-local-plan.pdf](#) (Last accessed June 2022).

¹⁴⁴ Nottinghamshire County Council (2013) Waste Core Strategy 2020 [online]. Available at: [waste-core-strategy-1.pdf \(nottinghamshire.gov.uk\)](#) (Last accessed June 2022).

Table 11.4: The aggregate sites available in Nottinghamshire in 2020

Site name	Operator name	Facility type	Status
Langford Lowfields	Tarmac	sand and gravel	Active
Girton	Tarmac	sand and gravel	Inactive
Besthorpe	Tarmac	sand and gravel	Active
Sturton Le Steeple	Tarmac	sand and gravel	Yet to be worked
East Leake	CEMEX	sand and gravel	Active
Cromwel	CEMEX	sand and gravel	Active
Scrooby	Rotherham Sand & Gravel (RGS)	sand and gravel	Active
Misson Bawtry Road	Rowley	sand and gravel	Active
Burntstump	Tarmac	Sherwood sandstone	Active
Bestwood 2	Tarmac	Sherwood sandstone	Active
Two Oaks Farm	Mansfield Sand Company	Sherwood sandstone	Active
Scrooby Top	Rotherham Sand & Gravel	Sherwood sandstone	Inactive

Source: Nottinghamshire County Council (2021)¹⁴⁰

11.4.8 The stock of reserves with planning permission is known as the landbank. Government policy requires landbanks to be maintained for all primary aggregate minerals, with a required landbank of at least seven years.

11.4.9 At the end of 2020 permitted reserves within Nottinghamshire totaled 17.97 million tonnes for sand and gravel and 8.98 million tonnes for Sherwood Stone. Reserves for both sand and gravel and Sherwood Stone are above the minimum 7-year landbank requirement standing at 12.74 years and 25.66 years respectively.

11.4.10 Crushed rock sales remain at zero with the county's needs being met by imports from adjoining counties.

11.4.11 Peat resources and Mineral Safeguarding Areas (MSA) have been reviewed using Nottinghamshire's Mineral Local Plan¹⁴³ and information provided by Natural England. No peat resources or MSA's were identified within 500m of the scheme¹⁴⁵.

¹⁴⁵ Natural England (2021) Natural England, BGS, NSRI copyright. Contains Ordnance Survey data © Crown copyright and database right 2021. [online]. Available at: [Great Britain Open Data Map \(mottmac.com\)](https://mottmac.com) (last accessed August 2022).

Generation and management of waste

11.4.12 The most recent information available relating to current waste generation and operational waste management infrastructure in Nottinghamshire and the East Midlands region has been gathered to provide the baseline for this assessment. Information on the current waste arisings, and the waste management infrastructure has been determined through a desk-top study, using a number of readily available resources, in particular data from the Environment Agency, Defra and Nottinghamshire County Council.

Waste generation in the East Midlands region and England

11.4.13 The latest data from the Environment Agency¹⁴⁷ indicates that England produced over 220 million tonnes of waste in 2020, which was managed in 6,026 permitted waste facilities¹⁴⁶. The waste facilities in the East Midlands region received over 17 million tonnes of waste in 2020, and Nottinghamshire County Council received over 3 million tonnes¹⁴⁷ (as shown in Table 11.5).

Table 11.5: Waste breakdown by site type (2020)

Site Type	Nottinghamshire (tonnes)	East Midlands (tonnes)	England (tonnes)
Landfill	311,359	3,566,637	40,034,198
Transfer	612,000	4,245,297	42,439,790
Treatment (excluding metal recycling sector)	1,930,863	7,229,890	86,817,098
Metal Recovery	348,827	772,038	14,318,173
Incinerated	306,060	997,400	16,271,706
Use of Waste	0	0	147,921
Land Disposal	300,732	779,942	9,859,302
Total*	3,815,720	18,122,720	220,440,796

Source: Environment Agency (2022)¹⁴⁷ Note: Mobile plant, processing, combustion, mining and storage of waste are included in the overall waste arisings figures.

Construction and demolition waste

11.4.14 With respect to construction and demolition (C&D) waste in 2020, the Environment Agency recorded that 6,418,300 tonnes of inert (C&D) waste

¹⁴⁶ Environment Agency (2022) Waste Data Interrogator 2020 – Waste summary tables for England - Version 2 [online]. Available at: <https://environment.data.gov.uk/portalstg/home/item.html?id=ae41a10bedef480f9dd070b29e031cc5> (Last accessed June 2022).

¹⁴⁷ Environment Agency (2022) Waste Data Interrogator 2020 – Wastes received – version 4 [online]. Available at: <https://environment.data.gov.uk/portalstg/home/item.html?id=f4adcd438cb144f8ad2b24529bbec78f> (Last accessed June 2022).

was received in permitted waste facilities in the East Midlands region, with 1,560,010 tonnes received in those in the Nottinghamshire sub-region¹⁴⁷.

11.4.15 The Waste Data Interrogator (WDI) reported that 1,014,749 tonnes of inert C&D waste was removed from permitted waste facilities in the East Midlands region with 230,485 tonnes removed from those in the Nottinghamshire sub-region¹⁴⁸. Of the 76.6 million tonnes of non-hazardous C&D waste received in permitted waste facilities in England in 2020, 14.7 million tonnes were removed.

11.4.16 Excavation and site clearance activities generate a significant quantity of waste arisings. The baseline target for recovery of C&D waste is 70% by weight, as set out in the EU Waste Framework Directive 2008/98/EC. According to Defra¹⁴⁹, the recovery rate of non-hazardous C&D waste in 2018 was 92.3% and 93.8% in the UK and England respectively.

Hazardous waste

11.4.17 Table 11.6 summarises the quantities of hazardous waste received and removed from permitted waste facilities in 2020 in England, the East Midlands region and Nottinghamshire sub-region. According to the WDI¹⁴⁷, 122,288 tonnes of hazardous waste was received in permitted waste facilities in the Nottinghamshire sub-region in 2020, of which 5,976 tonnes (4.8%) comprised C&D waste. 435,431 tonnes of hazardous waste was removed from permitted waste facilities in the Nottinghamshire sub-region, of which 901 tonnes were classified as C&D waste.

Table 11.6: Hazardous waste received and removed in 2020

Hazardous waste	Nottinghamshire sub-region (tonnes)	East Midlands (tonnes)	England (tonnes)
Received	122,288	1,000,943	6,992,926
Removed	435,431	851,613	5,873,434

Source: Environment Agency (2021)^{146, 147}

Potential hazardous waste arisings

11.4.18 To identify potential sources of contamination an initial review of authorised and historical landfill sites that are in close proximity of the scheme has been undertaken using the Environment Agency's 'Historic

¹⁴⁸ Environment Agency (2022). Waste Data Interrogator 2020 – Wastes removed – Version 4 [online]. Available at: <https://environment.data.gov.uk/portalstg/home/item.html?id=1f2e26cd5897440495e184f46fe69cd5> (Last accessed June 2022).

¹⁴⁹ Defra (2021) UK Statistics on Waste [online]. Available at: [UK statistics on waste - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/uk-statistics-on-waste) (last accessed June 2022).

Landfill Sites’ web map¹⁵⁰ and ‘Permitted Waste Sites - Authorised Landfill Site Boundaries’ web maps¹⁵¹.

11.4.19 There are two authorised landfill sites within 500 metres of the draft red line boundary which are designated for factory curtilage as shown in Table 11.7. There is also one small area noted as a historical landfill. Potential sources of contamination that are greater than 500 metres away from the scheme have not been considered, as these are considered unlikely to affect the scheme.

Table 11.7: Historic and permitted landfill within 500 metres of the scheme

Site name	Operator	Status	Treatment facility type	Easting	Northing	Distance from scheme (meters)
Muskham Road	British Sugar Corporation	Historic	The landfill is recorded as having accepted inert and industrial waste	479,400	355,100	215m
Newark Sugar Factory	British Sugar Plc	Active	A7: Industrial Waste Landfill (Factory curtilage)	479070	355420	Adjacent to the boundary of the scheme
Newark Sugar Factory	British Sugar Plc	Active	A7: Industrial Waste Landfill (Factory curtilage)	479600	355200	305m from the scheme (at the closets point)

Source: Environment Agency (2022)^{154, 150}.

Waste management facilities

11.4.20 The Environment Agency reported that in 2020, 621 sites accepted waste in the East Midlands region, and at the end of 2020, 859 sites in the

¹⁵⁰ Environment Agency (2021) Historic Landfill Sites [online]. Available at: <https://data.gov.uk/dataset/17edf94f-6de3-4034-b66b-004ebd0dd010/historic-landfill-sites> (Last accessed June 2022).

¹⁵¹ Environment Agency (2021) Permitted Waste Sites - Authorised Landfill Site Boundaries [online] Available at: <https://data.gov.uk/dataset/ad695596-d71d-4cbb-8e32-99108371c0ee/permitted-waste-sites-authorised-landfill-site-boundaries> (Last accessed June 2022).

region had environmental permits to accept waste. There were 124 active sites receiving waste in the Nottinghamshire sub-region in 2020. Waste should be treated in compliance with the waste hierarchy, eliminating waste as a priority and recycling and recovering unavoidable waste as a next step, with waste disposal methods such as landfill only used as a last resort.

11.4.21 Table 11.8 outlines the remaining capacity of landfills within Nottinghamshire, the East Midlands region and England at the end of 2020. There are currently 11 permitted landfills in the Nottinghamshire sub-region with eight landfills having remaining capacity at the end of 2020. The sub-region has four inert landfills and four non-hazardous landfills.

Table 11.8: Landfill capacity at the end of 2020

Landfill type	Nottinghamshire sub-region (m ³)	East Midlands (m ³)	England (m ³)
Hazardous Merchant	-	962,110	15,571,171
Hazardous Restricted	-	7,550	809,640
Non-Hazardous with SNRHW* cell	-	16,437,873	66,969,897
Non-Hazardous	3,839,981	18,830,328	164,824,065
Non-Hazardous Restricted	-	-	-
Inert	4,392,331	8,779,556	140,191,731
Total	8,232,312	26,205,919	388,366,504

Source: Environment Agency¹⁵²

11.4.22 The remaining capacity for the Nottinghamshire sub-region at the end of 2020, was 3,839,981 for non-hazardous landfill and 4,392,331 m³ for inert landfill. There are four inert landfills with remaining capacity, these are outlined in Table 11.9.

Table 11.9: Nottinghamshire permitted sites for inert landfill

Facility name	Operator name	Local Authority	Remaining capacity at the end of 2020 (m ³)
Serlby Landfill	WRG Waste Services Ltd	Bassetlaw	135,0000
Harrycroft Quarry Landfill Site	Lafarge Aggregates Limited	Bassetlaw	688,653

¹⁵² Environment Agency (2022) 2020 Remaining Landfill Capacity v2 [online] Available at: <https://environment.data.gov.uk/portalstg/home/item.html?id=7c316868000146ab8a5b2d07bff82368> (Last accessed June 2022).

Borrow Pits Landfill	British Sugar Plc	Newark and Sherwood	390,565
Vale Road Quarry	Mldland Landfill Ltd	Mansfield	1,963,113

Source: Environment Agency (2021)¹⁵²

11.4.23 A search on the Environment Agency’s public register¹⁵³ was undertaken for all permitted waste facilities within 10 kilometers of the existing A46 between the Farndon and Winthorpe junctions, measured from postcode NG24 1HN. This single location was selected as it is located centrally along the scheme. The search on the public register showed that there are 22 waste facilities, nine of which can treat or transfer C&D waste, within a 10 kilometre distance.

11.4.24 Table 11.10 outlines the available facilities for recycling and recovery which manage C&D waste, either through transfer, treatment, crushing and screening, and storage, within 10 kilometres of the existing A46 junctions. Not all treatment facilities may be suitable for the waste generated by the scheme during construction, but it demonstrates that sufficient treatment facilities are available for the waste that will be generated by the scheme.

11.4.25 Reuse, recycling and recovery of wastes will be prioritised. However, if these options are not available or feasible the following alternative is to adopt the Proximity Principle.

11.4.26 There are two appropriate permitted landfills within 10 kilometres of the scheme and 13 landfills with remaining capacity that lie within a 50 kilometre radius of the existing A46 junctions. The volumes of waste generated by the scheme will be assessed against the capacities of the relevant waste infrastructure to identify if there is sufficient capacity available.

Table 11.10: Suitable licensed waste facilities within 10 kilometres of the existing A46 between the Farndon and Winthorpe junctions

Site name	Operator	Treatment facility type	Postcode	Distance from the scheme (kilometres)
Newark H W R C	Veolia Environmental Services Nottinghamshire Ltd	S0813 No 13: 75kte Non-hazardous & hazardous HWA Site	NG24 2DE	1.1

Site name	Operator	Treatment facility type	Postcode	Distance from the scheme (kilometres)
Newark Waste Transfer Station	Veolia E S Nottinghamshire Ltd	S0805 No 5: 75kte HCI Waste TS + asbestos	NG24 2DZ	1.1
Briggs Metals Ltd	Briggs Metals Ltd	A20: Metal Recycling Site (mixed MRS's)	NG24 1DP	1.2
Quarry Farm	Nubeau Holdings Ltd	S0803 No 3: 75kte HCI Waste TS + treatment	NG24 3BZ	3.8
Quarry Farm Transfer Station	Regional Waste Recycling (Commercial) Ltd	A11: Household, Commercial & Industrial Waste T Stn	NG24 3BZ	4.0
Newark Mini Skips	Ivan Hall	S1504 No 4: 75kte HCI Waste TS	NG24 3BZ	4.1
Laffy's	Laffey's Ltd	S0906 No 6: Inert & Excavation WTS with treatment	NG23 5AJ	6.4
Cromwell Quarry	Tarmac Aggregates Ltd	S0803 No 3: 75kte HCI Waste TS + treatment	NG23 6JE	7.2
British Waterways Hazelford Lock	Canal and River Trust	A11: Household, Commercial & Industrial Waste T Stn	NG14 7FT	8.8

Source: Environment Agency (2021)¹⁵⁴

¹⁵⁴ Environment Agency (2022) Public Registers [online]. Available at: [Environmental Permitting Regulations – Waste Operations \(data.gov.uk\)](#) (last accessed June 2022).

Table 11.11: Permitted landfill sites with remaining capacity within 50 kilometres of the existing A46 Farndon and Winthorpe junctions for construction and demolition waste

Landfill facility name	Operator name	Landfill type	Remaining capacity at the end of 2020 (cubic metres)	Distance from the scheme (kilometres)
Borrow Pits Landfill	British Sugar Plc	L05 - Inert Landfill	390,565	2.8
Staple Quarry Landfill Site	FCC Recycling (UK) Ltd	L04 - Non-Hazardous	35,579	9.6
Lincwaste Ltd	Whisby Landfill	L04 - Non-Hazardous	2,595,652	18.5
Lincwaste Ltd	North Hykeham Landfill Site	L04 - Non-Hazardous	322,742	20.3
Lincwaste Ltd	Leadenham Landfill	L04 - Non-Hazardous	1,624,337	20.5
Brauncewell Quarries	Brauncewell Quarry	L05 - Inert Landfill	1,216,562	26.8
Harmston Waste Management Ltd	Harmston Quarry	L05 - Inert Landfill	114,188	27
EDF Energy (West Burton Power) Ltd	Cottam Ash Lagoons	L04 - Non-Hazardous	1,571,776	31.4
Midland Landfill Ltd	Vale Road Quarry	L05 - Inert Landfill	1,963,113	36.3
Lincwaste Ltd	Gainsborough Landfill	L04 - Non-Hazardous	1,604,238	37
EDF Energy (West Burton Power) Ltd	Bole Ings Ash Disposal Site	L04 - Non-Hazardous	1,435,146	42.5
WRG Waste Services Ltd	Serlby Landfill	L05 - Inert Landfill	1,350,000	47.2
Uniper UK Ltd	Ratcliffe on Soar Power Station	L04 - Non-Hazardous	797,480	49.1
Saint-Gobain Construction Products UK Ltd	Welby Tip	L04 - Non-Hazardous	22,943	49.4
Tarmac Trading Ltd	Brooksby Quarry	L05 - Inert Landfill	256,428	49.8

Source: Environment Agency (2021)^{152, 154}

11.4.27 In addition to permitted C&D waste management sites, inert material is also managed on sites that have an Environment Agency Environmental Permit exemption. These exempt sites generally comprise of land

restoration activities such as restoring mineral voids, engineering /landscaping schemes and for agricultural improvements on farmland. These sites are an important part of the provision of the capacity for managing inert materials. Although small tonnages of waste from other waste streams (e.g., biodegradable waste) may be managed at locations with an exemption, the largest tonnage of exempt activities is likely to involve C&D material.

11.4.28 There are 310 waste exempt sites listed by the Environment Agency within 10 kilometres of the A46 Farndon and Winthorpe junctions, of which 146 are ‘use of waste in construction’ (U1) exempt sites. U1 exempt sites utilise waste for the purpose of construction, such as buildings or engineering work, and are often short-lived, and therefore should be identified upon commencement of construction.

Future baseline

11.4.29 The future waste baseline has been assessed on the basis of a desktop review of the waste forecasts presented in Nottinghamshire and Nottingham Waste Core Strategy¹⁴⁴ for dealing with future waste arisings and is provided in Table 11.12.

Table 11.12: Forecast waste arisings (million tonnes) to 2030 in the Nottinghamshire sub-region

Waste stream	2015	2020	2025	2030
Municipal	637	653	669	683
Commercial/ Industrial	1,472	1,472	1,472	1,472
Construction/D emolition	2,725	2,725	2,725	2,725
Total	4,834	4,850	4,867	4,880

Source: Nottinghamshire County Council (2013)¹⁴⁴

11.4.30 Any future changes to this permitted capacity and throughput of waste management facilities are uncertain.

11.4.31 Exact quantities of materials required for the scheme are not known at this point however, the landbank requirements for Sherwood Sandstone and sand and gravel quarries are above the minimum seven-year requirement set out in the Nottinghamshire and Nottingham Local Aggregate Assessment¹⁴³. Therefore, it can be assumed that the scheme will not place pressure on resource availability.

11.5 Potential impacts

Construction

11.5.1 This section provides an overview of potential impacts relating to material resource use and waste generation as a result of the scheme during its construction. The construction phase considers site preparation, demolition and construction.

Use of Material resources

11.5.2 The types of material resources likely to be required are as follows (although the list is not exhaustive):

- Steel.
- Concrete.
- Plastic.
- Wood.
- Cement.
- Aggregate.

11.5.3 The receptors likely to be subject to impacts as a result of the requirement for material resources during the construction of the scheme include quarries and other sources of minerals, and other finite raw material resources. The potential impacts associated with the use of material resources on these receptors include:

- The availability of material resources and the subsequent impact on the demand for materials. Materials would need to be imported to the site as it is assumed that the scheme would be unlikely to recover / reuse site won material.
- The depletion of non-renewable resources. The majority of materials used on the scheme would comprise primary materials as the scheme is unlikely to be able to source all required materials from recycled / secondary materials.
- Sterilisation of Mineral safeguarding areas and/or peat resources.

Generation and management of waste

11.5.4 Waste generation during the construction phase may result in adverse impacts. These impacts include the temporary increased use of waste management facilities and permanent reduction in landfill capacity. Waste is likely to be generated primarily from site-won materials from excavations of natural and Made Ground but is also expected from the demolition of existing structures and from materials brought to site which are not used for their original purpose. Waste produced from the scheme must be

managed in compliance with the waste hierarchy, promoting waste prevention and maximizing recycling/recovery of waste that cannot be prevented. Waste arisings likely to be generated during the construction phase include:

- Debris and litter lying on the ground.
- Soil which may be contaminated or unsuitable for reuse without treatment.
- Inert waste from site preparation and excavation.
- Surplus excavated materials.
- Green waste from vegetation clearance and small quantities of unsorted non-hazardous waste like timber.
- Hazardous waste.
- Surplus material from site preparation (including any remediation) and excavation works.
- Damaged stock or cut-offs.

11.5.5 The receptors likely to be subject to impacts as a result of waste generation and its management are landfills and other waste management infrastructure. The potential impacts relating to the generation and management of waste on these receptors include:

- Temporary occupation of waste management infrastructure capacity (from treatment of waste).
- Temporary occupation of land for the storage of waste awaiting transfer off-site.
- Permanent reduction in landfill capacity (from disposal of waste).

11.5.6 Specific data is not available during environmental scoping, however, it is expected as the scheme is located within a flood zone that a significant cut and fill balance is likely to be created by the removal of fill material in flood compensation areas. The cut and fill balance must be managed in accordance with the waste hierarchy to reduce the impact of the waste arisings, prioritising reuse and recycling over disposal methods.

Operation

Use of material resources

11.5.7 There would be minimal requirement for materials used in the operation of the scheme with the exception of small quantities of materials that may be required for maintenance.

Generation and management of waste

11.5.8 The scheme would aim to minimise the generation of waste as much as possible throughout operations, this would include, but not be limited to, promoting resource efficiency by repairing and reusing materials, delivering infrastructure with reduced interventions required for maintenance and complying with required maintenance schedules to prolong materials' lifespans. Further measures to prevent the generation of waste can be found in section 11.6. The waste generated during the operation of the scheme is expected to be minimal in volume and similar in nature to existing waste produced by the scheme, hence the decision to scope out the generation of management of waste from operations.

11.6 Design, mitigation and enhancement measures

Design measures

11.6.1 A Design for Resource Efficiency (D4RE) online workshop was held on 1 April 2022 with the design team. The aim of the workshop was to identify opportunities to improve resource efficiency during the design of the scheme options. This would ensure cost savings are maximised by considering waste minimisation initiatives and identifying opportunities to reduce, reuse or recycle waste materials and improve resource efficiency.

11.6.2 A Resource Management Opportunities Matrix was used during the D4RE workshop to identify suitable opportunities. The matrix will utilise the D4RE Tool which assists designers, through the workshop format which is based on a stepped approach of identify, evaluate, capture and implement, to develop mitigation measures for resource use and waste management.

11.6.3 Opportunities were identified in the D4RE workshop, to enable resource efficiency and reduction in waste. All opportunities identified in the D4RE workshop may not have been integrated into the scheme design to date, but will continue to be explored and integrated where feasible. Opportunities identified include:

- Repair and reuse of existing drainage.
- Use of precast drainage solutions.
- Source local fill material.
- Identify uses for recycled aggregate and utilise.
- Use of warm mix asphalt.
- Reduce verge width of structure at the chainages.
- Opportunity to reduce cross section and the volume of concrete of the central barrier whilst maintaining safety and structural integrity.
- Low height modular gravity wall systems to reduce earthwork footprint along embankment widening.

- Reuse of site won stone in Sustainable Drainage System (SuDS).
- Use of electric, hydrogen or hydrotreated vegetable oil power.
- Minimise thickness of starter layers.
- Minimise footprint of works.
- Low carbon concrete kerbs, drainage outfalls and drainage chambers.
- Retain as much soil as possible utilising soil restoration for carbon sequestration.
- Recycle of planings for use in construction.
- Explore potential for 'green' steel with manufacturers.
- Use geo-membrane as back of wall drainage instead of individual blocks.

Mitigation measures

Construction

11.6.4 Measures would be implemented to reduce the effects of material resource use and waste generation by the scheme during construction. There is substantial overlap in the mitigation for both aspects (material resource use and waste generation), due to the synergy between the reuse of materials and the avoidance of waste generation. Potential mitigation measures identified at this stage include:

- Materials would be delivered on an 'as required' basis to avoid damage or contamination and therefore limit the likelihood of waste.
- All suitable excavated material would be reused in the construction of the scheme and in landscaping features to reduce the requirement to import materials for construction and reducing the need to remove surplus materials from site.
- Temporary stockpiling of fill materials prior to incorporation in the scheme would be avoided where possible, to ensure double handling and damage is minimised and therefore avoidance of waste. However, where required, materials would be stockpiled in accordance with best practice and managed appropriately to limit the likelihood of damage or contamination.
- Locally sourced materials and suppliers would be identified and used where practicable.
- Pre-cast elements would be used where practicable to ensure efficient use of materials and avoid the generation of waste arisings from off-cuts.
- The waste hierarchy would be implemented throughout construction to minimise disposal and maximise reuse and recycling of waste arisings. Opportunities for reuse and recycling of waste include (but are not limited to):
 - Re-using excavated soils on-site in the landscaping features of the scheme.

- Chipping green waste on-site for use in the landscaping for the scheme.
 - Composting of green waste.
 - Recycling of inert material by crushing, blending and subsequent reuse, as an aggregate.
 - Re-using waste for uses with clear benefits to the environment, for example in the remodelling of agricultural land or in the restoration of borrow pits.
 - Facilities would be provided on-site to separate out waste to enable the recovery of material through recycling.
- Where waste must be taken to a recycling or disposal site, the contractor must ensure that the sites have the appropriate permits. In addition, the suitable facility would be located as close to the works as possible to minimise the impacts of transportation, in particular the release of GHG emissions. The contractor would identify the closest and relevant treatment and disposal sites.
 - A non-exhaustive list of waste infrastructure sites within 10 kilometers of the scheme is provided in Table 11.10. The ability for waste arisings to be deposited at these sites will be dependent on the conditions imposed on the sites by the relevant licence or permit. There may be other facilities in the vicinity of the scheme that may be used.
 - A non-exhaustive list of permitted landfill sites that could potentially receive inert waste from the scheme is presented in Table 11.9.
 - The sites that have an Environment Agency Environmental Permit exemption can also potentially receive inert waste.
 - Consideration will be given to the need for a Site Waste Management Plan (SWMP), which would consider the sourcing, transport and use and disposal of materials in a sustainable manner and take account of, and capture, design changes as the scheme design evolves and would ensure that unavoidable construction waste is identified and able to be managed in accordance with the waste hierarchy and other relevant legislative requirements. The SWMP would be used to derive the management options that would achieve the highest practicable performance levels within the hierarchy.
 - A Second Iteration Environmental Management Plan will be produced and will incorporate the mitigation measures proposed
 - A Materials Management Plan (MMP) should also be produced by the contractor for the earthworks. This would ensure that any adverse effects associated with material resource use and waste generation are managed.

Operation

11.6.5 The mitigation measures outlined above for construction should be implemented during any maintenance activities for the scheme once operational, where applicable. This will assist in reducing material requirements and waste generation ensuring compliance with the waste hierarchy.

Enhancement measures

11.6.6 Enhancement measures for waste and resources will be considered as part of the ongoing EIA and design development of the scheme and will be reported in the ES.

11.7 Description of the likely significant effects

Construction

Use of material resources

11.7.1 It is not anticipated that all site-won material would be reused on the scheme, due to the potential poor quality of the material and its unsuitability for use as structural fill. It is likely, therefore, that backfill to structures would be imported to site, as material meeting the required specification is assumed would not be won from the site.

11.7.2 In addition, it is unlikely that suitable materials for the road construction would be available from site-won material, such as capping material and sub-base, which would need to be imported. The volumes of imported material would depend greatly on the characteristics of the existing ground. Elements such as steel for structures and barriers, lighting columns and ducts, signs and communications infrastructure would also need to be imported for use within the scheme.

11.7.3 It is not anticipated that any peat resources will be sterilised as a result of the scheme as no deposits are located within 500 metres of the scheme's footprint⁷⁰. According to the Nottinghamshire Minerals Local Plan¹⁴⁰, the site does not lie within a mineral safeguarding area.

11.7.4 It is likely that any significant effects due to the quantity of material resources required could be appropriately mitigated through the implementation of mitigation measures outlined in Section 11.5. However, without accurate material quantification at this stage for the preliminary design of the proposed scheme, this assumption cannot be confirmed. Therefore, further assessment within the ES will be necessary, with accurate material quantification and preliminary design information, to confirm the likelihood of significant effects.

Generation and management of waste

The scheme would aim to minimise the generation of waste as much as possible, through the implementation of the waste hierarchy. Additionally, it is assumed at this stage that the surplus cut materials would be suitable to be re-used in the landscaping for the scheme.

It is unlikely that the generation and management of waste would result in significant effects conditional to appropriate waste management and the implementation of mitigation measures suggested in the report.

Due to current uncertainties regarding the quantities of waste anticipated further assessment is required to confirm the likelihood of significant effects.

Operation

Use of material resources

11.7.5 Significant adverse effects are not likely for material assets during the operation of the scheme due to the relatively negligible quantities required for the operation and maintenance of the scheme.

11.7.6 The use of materials and waste produced through the operation of the scheme will be negligible. It is anticipated that materials required for maintenance activities would be infrequent and unlikely to require large volumes of material resources. Furthermore, it is expected that in the infancy of the scheme maintenance will not be required, therefore, there will be very minimal requirement for any use of materials or generation of waste. From professional experience and analysis of previous scoping reports conducted on similar road schemes, the use of materials and generation of waste during operation are typically scoped out due to them not meeting significant classification according to the criteria in the DMRB LA 110. Therefore, the use of material resources during the operational phase of the scheme has been scoped out of further assessment.

Generation and management of waste

11.7.7 It is anticipated that waste generated through general operational activities and significant maintenance and repair activities would be infrequent and unlikely to generate large volumes of waste requiring treatment or disposal.

11.7.8 Effective waste management in the scheme will control the generation of waste produced, furthermore the waste produced from operations can be treated in a similar way to existing waste types produced by the scheme. Therefore, the generation of waste during the operational phase of the scheme has been scoped out of further assessment for all scheme options.

11.8 Assessment methodology

11.8.1 The proposed methodology is in line with that outlined in DMRB LA110 Material Assets and Waste. The methodology will also ensure it is in line with the following guidance and best practice for material assets and waste:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites¹⁵⁵.
- CL:AIRE Definition of Waste: Development Industry Code of Practice¹⁵⁶.

11.8.2 Industry standards for assessing the impact of materials and waste for projects of this nature is available from DMRB LA 110 and will be used to assess the matters that are scoped in. The assessment will consider the following:

- Types and quantities of materials required for the scheme, where known.
- Details of the source or origin of materials, site-won materials to replace virgin materials, materials from secondary or recycled sources, or virgin or non-renewable sources, if known.
- The type and volume of materials that will be recovered from offsite sources.
- Cut and fill balance.
- Details of on-site storage and stockpiling arrangements.
- Forecast of non-hazardous, hazardous, and inert waste arisings.
- Surplus materials and waste falling under regulatory controls.
- Wastes that require storage on-site prior to re-use, recycling and disposal.
- Wastes to be pre-treated on-site for re-use within the scheme.
- Wastes requiring treatment or disposal off site.
- The impacts that will arise from the issues identified in relation to materials and waste.
- Identification of mitigation measures based on identified impacts.
- Conclusion based on nature and magnitude of impacts.

11.8.3 The assessment of effects on material resources and waste generation will encompass effects arising during:

¹⁵⁵ Department for Environment, Food and Rural Affairs (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [online]. Available at: [Construction Code of Practice for the Sustainable Use of Soils on Construction Sites \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/411113/Construction_Code_of_Practice_for_the_Sustainable_Use_of_Soils_on_Construction_Sites.pdf) (last accessed June 2022).

¹⁵⁶ Contaminated Land: Applications in Real Environments (2011) The Definition of Waste: Development Industry Code of Practice [online]. Available at: [Definition of Waste. Development Industry Code of Practice.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411113/Definition_of_Waste_Development_Industry_Code_of_Practice.pdf) (last accessed June 2022).

- The construction of the scheme up until the point when the scheme opens.
- The operation of the scheme in relation to maintenance for the lifetime of the scheme as well as those required or generated by the users of the scheme.

Significance criteria

11.8.4 The categories for significance are provided in Table 11.13 and 11.14 which define the significance category description and significance criteria. For these tables “Region” means the authority comprising the study area, in this case Nottinghamshire. “Primary materials” describes materials that are from a non-renewable source.

Table 11.13: Significance categories and descriptions for material assets and waste generation

Significance category	Description
Very Large	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • No criteria: use criteria for large categories. <p><i>Waste:</i></p> <ul style="list-style-type: none"> • >1% reduction or alteration in national capacity of landfill, construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • Project achieves <70% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and • Aggregates required to be imported to site comprise <1% re-used/recycled content and • Projects sterilises >1 mineral safeguarding site and/or peat resource <p><i>Waste:</i></p> <ul style="list-style-type: none"> • Project achieves 1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and • >50% of project waste for disposal outside of the region.
Moderate	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • Aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target <p><i>Waste:</i></p> <ul style="list-style-type: none"> • >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and

Significance category	Description
	<ul style="list-style-type: none"> • 1-50% of project waste for disposal outside of the region.
Slight	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • Project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • Aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target. <p><i>Waste:</i></p> <ul style="list-style-type: none"> • ≤1% reduction or alteration in the regional capacity of landfill; • waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • Project achieves >99% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials; and • Aggregates required to be imported to site comprise >99% re-used / recycled content. <p><i>Waste:</i></p> <ul style="list-style-type: none"> • No reduction or alteration in the capacity of waste infrastructure within the region.

Source: Design Manual for Roads and Bridges: LA 110 Material assets and waste (2019) ¹¹⁶

Table 11.14: Significance criteria for material assets and waste

Significance	Description
Significant (one or more criteria met)	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • category description met for moderate or large effect. <p><i>Waste:</i></p> <ul style="list-style-type: none"> • category description met for moderate, large or very large effect
Not significant	<p><i>Material assets:</i></p> <ul style="list-style-type: none"> • category description met for neutral or slight effect. <p><i>Waste:</i></p> <ul style="list-style-type: none"> • category description met for neutral or slight effect.

Source: Design Manual for Roads and Bridges: LA 110 Material assets and waste (2019) ¹¹⁶

11.9 Assessment assumptions and limitations

- 11.9.1 A summary of key assumptions and limitations is provided below:
- 11.9.2 Cut and fill volumes that include the flood compensation area were not available at the time of writing this scoping report. Therefore, the assessment is limited to identifying activities that are likely to require significant quantities of materials, or are likely to generate significant quantities of waste. Conclusions and recommendations may be revised within the ES, on the basis of updated information following further research, quantitative analysis and investigation.
- 11.9.3 Baseline information and potential effects identified are based on publicly available information. At this scoping stage there are no material or waste quantities available, therefore, assumptions such as existing arrangements in respect of operational waste have been considered sufficient for the scheme.
- 11.9.4 This scoping chapter has not considered the environmental effects associated with the off-site extraction of raw materials used for the off-site manufacture of products. These stages of the products or materials' lifecycles are outside of the scope of the assessment due to the range of unknown variables associated with the processes involved and are not considered to form part of the scheme. In most cases, it can also be assumed that these processes would have already been subject to EIAs in securing consents for the facilities' operation.
- 11.9.5 Information on permitted capacity of waste management facilities has been used in the assessment, based on current publicly available data (at the time of writing). The permitted capacity of waste management facilities indicate that the waste generated from the scheme should not pose a significant effect, however, as waste types and quantities are unknown at this stage, waste during construction will be scoped in for further assessment.
- 11.9.6 There is potential for change to permitted capacities, opening of additional waste management facilities and closure of existing facilities.
- 11.9.7 Given the indicated remaining capacities for the Nottinghamshire sub-region at the end of 2020, there is potential for there to be sufficient availability to handle waste generated from the construction and operation of the scheme, 'however, as waste types and quantities are unknown at this stage, waste during construction will be scoped in for further assessment.
- 11.9.8 The procurement strategy for the materials required for the construction of the scheme is unknown at this stage and likely to be unknown for the ES.

For the purposes of the assessment, it will be assumed that, apart from bulk fill, not all materials would be available to be sourced locally (within Nottinghamshire), and that the majority would be sourced nationally (within the UK). This will represent the (environmentally) worst case scenario.

11.10 Consultation

11.10.1 No consultation specific to material assets and waste has been undertaken to date. Consultation with the Environment Agency and Newark and Sherwood District Council will be progressed if required during the development of the scheme design and ES.

11.11 Summary

11.11.1 In line with the LA 110, responses to the following scoping questions in Table 11.15 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 11.15: Materials and Waste scoping questions

Scoping Question	Answer
1) Is the project likely to recover/reuse little on site material thereby requiring materials to be imported to site?	The project will prioritise recovering and reusing material where possible as discussed in the design measures highlighted in section 11.6. It is anticipated that some material will need importing where recovering or reusing site-won materials is not possible. The use of materials during construction is scoped in for further assessment.
2) Is the project likely to use little/no recycled/secondary materials thereby requiring the majority of materials used on the project to comprise primary materials?	The majority of the materials used in the construction of the project will comprise of primary materials as it is unlikely that all materials can be sourced from recycled or secondary materials. However, as highlighted in section 11.6 Design, mitigation and enhancement measures, measures will be taken to utilise recycled or secondary materials where possible. The use of materials during construction is scoped in for further assessment.
3) Is the project is likely to sterilise (substantially constrain/prevent existing and potential future use of) mineral sites or peat resources?	No, the project is not located within 500 metres of any peat resources or MSAs.

Scoping Question	Answer
4) Would the project generate large quantities of waste relative to regional landfill capacity?	The project aims to reduce the production of waste. Where this is not possible the waste hierarchy will be implemented, using landfill as a last resort. Therefore the quantity of waste sent to landfill is expected to be minimal. In addition, the Nottinghamshire region has sufficient availability in both non-hazardous and inert landfills for the acceptance of waste materials, consequently the waste material generated from the scheme would have a minimal effect on the available capacities. However, due to current uncertainties regarding the quantities of waste anticipated, the generation of waste during construction is scoped in for further assessment.

11.11.2 The proposed scope of the ES is contained within Table 11.16.

Table 11.16: Summary of potential impacts and requirement for further assessment

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Use of materials	N/A	Further assessment is required, due to the uncertainties in material types and volumes.
	Generation of waste	N/A	Further assessment is required, due to the uncertainties in types and volumes of waste generated and its management.
Operation	N/A	Use of materials	No further assessment is required as maintenance activities will be infrequent and consequently expected volumes of materials will be minimal.
	N/A	Generation of waste	No further assessment is required as operational activities would unlikely generate large volumes of waste requiring treatment or disposal.

12 Noise and Vibration

12.1 Introduction

12.1.1 This chapter aims to identify the potential for significant effects of the scheme upon noise and vibration. This chapter has been prepared in accordance with DMRB LA111 Noise and Vibration¹⁵⁷. Further assessment will be presented within the ES.

12.2 Legislation and policy

12.2.1 The following legislation, policy, standards, and guidelines are considered to be relevant to the assessment of noise and vibration due to the scheme:

Legislation

The Land Compensation Act 1973 Part 1

12.2.2 The Land Compensation Act 1973 Part 1¹⁵⁸ includes provision for compensation for loss in property value resulting from physical factors, including noise and vibration, resulting from the use of public works, such as new or improved roads.

The Noise Insulation Regulations 1975 (amended 1988)

12.2.3 The Noise Insulation Regulations 1975 (amended 1988)¹⁵⁹ were made under Part 2 of the Land Compensation Act for the obligatory and discretionary provision of noise mitigation measures for dwellings adjacent to new highways. Among the criteria for a property to qualify for insulation in living rooms and bedrooms is the façade noise level is at least 68 dB LA10,18hr, and that noise from the new or altered highway increases by at least 1 dB.

The Control of Pollution Act 1974 (sections 60 and 61)

12.2.4 Whilst receptors that live nearby to construction activities may accept that there would be some disturbance caused to those living nearby, the Control of Pollution Act 1974¹⁶⁰ offers further protection. Section 60 of the Act enables a local authority to serve a notice specifying its noise control requirements covering plant or machinery (which is or is not being used), hours of working, and levels of noise that can be emitted. Section 61 relates to prior consent in which the contractor consults with the local authority and provides an application prior to construction works

¹⁵⁷ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

¹⁵⁸ Her Majesty's Stationery Office, Land Compensation Act, 1973.

¹⁵⁹ Her Majesty's Stationery Office, Noise Insulation Regulations. Building and Buildings, 1975.

¹⁶⁰ Her Majesty's Stationery Office, The Control of Pollution Act, 1974.

commencing to obtain approval for the methods to be used and the steps proposed to minimise noise resulting from the works.

The Environmental Noise (England) Regulations 2006 (amended 2018)

12.2.5 The Environmental Noise (England) Regulations¹⁶¹ implement European legislation requiring noise action plans to be developed on a five-year rolling programme. Action plans have to be developed for the major noise sources and areas for which maps have been produced and that identified ‘Important Areas’ for future mitigation. The action plans seek to manage noise issues and effects including noise reduction, if necessary, based on the results obtained through the mapping process.

National policy

The National Policy Statement for National Networks 2014

12.2.6 The National Policy Statement for National Networks (NPSNN)¹⁶² sets out the need for, and Government’s policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It promotes good health and good quality of life through effective noise management and notes at paragraph 1.193 that *“Due regard must have been given to the relevant sections of the Noise Policy Statement for England, National Planning Policy Framework and the Government’s associated planning guidance on noise”*. Government policy is set out in the Noise Policy Statement for England – see below.

12.2.7 The NPSNN states at paragraph 5.200, “Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process”.

12.2.8 Paragraph 5.191 of the NPSNN states that noise should be assessed using the principles of the relevant British Standards and other guidance and that prediction of road traffic noise should be based on the method described in the Calculation of Road Traffic Noise (CRTN).

The National Planning Policy Framework 2021

12.2.9 Paragraph 174 of the National Planning Policy Framework¹⁶³ (NPPF) states that: “Planning policies and decisions should contribute to and enhance the natural and local environment by:...e) preventing new and existing development from contributing to, being put at unacceptable risk

¹⁶¹ Her Majesty’s Stationery Office, Environmental Noise Regulations, 2006 (Amended 2018).

¹⁶² Department for Transport, National Policy Statement for National Networks, 2014.

¹⁶³ Department for Levelling Up, Housing and Communities, National Planning Policy Framework (NPPF), 2021.

from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.”

12.2.10 Paragraph 185 of the NPPF states that planning policy and decisions should aim to: “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; Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”

The Noise Policy Statement for England (NPSE) 2010

12.2.11 The Noise Policy Statement for England (NPSE)¹⁶⁴ purpose is to promote “good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.” The three main aims are to:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

12.2.12 Within the aims stated above there are several key phrases that lead to additional concepts now considered in the assessment of noise impact; these and their definitions are detailed below:

- Lowest Observed Adverse Effect Level (LOAEL): this the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL): this is the level above which significant adverse effects on health and quality of life occur.

12.2.13 There are no pre-defined levels for these effect levels as it is acknowledged that they will be different for different sources, different receptors and at different times.

¹⁶⁴ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

Planning Practice Guidance 2014

12.2.14 Planning Practice Guidance (PPG)¹⁶⁵ provides guidance on how the policy set out in NPPF may be interpreted in practice for a wide range of issues. There is a subsection of PPG relating specifically to noise:

12.2.15 “Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *Whether or not a significant adverse effect is occurring or likely to occur.*
- *Whether or not an adverse effect is occurring or likely to occur.*
- *Whether or not a good standard of amenity can be achieved.*

12.2.16 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level...”

12.2.17 Among the specific factors to consider where relevant the guidance states: “In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.”

12.2.18 PPG provides a noise exposure hierarchy which describes the perception and outcomes associated with increasing effect levels.

Local policy

Nottinghamshire Local Transport Plan 2011-2026 (Nottingham Agglomeration Noise Action Plan)

12.2.19 The Nottinghamshire Local Transport Plan 2011-2026¹⁶⁶ presents considerations on road induced noise affecting the health, wellbeing and quality of life of communities, also stating: “..Priority will be given to 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.”.

¹⁶⁵ Department for Communities and Local Government, Planning Practice Guidance, 2019.

¹⁶⁶ Nottinghamshire Local Transport Plan 2011-2026, Nottingham County Council

Standards and guidance

DMRB LA 111 Noise and Vibration

12.2.20 The DMRB LA 111 'Noise and Vibration'¹⁶⁷ provides the assessment requirements for highways projects in the UK and best reflects EIA methodology as applied to highways. It includes requirements for the classification of magnitude of impact, assessment of both long and short-term effects and determination of significance.

Calculation of Road Traffic Noise 1988

12.2.21 Calculation of Road Traffic Noise¹⁶⁸ provides procedures for predicting noise levels for a given flow of road traffic at sensitive receptors. These methodologies are used in the determination of entitlement under the Noise Insulation Regulations and for traffic noise change assessments undertaken in accordance with DMRB LA 111.

British Standard 5228:2009+A1:2014

12.2.22 British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 1: Noise¹⁶⁹ provides a methodology for calculating noise levels generated by fixed and mobile plant used for a range of typical construction operations.

12.2.23 BS 5228-1 provides guidance for the determination of significance of noise effects due to construction activities which combine both an exceedance of noise level thresholds and time period of works. The guidance also recommends mitigation and measures that can be applied to minimise noise impacts from construction works.

12.2.24 British Standard 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 2: Vibration¹⁷⁰ details that even when it is of a very low magnitude, vibration generated as the result of construction or operation of a development can be perceptible to people living or working close by. Nuisance associated with vibration is frequently associated with the assumption that, if vibrations can be felt, then damage is inevitable. However considerably greater levels of vibration over the perceptible threshold are required before damage to buildings at either a cosmetic or structural level will occur.

¹⁶⁷ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

¹⁶⁸ Department of Transport, Calculation of Road Traffic Noise, 1988.

¹⁶⁹ British Standards Institution, BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise, 2014.

¹⁷⁰ British Standards Institution, BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration, 2014.

WHO Night Noise Guidelines for Europe, 2009

12.2.25 The WHO Night Noise Guidelines for Europe (NNG)¹⁷¹ suggest on a very precautionary basis, that the population should not be exposed to a NNG value greater than 40 dB $L_{\text{night, outside}}$ (defined as the night noise level outside in free field conditions) during the part of the night when most people are sleeping. However, the precautionary nature of this target is fully appreciated by the WHO and a noise level of 55 dB $L_{\text{night, outside}}$ is therefore recommended relating to the onset of heart disease.

WHO Environmental Noise Guidelines for the European Region, 2018

12.2.26 The World Health Organization Environmental Noise Guidelines for the European Region¹⁷² provide evidence-based recommendations on the health effects of noise. The guidelines complement the expert-based recommendations of the WHO ‘Night Noise Guidelines’.

12.2.27 The guidelines provide source specific recommendations for road traffic, railway, aircraft and wind turbine noise, and indoor as well as outdoor exposure levels for leisure noise.

12.2.28 The recommendations use a risk-based approach and the guidance states that the “guideline exposure levels presented are therefore not meant to identify effect thresholds (the lowest observed adverse effect levels for different health outcomes). This is a difference in approach from prior WHO guidelines, like the night noise guidelines for Europe (WHO Regional Office for Europe, 2009), which explicitly aimed to define levels indicating no adverse health effects.” This means that the recommendations in the guidelines should not be directly associated with adverse effect levels such as LOAEL and SOAEL. It is also noted that, unlike other guidance and the aims of the NPSE, the WHO ENG recommendations do not take context or sustainability policies into account.

12.3 Study area

12.3.1 DMRB LA 111 requires the definition of study areas during the construction and operational phase of a scheme.

Construction

12.3.2 The construction noise and vibration study area is defined as that which includes all sensitive receptors that are potentially affected by construction noise and vibration or are in areas where there is a reasonable stakeholder

¹⁷¹ World Health Organization, Night Noise Guidelines for Europe, 2009.

¹⁷² World Health Organization, Environmental Noise Guidelines for the European Region, 2018.

expectation that a construction noise and vibration assessment would be undertaken.

- DMRB LA 111 notes that a study area of 300 metres from the closest construction activity is normally sufficient to encompass noise sensitive receptors (100 metres from the closest construction activity with the potential to generate vibration, for vibration sensitive receptors).
- DMRB LA 111 requires that the construction noise study area will include a 25 metre width from the kerb line of any diversion routes (as a result of a project requiring full carriageway closures during the night (23:00-07:00) to enable construction works to take place).
- DMRB LA 111 requires that the construction traffic noise study area will include a 50 metre width from the kerb line of public roads with the potential for an increase in basic noise level (BNL)¹⁷³ of 1 dB(A) or more as a result of the introduction of construction traffic. The BNL is the noise level at a reference 10 metre distance from the nearest carriageway.

Operation

12.3.3 The operational noise and vibration study area includes noise sensitive receptors that are potentially affected by operational noise changes generated by the scheme (either on the route of the scheme or other roads not physically changed by the scheme), or are in areas where there is a reasonable stakeholder expectation that an operational noise assessment would be undertaken:

- DMRB LA 111 advises the study area to be within 600 metres of new road links or road links physically changed or bypassed by the scheme.

12.3.4 Beyond 600 metres, the area within 50 metres of other road links with potential to experience a short term BNL change of more than 1.0 dB(A). Residential areas which will fall within the study area have been identified in Section 12.4.

Noise Important Areas

12.3.5 The Environmental Noise (England) Regulations 2006 implement the Environmental Noise Directive (END)¹⁷⁴ in England. This requires that noise from major sources of environmental noise is mapped to calculate the exposure of populated areas, identifying Noise Important Areas (NIAs) that are at risk of experiencing significant adverse impacts to health and

¹⁷³ The Basic Noise Level (BNL) refers to the LA10,18hr noise level from road traffic at 10m from the nearside carriageway edge as defined within the Calculation of Road Traffic Noise (CRTN)

¹⁷⁴ European Commission (2002). Environmental Noise Directive [online] available at: [Noise - Environment - European Commission \(europa.eu\)](https://ec.europa.eu/euipo/eand/) (Last accessed March 2022).

quality of life as a result of their exposure to road traffic noise and that the management of noise is required to promote wellbeing. This is set out in the Noise Action Plans which are developed and implemented by the authorities responsible for the sources of noise affecting the NIAs. Where road schemes have the potential to affect the exposure of populated areas within an NIA, this should be assessed and measures to avoid adverse changes as a result of the scheme or opportunities to create beneficial impacts should be considered.

12.3.6 Several NIAs are located in the vicinity of the scheme, seven of which are within the study area:

- 7834 (Langford, A46).
- 7838 (Newark-on-Trent, A1).
- 7840 (Newark-on-Trent, A46).
- 7839 (Newark-on-Trent, A46).
- 8220 (Newark-on-Trent, A46/A1).
- 7846 (Farndon, A46).
- 7847 (Farndon, A46).

12.4 Baseline conditions

Noise monitoring locations

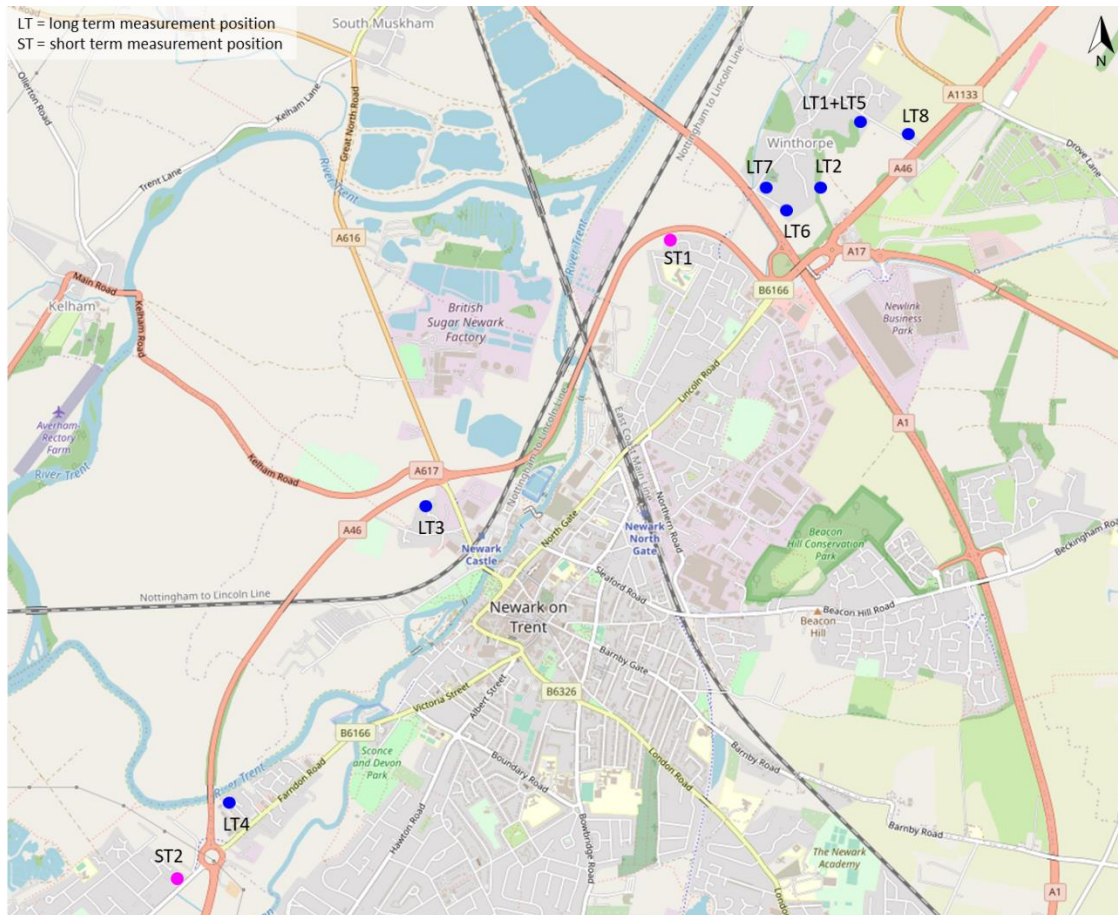
12.4.1 Baseline noise monitoring for the scheme was undertaken between 29 March and 8 April 2022 and between 5 May and 12 May 2022.

12.4.2 Locations were chosen to represent a spread of locations along the length of the scheme, in general being representative of closest receptors to the scheme. Some locations, especially within Winthorpe, were influenced by stakeholder requests. The aim of the surveys was to:

- Inform baseline noise modelling results by providing a useful cross-check at discrete locations.
- Inform the public consultation process.
- Enable ambient noise levels to be used as the basis of the construction impact assessment.

12.4.3 Eight long term (LT) and two short term (ST) monitoring locations were selected as representative of key areas in the vicinity of the proposed road alignment changes, to facilitate a more complete understanding of the local noise environment in relation to anticipated traffic flow changes, see Figure 12.1. All monitoring locations are considered to be directly affected by noise from the existing road network in their vicinity.

Figure 12.1: Noise monitoring locations



Source: © OpenStreetMap contributors (data is available under the Open Database Licence, <https://www.openstreetmap.org/copyright>) with Mott MacDonald mark-up

Noise sensitive receptors

12.4.4 The study area around the proposed scheme consists of discrete groups of residential receptors separated by more rural, agricultural areas with isolated properties. There are also recreational and industrial / commercial receptors in the area. In addition to the existing A46 there are several other trunk roads in the area and two railways thus the background noise consists largely of road traffic noise, the level being dependent on time of day and distance from the road network in addition to noise from the railways. The residential areas within the scheme corridor may be grouped as follows:

- The residential area at the southern end of the scheme, between the existing A46 and the B6166, at its closest, approximately 50 metres from the A46.
- A gypsy and traveller community off Tolney Lane, at its closest approximately 130 metres from the A46.
- A residential area between Great North Road, Kelham Lane and the existing A46, at its closest approximately 80 metres from the A46 and 80 metres from the Great North Road.

- Kings Waterside and Marina and dwellings to the east. At its closest, the Marina is approximately 90 metres from the A46 and dwellings to the east approximately 130 metres from the A46.
- A large residential area on the approach to where the existing A46 intersects the A1, at its closest approximately 30 metres from the A46.
- The community of Winthorpe to the north of the A46 / A1 junction, at its closest, the main community approximately 180 metres from the A46 although on Hargon Lane there are properties approximately 70 metres from the A46. There are also properties within 100 metres of the A1.

12.4.5 In addition, there may be further residential areas adjacent to roads subject to a change in noise level of 1dB or more, these being established once traffic forecasts are available. Outside the main study area the previous stage of assessment identified minor increases in noise levels on South Hykeham Road and Jerusalem Road, close to the A46 at Lincoln, in addition to the route between Long Bennington junction on the A1 and Elston junction, affecting Valley Lane, Staunton Road, Station Road (Cotham) and Top Street (Elston). Additional detail on the affected road network will be provided within the ES once revised traffic forecasts are available.

Construction

12.4.6 BS 5228-1¹⁷⁵ provides relevant time periods for construction noise impact assessment, referring to different times of the day, and days of the week to reflect the differences in the sensitivity of receptors. Measurement data has been analysed to consider the time periods accordingly:

- $L_{Aeq, daytime}$
 - $L_{Aeq, 12h\ daytime}$ - between 07:00 and 19:00 from Monday to Friday.
 - $L_{Aeq, 6h\ daytime}$ - between 07:00 and 13:00 on Saturday.
- $L_{Aeq, evening\ time\ and\ weekends}$
 - $L_{Aeq, 4h\ evening}$ - between 19:00 and 23:00 from Monday to Friday.
 - $L_{Aeq, 10h\ weekend}$ - between 13:00 and 23:00 on Saturday.
 - $L_{Aeq, 16h\ weekend}$ - between 07:00 and 23:00 on Sunday.
- $L_{Aeq, 8h\ night\ time}$ - between 23:00 and 07:00.

¹⁷⁵ British Standards Institution, BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise, 2014

Operation

12.4.7 Noise monitoring data include L_{A10} values, the index used in the UK for highway noise assessment, to inform the operational modelling for the scheme. This also enables predicted noise levels from modelled traffic flows to be directly compared against measured data.

Monitoring results

12.4.8 A summary of noise monitoring results at all locations are presented in Tables 12.1, 12.2 and 12.3.

12.4.9 L_{Aeq} values in Table 12.1 shows the data averaged over the periods relevant to the construction noise assessment, while the $L_{A10,18hour}$ values are equivalent for those used in operational noise assessment and represent the standard UK index for traffic noise. While the operational noise assessment will be based upon annual average values, the proximity of measured values to the values that properties will be assessed against, as outlined in Section 12.8, indicate that some locations are already exposed to relatively high noise levels.

12.4.10 Tables 12.2 and 12.3 show the L_{Aeq} and L_{A10} values as measured over a 15-minute period in addition to the L_{Amax} and the L_{A90} , the former being an indication of maximum levels over the period and the latter being representative of the background noise ie in the absence of short term events such as dog barking, car horns etc.

Table 12.1: Summary of free field LT data

Location	$L_{A10,18h}$ dB	$L_{Aeq,12h}$ daytime dB	$L_{Aeq,4h}$ evening dB	$L_{Aeq,8h}$ night dB	$L_{Aeq,6h}$ daytime dB	$L_{Aeq,10h}$ weekend dB	$L_{Aeq,8h}$ night dB	$L_{Aeq,16h}$ weekend dB	$L_{Aeq,8h}$ night dB
	Weekdays				Saturday			Sunday	
LT1	---	---	---	---	---	---	---	---	---
LT2	55- 60	55- 59	52- 58	49- 56	54	53	51	54	56
LT3	62- 67	63- 66	59- 63	58- 61	61	59	57	63	61
LT4	66- 71	67- 69	63- 67	60- 64	64	62	57	65	62
LT5	52- 57	51- 56	47- 59	45- 54	50	50	49	51	52

Date	Range LA10,18h dB	Range LAeq,12h daytime dB	Range LAeq,4h evening dB	Range LAeq,8h night dB	LAeq,6h daytime dB	LAeq,10h weekend dB	LAeq,8h night dB	LAeq,16h weekend dB	LAeq,8h night dB
LT6	62-69	62-69	59-64	60-64	61	60	58	64	64
LT7	66-70	67-69	64-65	62-64	67	64	59	64	63
LT8	56-59	55-60	52-57	50-54	53	54	49	57	53

Table 12.2 Summary of free field ST1 data

Location	Date	Start time	LAeq,15min dB	LAmx,15min dB	LA10,15min dB	LA90,15min dB
ST1	30/03/2022	09:30	64	70	67	59
	30/03/2022	11:00	65	72	67	61
	30/03/2022	11:20	66	73	68	61
	07/04/2022	15:25	65	71	67	61
	07/04/2022	15:45	64	71	67	60
	08/04/2022	09:43	65	71	67	59
	08/04/2022	10:01	64	72	67	58

Table 12.3: Summary of free field ST2 data

Location	Date	Start time	LAeq,15min dB	LAmx,15min dB	LA10,15min dB	LA90,15min dB
ST2	05/05/2022	13:53	67	85	71	48
	05/05/2022	14:10	68	83	72	51
	13/05/2022	09:20	69	81	73	55
	13/05/2022	09:36	68	82	73	55

12.5 Potential impacts

Construction

12.5.1 During construction, the scheme has the potential to directly alter the noise and vibration baseline for sensitive receptors for a temporary period. Impacts are likely to be restricted to areas where the existing baseline noise levels are exceeded. Principally, this would be in the vicinity of the scheme envelope, although this could extend along elements of the existing road network, depending on haul routes and the quantity of construction-related traffic.

12.5.2 Factors which have the potential to affect construction phase noise and vibration impacts include:

- Construction plant inventory and utilization.
- The programme and the duration of activities with noise and vibration impacts exceeding relevant thresholds.
- Hours of work.
- Proximity of the works to receptors.
- Frequency and routing of the movement of construction vehicles.
- The location of compounds.
- The routing of temporary diversions, the volumes of traffic using them and duration they are applied.

12.5.3 A review of construction activities will be undertaken at the ES stage and appropriate mitigation identified as appropriate.

Operation

12.5.4 During operation there is the potential for changes to traffic flows and road alignment to result in noise changes at noise sensitive receptors, particularly from increased road traffic. Impacts due to changes in noise may affect residential, ecological and other sensitive receptors (for example commercial or community uses). Impacts can be beneficial or adverse. Factors which have the potential to affect road traffic noise include:

- Overall traffic volume.
- Proportion of heavy vehicles.
- Traffic speed (i.e. changes in free-flow conditions and waiting times).
- Road alignment (vertical and horizontal alignment).
- The type of carriageway surfacing material.
- Change to the noise character of the existing area or non-acoustic factors (for example vegetation removal).

12.6 Design, mitigation and enhancement measures

12.6.1 The application of the following measures will be driven by requirements within the National Policy Statement for National Networks (NPSNN) as detailed in this Chapter in Section 12.2 Legislation and Policy.

Design measures

12.6.2 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere the principles of the design and mitigation hierarchy outlined in LA 104. The first principle being to avoid adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme

design development to date, such as the use of thin surface courses on new carriageways to provide a reduction in road surface noise, is outlined in Chapter 2 Section 2.6 of this report.

12.6.3 Additional opportunities for further embedded mitigation that will be considered during the development of the ongoing scheme design include increasing noise protection through the use of earthworks to protect sensitive noise receptors.

Mitigation measures - Construction

12.6.4 Mitigation measures of relevance during construction, to be included within the Second Iteration Environmental Management Plan, include the following:

- Implementation of Best Practicable Means (BPM) as defined by BS5228.
- Control of the timing of works.
- Restrictions on the noisiest of activities.
- Use of acoustic screening or enclosures around noisy items of plant and machinery.
- Careful siting of haul routes.
- Early construction of mitigation or screening where required for operational purposes.
- Careful site layout to minimise noise and vibration impacts (for example location of compounds and compound internal layout).
- Noise and vibration monitoring.
- Noise insulation or temporary rehousing.

12.6.5 The effects of potential noise and vibration on affected communities can be mitigated by effective communication between the promoter, contractor and the public. Prior notification of construction works to any potential affected residents will be required. Following that, investigation and remediation of noise issues during construction may also be required.

12.6.6 The use of BPM would be applied for noise control at all times during construction. These should include the selection of the most appropriate method and plant for the job, adequate maintenance of plant, optimum siting of stationary plant, local screening and the education of the workforce. Restrictions may also be placed on early/late delivery times.

Mitigation measures - Operation

12.6.7 Mitigation measures of relevance during operation, to be included within the Second Iteration Environmental Management Plan, include the inclusion of noise barriers and earth bunds.

12.6.8 Sound insulation packages for residences will be considered where significant impacts remain after incorporation of reasonably practicable mitigation measures. It should be noted that this will have no effect on the surrounding environment.

Enhancement Measures

12.6.9 Enhancement measures for Chapter 12 will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

12.7 Description of the likely significant effects

Construction

12.7.1 With strict adherence to mitigation as described in Section 12.6, construction noise would be managed to appropriate levels and is therefore not anticipated to have significant direct adverse effects. Effects associated with construction vibration are also not anticipated to be significant, with the implementation of appropriate mitigation to be identified as part of the ES. However, at this stage with insufficient information on construction activities further assessment will be required in the ES to confirm this and to inform the mitigation strategy.

12.7.2 A detailed construction assessment will be undertaken to inform use of any temporary mitigation measures to control noise and vibration impacts during construction, based upon the requirements of BS5228 Parts 1 and 2.

Operation

12.7.3 With the implementation of suitable mitigation as described in Section 12.6 where relevant, potential adverse effects would be reduced. It is considered that there is however potential for significant residual adverse effects to noise sensitive receptors which warrants further assessment within the ES.

12.7.4 In line with DMRB LA 111, ‘..maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects’. Operational vibration is therefore scoped out of the assessment as it is not considered that the scheme would result in significant adverse effects.

12.8 Assessment methodology

12.8.1 The assessment of construction noise and vibration, and operational noise impacts will be undertaken in accordance with DMRB LA 111 to identify potential significant effects.

12.8.2 Significance will be considered on the basis of magnitude of impact and with respect to the Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) values which are concepts that were introduced by the Noise Policy Statement for England¹⁷⁶ and required by NPSNN¹⁷⁷.

12.8.3 The ES will report against the three aims within the NPSNN (as presented in Table E/1.3 of NPSNN¹⁷⁸), and demonstrate the actions taken to support delivery of each aim.

Construction noise

12.8.4 DMRB LA 111 provides requirements for the assessment of construction noise effects at sensitive receptors which utilises BS5228–1:2009+A1:2014 ‘Example Method 1 – ABC Method’ calculation methodology. DMRB LA 111 provides requirements for the determination of the magnitude of impact and significance of effects due to construction noise including noise from additional construction activities such as construction traffic and diversion routes. The magnitude of impact is classified as negligible, minor, moderate or major by comparison of the construction noise levels with LOAEL and SOAEL values for all relevant receptor properties as per DMRB LA 111 Table 3.16 and as reproduced in Table 12.5. The LOAEL and SOAEL values for construction noise are defined in Table 12.4.

Table 12.4 Summary of construction noise LOAEL and SOAEL values

Period	LOAEL	SOAEL
Construction Noise		
Day (07:00-19:00) weekday and Saturday morning (07:00-13:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1
Night (23:00-07:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1

¹⁷⁶ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

¹⁷⁷ National Policy Statement for National Networks.

¹⁷⁸ Department for Transport, National Policy Statement for National Networks, 2014.

Evening and weekends (periods not covered above)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1
Construction Vibration		
Anytime	0.3mm/s	1.0mm/s

Source: DMRB LA 111 Tables 3.12 and 3.31

Table 12.5: Magnitude of impact and construction noise descriptions

Magnitude of impact	Construction noise level
Major	Above or equal to SOAEL +5 dB
Moderate	Above or equal to SOAEL and below SOAEL +5 dB
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Source: DMRB LA 111 Table 3.16

12.8.5 The magnitude of impact from noise due to construction traffic and diversion routes is classified by considering changes in the Basic Noise Level to be negligible, minor, moderate or major as per DMRB LA 111 Table 3.17 as reproduced in Table 12.6.

Table 12.6: Magnitude of impact at receptors for construction traffic and diversion routes

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

Source: DMRB LA 111 Table 3.17

12.8.6 Construction noise and construction traffic noise is determined to cause a significant effect where a moderate or major magnitude of impact will occur for a duration exceeding: 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any six consecutive months as per DMRB LA 111 section 3.19.

Construction vibration

12.8.7 DMRB LA 111 provides requirements for the assessment of construction vibration effects at sensitive receptors which refers to BS5228 'Code of construction practice for noise and vibration control on construction and open sites – Part 2: Vibration'.

12.8.8 The construction vibration magnitude of impact is determined to be negligible, minor, moderate or major by comparison of construction vibration levels with LOAEL and SOAEL values for all relevant receptor properties as per DMRB LA 111 Table 3.33 and section 3.34 and reproduced in Table 12.7. The LOAEL and SOAEL values for construction vibration are defined in Table 12.4.

12.8.9 To put the values in Table 12.4 into context, a major impact as defined in Table 12.7 corresponds in BS5228-2 to a vibration level at which “*Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments*”. A moderate impact at or above SOAEL corresponds in BS5228-2 to a vibration level at which “*It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents*” A minor impact above or equal to LOAEL corresponds in BS5228-2 to a vibration level at which “*Vibration might just be perceptible in residential environments*”

Table 12.7: Construction vibration level – magnitude of impact

Magnitude of impact	Vibration level
Major	Above or equal to 10 mm/s PPV
Moderate	Above or equal to SOAEL and below 10 mm/s PPV
Minor	Above equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Source: DMRB LA 111 Table 3.33

12.8.10 A potential significant effect due to construction vibration is identified where a moderate or major magnitude of impact is predicted to occur for a duration exceeding: 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any six consecutive months as per DMRB LA 111 section 3.34.

Operation

12.8.11 The DMRB LA 111 provides requirements for the assessment of operational noise effects at sensitive receptors. This methodology will be adopted for the quantitative assessment of operational noise effects for the scheme.

12.8.12 Receptors which are potentially sensitive to noise include dwellings, hospitals, healthcare facilities, education facilities, community facilities, designated sites, public rights of way and cultural heritage assets.

12.8.13 The level of road traffic noise from the road network will be predicted using CRTN methodology from forecast traffic data provided in terms of

18-hour Annual Average Weekday Traffic (AAWT) flow between the hours of 06:00 to 00:00, along with speed pivoted vehicle speed and percentage of heavy goods vehicles. A correction factor for the road surfacing for each scenario will be included as required and detailed in DMRB LA 111. The factor is dependent on road surface type and speed of traffic and will vary between scenarios.

12.8.14 Calculations determine road traffic noise levels using noise descriptors $LA_{10,18hr}$ and L_{night} . L_{night} values are derived from daytime noise levels using TRL¹⁷⁹ Method 3 in accordance with DMRB LA 111.

12.8.15 Calculations of the road traffic noise level are carried out for four scenarios:

- Do-Minimum option in the opening year.
- Do-Minimum option in the future assessment year.
- Do-Something option in the opening year.
- Do-Something option in the future assessment year.

12.8.16 In the above scenarios, 'Do-Minimum' means traffic growth with committed development only. 'Do-Something' means committed growth with the scheme. The future assessment year is opening year +15 years. In accordance with DMRB the assessment of road traffic noise effects requires the following comparisons:

- Do-Minimum scenario in the opening year against Do-Something in the opening year (short-term change with the scheme).
- Do-Minimum scenario in the opening year against Do-Something in the future assessment year (long-term change with the scheme).
- Do-Minimum scenario in the opening year against Do-Minimum in the future assessment year (long-term change without the scheme).

12.8.17 DMRB LA 111 classifies the magnitude of noise level change as negligible, minor, moderate or major and applies different criteria in the short-term and long-term. These changes may be beneficial (noise decrease) or adverse (noise increase). These classifications will be applied as per DMRB LA 111 Tables 3.54a and 3.54b which are summarised below in Table 12.8.

¹⁷⁹ TRL Limited, Converting the UK traffic noise index $LA_{10,18h}$ to EU noise indices for noise mapping, PR/SE/451/02 (EPG 1/2/37).

Table 12.8: Short term and long term magnitude of change

Magnitude	Short term noise change (dB L _{A10,18hr} or L _{night})	Long term noise change (dB L _{A10,18hr} or L _{night})
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3.0 to 4.9	5.0 to 9.9
Minor	1.0 to 2.9	3.0 to 4.9
Negligible	Less than 1.0	Less than 3.0

Source: DMRB LA 111 Table 3.54a and Table 3.54b

12.8.18 The initial assessment of operational noise significance is based on the short-term magnitude of change as per DMRB LA 111 Table 3.58 which is reproduced in Table 12.9. The initial assessment considers negligible and minor short-term change likely not to be significant and moderate and major short-term change to be significant.

Table 12.9: Initial assessment of operational noise significance

Significance	Short term magnitude of change
Significant	Major
Significant	Moderate
Not significant	Minor
Not significant	Negligible

Source: DMRB LA 111 Table 3.58

12.8.19 In all cases where the magnitude of noise level change in the short-term is classified as minor, moderate or major, additional factors described in DMRB LA 111 Table 3.60 are considered to determine the significance. The factors that influence this judgement include the magnitude of change with respect to minor and moderate boundaries, the magnitude of impact in the long term and short term, the consideration of absolute noise levels with respect to the LOAEL and SOAEL, the location of noise sensitive parts of the receptor, the acoustic context, and the perception of change. Operational noise LOAEL and SOAEL values are provided in Table 12.10 below. DMRB LA 111 Table 3.30 is reproduced below in Table 12.11.

Table 12.10 Summary of operation noise LOAEL and SOAEL values

Period	LOAEL	SOAEL
Operational Noise		
Daytime (06:00-24:00)	55 dB L _{A10,18hr} (facade)	68 dB L _{A10,18hr} (facade)
Night-time (23:00-07:00)	40 dB L _{night,outside} (free-field)	55 dB L _{night,outside} (free-field)

Source: DMRB LA 111 Table 3.49.1

Table 12.11 Determining final operational significance on noise sensitive buildings

Local circumstances	Influence on significance judgement
Noise level change (is the magnitude of change close to the minor/moderate boundary?)	1) Noise level changes within 1 dB of the top of the 'minor' range can indicate that it is more appropriate to determine a likely significant effect. Noise level changes within 1 dB of the bottom of a 'moderate' range can indicate that it is more appropriate to consider a change is not a likely significant effect.
Differing magnitude of impact in the long term to magnitude of impact in the short term	1) Where the long term impact is predicted to be greater than the short term impact, it can be appropriate to conclude that a minor change in the short term is a likely significant effect. Where the long term impact is predicted to be less than the short term it can be appropriate to conclude that a moderate or major change in the short term is not significant. 2) A similar change in the long term and non-project noise change can indicate that the change is not due to the project and not an indication of a likely significant effect.
Absolute noise level with reference to LOAEL and SOAEL (by design this includes sensitivity of receptor)	1) A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment. 2) Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect.
Location of noise sensitive parts of a receptor	1) If the sensitive parts of a receptor are protected from the noise source, it can be appropriate to conclude a moderate or major magnitude change in the short term and/or long term is not a likely significant effect. 2) Conversely, if the sensitive parts of the receptor are exposed to the noise source, it can be more appropriate to conclude a minor change in the short term and/or long term is a likely significant effect. 3) It is only necessary to look in detail at individual receptors in terms of this circumstance where the decision on whether the noise change gives rise to a significant environmental effect is marginal.
Acoustic context	1) If a project changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short term and/or long term is a likely significant effect.
Likely perception of change by residents	1) If the project results in obvious changes to the landscape or setting of a receptor, it is likely that noise level changes will be more acutely perceived by the noise sensitive receptors. In these cases it can be appropriate to conclude that a minor change in the short term and/or long term is a likely significant effect. 2) Conversely, if the project results in no obvious changes for the landscape, particularly if the road is not visible from the receptor, it can be appropriate to conclude that a

Local circumstances	Influence on significance judgement
	moderate change in the short term and/or long term is not a likely significant effect.

Source: DMRB LA 111 Table 3.60

12.9 Assessment assumptions and limitations

Assumptions regarding likely significant effects from construction

12.9.1 Assessment of construction noise and vibration is dependent on the availability of detailed construction plans and methodologies to reflect planned works.

12.9.2 Information on construction activities to inform this scoping report is limited to a high-level description of construction operations.

Assumptions regarding likely significant effects from operation

12.9.3 DMRB based assessments require detailed topographical data for the proposed scheme and surrounding area. Horizontal and vertical alignments of the scheme are incorporated into the current acoustic model and these may change as design progresses.

12.9.4 Public domain LiDAR topographical data is used within the existing acoustic model.

12.9.5 Ordnance Survey address-point data is used to identify residential receptors.

12.9.6 The level of road traffic noise from the road network will be predicted using CRTN methodology from forecast traffic data, along with speed pivoted vehicle speed and percentage of heavy goods vehicles. As detailed in DMRB LA 111, a correction factor for the road surfacing will be included as required. The factor is dependent on road surface type and speed of traffic and will vary between scenarios. This will be determined and further assessed within the ES.

12.10 Consultation

12.10.1 The Environmental Health team at Nottinghamshire County Council were contacted via email on 17 February 2022 asking for feedback and comments on the proposed noise monitoring locations; no response has been received to date. Consultation with the Local Authority Environmental Health Officer will be necessary to discuss the effects of noise and vibration as part of work associated with the ES.

12.11 Summary

12.11.1 In line with LA 111, responses to the following scoping questions in Table 12.12 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 12.12: Noise and Vibration scoping questions

Scoping question	Answer
1) Does construction noise generated by the project have the potential to adversely affect any noise sensitive receptors?	Yes, the previous stage of assessment identified the potential for adverse effects arising from construction noise.
2) Are there any noise receptors where there would be a reasonable stakeholder expectation that a construction noise assessment would be undertaken?	Yes, noise is a sensitive issue for residents.
3) Does vibration from construction have the potential to adversely affect any vibration sensitive receptors?	Potentially, yes.
4) Does the scale of the development or type of construction mean that there will be a reasonable stakeholder expectation that a construction vibration assessment would be undertaken at any vibration sensitive receptors?	Potentially, yes
5) Is the project likely to cause a change in the BNL of 1dB LA10,18hr in the do-minimum opening year (DMOY) compared to the do-something opening year (DSOY)?	Yes.
6) Is the project likely to cause a change in the BNL of 3dB LA10,18hr in the do-something future year (DSFY) compared to the DMOY?	This is dependent on forecast traffic flows. Although none such were identified in assessment work undertaken at earlier stages, a revision to traffic flows means that this cannot be discounted.

Scoping question	Answer
7) Does the project involve the construction of new road links within 600m of noise sensitive receptors?	Yes.
8) Would there be a reasonable stakeholder expectation that an assessment would be undertaken?	Yes

12.11.2 The proposed scope of the ES is contained within Table 12.13.

Table 12.13: Proposed scope of the Noise and Vibration chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Noise and vibration	N/A	N/A
Operation	Noise	Vibration	DMRB LA111 note: <i>Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects.</i>

13 Population and Human Health

13.1 Introduction

13.1.1 This chapter aims to identify the potential for significant effects as a result of the scheme upon population and human health. This chapter has been prepared in accordance with DMRB LA 112 Population and Human Health. Further assessment will be presented in the ES.

13.2 Legislation and policy

Legislation

13.2.1 European Directive 3011/92/EU, as amended by European Directive 2014/52/EU, requires an ES to include, inter alia, an assessment of potential effects upon population and human health, which is interpreted to include potential impacts/effects on physical, mental and social wellbeing. The Directive does not establish the way in which the topic is to be addressed and there is no prescribed EIA definition for 'Population and Human Health'.

National policy

National Policy Statement for National Networks¹⁸⁰

13.2.2 The National Policy Statement for National Networks (NPSNN) sets out the Government's vision and strategic objectives for national networks, including improving overall quality of life, journey quality, reliability and safety and linking up communities. The Government deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of the wider transport system. Junction improvement is considered as a measure which will be used to enhance the existing national road network towards this vision.

13.2.3 Within the NPSNN, the Government has committed to create a more accessible and inclusive transport network that provides a range of opportunities and choice for people to connect with jobs, services and friends and family. It is stated that applicants are expected to deliver improvements that reduce community severance and improve accessibility and inclusivity (Section 3.19 to 3.22).

13.2.4 It is acknowledged in the NPSNN that new or enhanced national network infrastructure may have direct and indirect impacts on health, wellbeing

¹⁸⁰ Department for Transport (2014) National Networks National Policy Statement [online] available at: [National Policy Statement for National Networks \(publishing.service.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281242/national_policy_statement_for_national_networks.pdf).

and the quality of life of the population. An ES should identify and set out the assessment of likely significant adverse health impacts, where the proposed project is likely to have significant environmental impacts that would have an effect on human beings. The applicant should identify measures to avoid, reduce or compensate for adverse health impacts as appropriate (Section 4.79 to 4.82).

13.2.5 Applicants are required to consider taking appropriate mitigation measures to address adverse effects on PRoW and consider opportunities to improve access, in accordance with the requirements associated with the assessment of impact on open space, green infrastructure and Green Belt. Also, consideration needs to be given to the use, character, attractiveness and convenience of the PRoW (Section 5.162 to 5.185).

National Planning Policy Framework¹⁸¹

13.2.6 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and the requirements for the planning system. It provides a framework within which Local Authorities and residents can produce local and neighbourhood plans reflecting the needs and priorities of communities.

13.2.7 Section 8 sets out core planning principles of the NPPF to achieve healthy, inclusive and safe places by promoting social interaction, ensuring safety and accessibility of public areas and supporting healthy lifestyles. This also includes addressing identified local health and wellbeing needs through provision of safe and accessible green infrastructure.

13.2.8 The same section presents core principles to support access to a network of high quality open spaces and opportunities for sport and physical activity. Planning policies and decisions should protect and enhance PRoW and National Trails to support population health.

13.2.9 Section 9 encourages development that provides opportunities for sustainable transport, particularly by giving priority to pedestrian and cycle movements, and providing access to high quality public transport facilities.

Local Policy

13.2.10 The Newark and Sherwood Local Plan outlines plans for strategic sites, open breaks, sites of interest in nature conservation, housing sites with planning permission, public open spaces, employment sites with

¹⁸¹ Communities and Local Government (2012) National Planning Policy Framework [online] available at: [Title \(publishing.service.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214462/nppf-2012.pdf).

planning permission, housing allocations, transport schemes, and mixed-use allocations.

13.2.11 Newark and Sherwood District Council's Economic Growth Strategy 2021-2026 defines how the council will work with businesses and residents to lead the local economy and 'build a shared prosperity'.¹⁸²

13.2.12 Feeding into the Economic Growth Strategy, the Infrastructure Delivery Plan (2010) identifies the various forms of infrastructure that are required to meet the level of growth anticipated in the area up until 2026.¹⁸³ It identifies sections of the A46 as requiring improvements in order to accommodate planned growth in the area.

Population and human health standards and guidance

13.2.13 The following standards and guidelines are also considered to be relevant to the assessment of population and human health effects due to the scheme:

- The Design Manual for Roads and Bridges (DMRB) – LA112 Population and Human Health.
- Institution of Environmental Management and Assessment (IEMA) Health in Environmental Impact Assessment: A primer for a proportionate approach.

13.3 Study area

13.3.1 The population and human health assessment for both the construction and operational phases will be conducted at both a Local Impact Area (LIA) level and a Wider Impact Area (WIA) level dependent on the type of impact being assessed.

13.3.2 For Land-use and Accessibility and Human Health, study areas have been defined in accordance with DMRB LA112 Population and Human Health Guidance¹⁸⁴ and professional judgement¹⁸⁵ and are defined as follows:

- Land-use and Accessibility study area: The area located within 500 metres of the scheme footprint will be referred to as the LIA. This is the

¹⁸² Newark and Sherwood District Council, 2023. Economic Growth Strategy. Available at: <https://www.newark-sherwooddc.gov.uk/media/newark-and-sherwood/images-and-files/economic-development/Newark-&-Sherwood-Economic-Growth-Strategy-2021-2026.pdf>.

¹⁸³ Newark and Sherwood District Council. 2010. Infrastructure Delivery Plan. Available at: <https://www.newark-sherwooddc.gov.uk/media/newark-and-sherwood/images-and-files/planning-policy/pdfs/infrastructure/infrastructure-delivery-plan/Infrastructure-Delivery-Plan--Main-Text.pdf>.

¹⁸⁴ Standards for Highways, 2011. LA112- Population and Human Health. Available at: <https://www.standardsforhighways.co.uk/dmrB/search/1e13d6ac-755e-4d60-9735-f976bf64580a>.

¹⁸⁵ With professional judgement used where there is no standard definition of the study area for some effects like employment.

primary study area for this discipline and is designed to capture most potential population and human health effects during construction and operation of the scheme. Where it was recognised that impacts could extend beyond the proposed study areas due to potential indirect impacts of the proposed scheme, assessment boundaries were extended accordingly to address the extent of the potential impacts.

- Human Health: The area covered by the local authority of Newark and Sherwood District Council, which includes the closest settlements of Newark-on-Trent and Winthorpe, is referred to as the WIA. The WIA includes the extent of the area that may be affected by the construction and operation of the scheme and is used for the consideration of human health effects and potential effects on economic activity. The WIA also covers the extent of the ARN which ensures that the effects of the scheme upon traffic that may result in an impact upon human health (noise and air quality) are fully assessed. This is important as one of the objectives of the scheme is to support the economic growth aspirations of the District and the region by providing a more reliable road network.

13.4 Baseline conditions

13.4.1 A range of publicly available data sources have been used to determine the population and human health baseline. These include statistics on demographics and employment from the Office for National Statistics (ONS), health statistics from Public Health England, and Newark and Sherwood District Council local authority data on land use and resources.

13.4.2 The baseline conditions are presented in accordance with DMRB LA112 assessment requirements.

Land use and accessibility

Private property and housing

13.4.3 There are approximately 420 residential properties within the LIA.

13.4.4 Key communities near to the scheme are Newark-on-Trent to the south west of the scheme, accessed from the A46 via Farndon Road; Great North Road, and Lincoln Road; and the village of Winthorpe, located to the north east of the scheme, accessed via the A1133.

Community land and assets

13.4.5 There are a number of community resources located within the LIA, including those listed below:

- Newark Rugby Club, Kelham Road, located approximately 250 metres to the north west of the scheme.

- Sconce and Devon Park, Boundary Road, approximately 500 metres to the south west.
- Lovers Lane Primary School, Warburton Street, approximately 500 metres to the south.
- Bishop Alexander Primary School, Alexander Avenue, approximately 270 metres to the south.
- Newark Showground, Lincoln Road, approximately 470 metres to the south east.
- Newark Golf Centre, Drove Lane, approximately 120 metres to the south east.
- Winthorpe Community Centre, Woodlands, approximately 500 metres to the north east.
- Winthorpe Primary School, Throughfare Lane, approximately 500 metres to the north east.
- Newark, Ransome & Marles Cricket Club, approximately 120 metres to the south west.

Development land and businesses

13.4.6 The Development Plan for the Newark and Sherwood District comprises the Amended Core Strategy (adopted 7 March 2019)¹⁸⁶ and Allocations & Development Management (adopted 16th July 2013) Development Plan Documents¹⁸⁷.

13.4.7 Within the LIA the Newark and Sherwood Local Plan outlines plans for strategic sites, open breaks, sites of interest in nature conservation, housing sites with planning permission, public open spaces, employment sites with planning permission, housing allocations, Spatial Policy 7 transport schemes, and mixed-use allocations.

13.4.8 The following sites were identified within the LIA and further details regarding their location and capacity will be included within the ES:

- three Employment Sites with planning permission.
- four housing sites with planning permission.
- two mixed use allocations.

¹⁸⁶ Newark and Sherwood District Council, 2019. Amended Core Strategy. Available at: <https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-core-strategy-dpd/amended-core-strategy-DPD.pdf>.

¹⁸⁷ Newark and Sherwood District Council, 2013. Allocations & Development Management Plan. Available at: <https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/supplementary-planning-information/allocations-and-development-management-dpd/Allocations-and-Development-Management-Development-Plan-Document.pdf>.

- the transport scheme, Newark Flyover which is supported by Policy 7 in the Amended Core Strategy (2019).

Agricultural land holdings

13.4.9 There are approximately 550 agricultural land holdings within the LIA. These are a mixture of freehold and leasehold. Much of the land within the LIA is used for arable production. Further details regarding the number of landholdings expected to be directly impacted by the scheme will be included within the ES.

Walkers, cyclists, and horse riders

13.4.10 According to Newark and Sherwood District Council Public Right of Way data, there are a number of PRoWs (footpaths and bridleways) in the LIA. These include:

- Newark BW2: Bridleway following the southern side of the River Trent.
- Newark BW5: Bridleway following on from BW5 along the southern side of the River Trent.
- Newark BW6: Bridleway following on from BW6 along the southern side of the River Trent.
- Winthorpe FP2: Footpath through Winthorpe village and crossing the A46.

13.4.11 There are further walking, cycling and horse-riding (WCH) amenities in the LIA study area including long distance routes (such as Lark Valley Path, Trent Valley Long Distance Path and National Cycle Network Route 64), and road crossings which will be identified in further detail in the ES.

13.4.12 At this stage information on the level and frequency of use and type of user (for example, whether vulnerable travellers use any routes in the LIA) of different WCH routes is not known.

Human health

Human health profiles of affected communities

Population

13.4.13 Newark-on-Trent is a market town in the Newark and Sherwood district of Nottinghamshire, approximately 27 kilometres north-east of Nottingham. The population of the LIA is 420. Table 13.1 shows the demographic structure of the LIA, Newark and Sherwood, East Midlands and England. Further details regarding population data will be included within the ES.

Table 13.1 Demographic structure of the LIA

Location	Total population	Children (<16 years)	Young people (16-24 years)	Working age (16-64 years)	Older people (65+ years)
Local impact area	12,826	18%	9%	63%	19%
Newark and Sherwood	134,028	18%	9%	60%	22%
East Midlands	5,404,012	19%	11%	62%	20%
England	62,500,775	19%	11%	62%	19%

Source: ONS 2020 mid-year population estimates

Deprivation

13.4.14 The England Indices of Multiple Deprivation (IMD) is used for the measurement and comparison of relative levels of deprivation. Table 13.2 shows the income deprivation quintiles across the LIA, Newark and Sherwood, East Midlands, and England.

Table 13.2: Income deprivation quintiles

Location	Most deprived quintile	Second most deprived quintile	Third most deprived quintile	Fourth most deprived quintile	Least deprived quintile
Local impact area	3,150	3,997	892	3,734	0
Newark and Sherwood	17,645	23,272	34,749	26,810	20,651
East Midlands	862,648	952,310	934,772	1,036,800	1,079,053
England	11,301,143	11,629,843	11,485,024	11,177,974	10,956,154

Source: ONS 2020 mid-year population estimates and MHCLG 2019 Indices of Multiple Deprivation

Health indicators

13.4.15 Table 13.3 presents key health indicators within the LIA, Newark and Sherwood, East Midlands and England.

Table 13.3: Health indicators within the LIA, Newark and Sherwood, East Midlands and England

Location	LIA	Newark and Sherwood	East Midlands	England
Long term health problem or disability (% of population)	19%	20%	19%	18%
Life expectancy at birth for females (2018-2020) (age)	n/a	82.7	82.7	83.1
Life expectancy at birth for males (2018-2020) (age)	n/a	79.8	79.2	79.4
Under 75 mortality rate from all cardiovascular disease (rate per 100,000)	n/a	58.1	72.1	70.4

Sources: ONS life expectancy estimates, all ages, UK, 2018-2020/Public Health England Profile 2017-2019, 2011 Census, ONS – long-term health problem or disability.

Health determinants

13.4.16 Health determinants include the range of personal, social, economic, and environmental factors that influence human health status¹⁸⁸. The DMRB LA 112 specifies the indicative types of human health determinants, which include:

- The location and type of community, recreational and education facilities and severance / separation of communities from such facilities.
- The location of green and open space and severance / separation from such facilities.
- The location of healthcare facilities and severance / separation from such facilities.
- Outline spatial characteristics of the transport network and usage in the area¹⁸⁹.
- Air quality management areas and ambient air quality.
- Noise sensitive areas.
- Sources and pathways of potential pollution.
- Landscape amenity.
- Safety information associated with the existing road¹⁹⁰.
- Information from stakeholder consultation¹⁹¹.

Community, recreational and educational facilities

13.4.17 The community, recreational and educational facilities within the LIA are listed in section 13.2.1.2 above.

Green / open space

13.4.18 There are several green and open spaces within the LIA. These are:

- Sconce and Devon Park, Boundary Road, located approximately 500 metres to the south west of the scheme.
- Riverside Park, Great North Road, approximately 480 metres to the south west.
- Mather Road Play Area, Mather Road, approximately 200 metres to the south.
- Fleming Drive Play Area, Fleming Drive, approximately 320 metres to the south east.

¹⁸⁸ UK Government (2017) Chapter 6: social determinants of health. Available at: <https://www.gov.uk/government/publications/health-profile-for-england/chapter-6-social-determinants-of-health>. Further detail regarding health determinants will be provided within the ES.

¹⁸⁹ Usage details are not available at this early stage.

¹⁹⁰ Safety information is not available at this early stage.

¹⁹¹ Consultation information is not available at this early stage.

- Cedar Avenue Park, Cedar Avenue, approximately 310 metres to the south.

Healthcare facilities

13.4.19 There are several healthcare facilities and hospitals within the LIA, amongst which are:

- The Farndon Unit, Farndon Road, located approximately 130 metres to the south west of the scheme.
- Raphael Healthcare, Farndon Road, located approximately 130 metres to the south west of the scheme.
- Winthorpe Hall Care Home, Gainsborough Road, located approximately 500 metres to the north east of the scheme.

Transport network

13.4.20 The A46 connects the West Midlands with Lincolnshire, passing close to Bath, Leicester, and Newark. The A46 is approximately 344 kilometres long and provides connectivity within the LIA and WIA between Newark upon Trent, Farndon, and Winthorpe. Within the LIA, the A46 is crossed by Great North Road, the A1, and the A1133.

13.4.21 The A46 is located near to the two main railway stations in the local area, Newark Castle station and Newark Northgate station. Newark Castle Station is operated by East Midlands Railway providing regular services across the East Midlands and two trains per day to London. Newark Northgate Station is served by intercity trains to London, Newcastle and Edinburgh as well as Lincoln.

13.4.22 The bus network operating within the LIA operates from Newark Bus Station and provides connectivity between Lincoln, Nottingham, and Grantham. The services include¹⁹²:

- Bus 47: Lincoln.
- Bus 90/A: Nottingham.
- Bus 28: Mansfield.
- Bus 24: Grantham.

13.4.23 The PRoW and other WCH provision in the LIA are listed in section 13.2.1.5 above.

¹⁹² Nottinghamshire Country Council (2022). *Newark Bus Station*. Accessed at: <https://www.nottinghamshire.gov.uk/transport/public-transport/bus-stations/newark-bus-station>.

Air quality management

13.4.24 There are no Air Quality Management Areas currently designated within the Newark and Sherwood District Council area.

Noise

13.4.25 As outlined in Section 12.3.4 Noise Important Areas of Chapter 12 Noise, several Noise Important Areas are located in the vicinity of the scheme, seven of which are within the Local Impact Area:

- 7834 (Langford, A46).
- 7838 (Newark-on-Trent, A1).
- 7840 (Newark-on-Trent, A46).
- 7839 (Newark-on-Trent, A46).
- 8220 (Newark-on-Trent, A46/A1).
- 7846 (Farndon, A46).
- 7847 (Farndon, A46).

13.4.26 The closest noise sensitive receptors adjoining the A46 (listed in Section 12.4.3 Noise Sensitive Receptors of Chapter 12 Noise) are exposed to background noise largely consisting of road traffic noise and noise from the railways, dependent on the time of day.

Land quality

13.4.27 The baseline conditions are summarised in Section 10.3 Baseline conditions of Chapter 10 Geology and Soils. The scheme is situated within an existing highway network comprising carriageway, roundabouts and junctions, with surrounding agricultural, residential, commercial and industrial land.

Landscape amenity

13.4.28 Works proposed fall within National Character Area (NCA) 48 Trent and Belvoir Vales, which is detailed further in Section 8.4 Baseline conditions of Chapter 8 Landscape and Visual Effects.

13.5 Potential impacts

Construction

Land use and accessibility

13.5.1 The construction of the scheme may require both permanent and temporary land take from the grounds of residential properties, businesses and development land in the Newark area within the scheme footprint.

13.5.2 The construction of the scheme may require both permanent and temporary use of agricultural land along the route within the scheme footprint, potentially impacting on the functioning and viability of agricultural holdings and enterprises.

13.5.3 Temporary changes to access and increases in traffic from construction activities could impact access to private property and housing in Newark and Winthorpe; community land and assets, such as Winthorpe Community Centre; development land and businesses; and access of WCH within the LIA, particularly users of Winthorpe Footpath 2. Temporary changes to access may also impact the ability of residents to access existing or prospective employment.

13.5.4 Temporary diversions or closures of WCH routes (including PRoW, footways, road crossings and long distance routes) are likely to be needed within the LIA. This could result in changes to accessibility and increases to journey lengths for WCHs potentially introducing severance for communities.

13.5.5 Further details regarding potential scheme-specific impacts will be included within the ES.

Human Health

13.5.6 Temporary creation of jobs necessary to deliver the scheme may have direct and indirect beneficial impacts on employment in the WIA.

13.5.7 Temporary changes to the local environment (increase of noise, decrease of air quality, landscape, severance) may affect the health of communities.

Operation

Land use and accessibility

13.5.8 There is the potential for permanent closures or diversions to be needed for WCH routes within the LIA and for new WCH provisions to be delivered as part of the scheme. These could potentially increase journey lengths for WCH.

13.5.9 The scheme has the potential to reduce severance resulting in a benefit for cyclists, walkers and other vulnerable road users wishing to cross the A46 within the LIA.

Human health

13.5.10 The scheme has the potential to improve the provision of infrastructure that encourages active travel modes, supports a potential reduction in pollutants and offers access to employment with the potential for positive health impacts.

13.5.11 The operation of the scheme is anticipated to reduce congestion, reduce journey time and improve safety, improving the access to employment for people living within the LIA and supporting the future economic growth of the region.

13.6 Design, mitigation and enhancement measures

Design measures

13.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104. The first principle being to avoid potential adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report.

13.6.2 There are a number of opportunities for further embedded mitigation that will be considered during the development of the ongoing scheme design. These include:

- Minimising the extent of direct, permanent land take affecting identified individual receptors.
- Providing appropriate signage for temporary WCH diversions to direct users during construction and support access to community and recreational facilities using footpaths and cycleways.
- Producing an NMU strategy which includes the provision and locations for diversions of existing NMU routes, new crossings, potential cycle routes and PRowS to be extinguished, as well as ensuring access for key NMU routes.
- Utilising DMRB GG 142¹⁹³ to enable opportunities for new or improved facilities and the integration with the local and national networks. This could include the creation and / or improvement of facilities for pedestrians, cyclists and equestrians that are separate from the highway.

¹⁹³ National Highways (2019) *DMRB GG 142 - Walking, cycling and horse-riding assessment and review*. Accessed at: [5f33456d-32f9-4822-abf6-e12510f5c8dc \(standardsforhighways.co.uk\)](https://www.standardsforhighways.co.uk/5f33456d-32f9-4822-abf6-e12510f5c8dc).

Mitigation measures- Construction

13.6.3 Mitigation measures of relevance during construction include the following:

- Use of appropriate mitigation measures through the implementation of the Second Iteration Environmental Management Plan to mitigate adverse effects associated with air quality, noise, traffic, and visual.
- Development of a Construction Communications plan to engage with local people and businesses about how construction may impact them, for example through road diversions.
- A Traffic Management Plan (TMP) would be implemented during the construction phase of the Scheme, to ensure that access is maintained and disruption is minimised as far as possible.
- Users of affected PRoW, footpaths and cycleways would be notified of planned diversions, and closures, with signs along sections to be closed during construction, prior to the works.
- Mitigation to maintain access to all affected residential properties, businesses and areas of open space and recreation.
- Ongoing consultation to take into account the individual needs of landowners and inform mitigation design, where appropriate.
- Liaise with private businesses to inform them on the extent of the construction works and changes that will be delivered in the local area. Potential mitigation could include building a better understanding of access requirements to maintain footfall for businesses.
- Liaise with bus companies in advance of works to enable them to plan service changes as necessary and advise passengers accordingly.

Mitigation measures - Operation

13.6.4 Mitigation measures of relevance during operation include the following:

- Provide appropriate signage for new or permanently diverted WCH routes.
- Access to all affected residential properties, businesses and areas of open space and recreation will be maintained.

Enhancement measures

13.6.5 Enhancement measures for Population and Human Health will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

13.7 Description of the likely significant effects

Construction

Land-use and accessibility

13.7.1 The likely significant effects on land use and accessibility in construction are as below.

13.7.2 The construction of the scheme would require both permanent and temporary land take from the grounds of residential properties and businesses within the Newark and Winthorpe communities, with a likely significant effect on the viability of businesses.

13.7.3 Temporary changes to access and increases in traffic from construction activities may impact access to private property and housing; community land and assets; development land and businesses; and access of walkers cyclists and horse riders within the LIA, due to potential diversions, delays, and construction traffic. These impacts are likely to be temporary, but there is the potential for significant effects on population and human health within the LIA as a result of temporary reduction in access, if the access cannot be maintained to all affected receptors, such as private property and businesses at Brownhill Junction. If access cannot be maintained this may potentially affect facilities (such as Bishop Alexander Primary School and Winthorpe Community Centre), and have a likely significant effect on the ability for people to access resources and travel between communities, particularly the communities of Newark and Winthorpe.

13.7.4 There is the also the potential for WCH facilities, particularly Winthorpe Footpath 2, to experience temporary and permanent diversions. This may result in journey length and time increases which will have a likely significant effect on increased severance to routes used by local people including, vulnerable travellers, for accessing community facilities and travelling between communities. This could result in potentially significant adverse effects.

13.7.5 Furthermore, the construction of the scheme may require both permanent and temporary use of agricultural land along the route, with a potentially significant effect on the functioning and viability of agricultural holdings and enterprises.

Human health

13.7.6 The likely significant effects on human health in construction are as below.

13.7.7 There is likely to be temporary changes to the local environment (such as distracting features like cranes, plant and machinery, introduced into the local landscape) increasing effects of dust and noise, and severance on

human health. The cumulative effect of these impacts may be significant for human health which needs to be fully understood (within the ES).

13.7.8 There are anticipated to be likely positive effects on the local economy and the supply chain during construction of the scheme. Temporary creation of jobs necessary to deliver the scheme may have direct and indirect significant beneficial effects on employment in the WIA.

Operation

Land-use and accessibility

13.7.9 The likely significant effects on land use and accessibility in operation are as below.

13.7.10 The scheme has the potential to decrease congestion on the local road network, which will have a likely significant effect on improving access to settlements surrounding the scheme.

13.7.11 There is also the potential for permanent closures or diversions to be needed for WCH routes within the LIA and for associated WCH provisions to be designed as part of the scheme. These could potentially have a likely significant impact on increased journey lengths for WCH including for vulnerable travellers and result in potentially significant adverse effects.

Human health

13.7.12 The likely significant effects on human health in operation are as below.

13.7.13 There is likely to be permanent changes to the local environment (from the provision of infrastructure introduced into the local landscape) increasing the effects of dust and noise, and severance on human health. The cumulative effect of these impacts may be significant for human health which needs to be fully understood (within the ES).

13.7.14 The scheme has the potential to decrease congestion on the local and strategic road network, which has the potential to support future economic growth in the region. This is likely to positively impact health and wellbeing outcomes for communities within the health study area.

13.8 Assessment methodology

13.8.1 This chapter of the ES will be undertaken making use of desk-based information available from the Office for National Statistics, Addressbase, Public Health (England) and Newark and Sherwood District Council; as well as drawing upon information determined as part of the assessment of other relevant disciplines presented within the ES.

13.8.2 The following standards and guidelines are considered to be relevant to the assessment of population and human health effects.

- The Design Manual for Roads and Bridges (DMRB) LA112 Population and Human Health¹⁹⁴.
- Institution of Environmental Management and Assessment (IEMA) Health in Environmental Impact Assessment: A primer for proportionate approach¹⁹⁵.

13.8.3 The assessment will focus on those impacts that are likely to have significant effects on population and human health conditions and will be completed in accordance with the standard on population and human health impact assessment included in DMRB LA 112. Significance is determined by considering the sensitivity of the receptor, as well as the magnitude of the impact on those receptors.

Land-use and accessibility

Sensitivity

13.8.4 Table 13.4 below sets out criteria that will be used to describe and assess the sensitivity of community receptors, as outlined in DMRB LA 112 Population and human health, Revision 1.

Table 13.4 Sensitivity criteria

Sensitivity	Sensitivity criteria
Very high	<p>Private property and housing:</p> <p>Existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (ONS data).</p> <p>Existing housing and land allocated for housing (e.g. strategic housing sites) covering >5ha and/or >150 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>Complete severance between communities and their land/assets, with little/no accessibility provision</p> <p>Alternatives are only available outside the local planning authority area.</p> <p>The level of use is very frequent (daily).</p> <p>The land and assets are used by the majority (>=50%) of the community.</p>

¹⁹⁴ DMRB, 2020. LA112- Population and Human Health. Available at: <https://www.standardsforhighways.co.uk/dmrb/search/1e13d6ac-755e-4d60-9735-f976bf64580a>

¹⁹⁵ IEMA, 2017. Health in Environmental Impact Assessment: A primer for proportionate approach. Available at: <https://www.iema.net/download-document/33596>

Sensitivity	Sensitivity criteria
	<p>Development land and businesses:</p> <p>Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >5ha.</p> <p>Agricultural land holdings:</p> <p>Areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure.</p> <p>Access between land and key agricultural infrastructure is required on a frequent basis (daily).</p> <p>WCH:</p> <p>National trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution.</p> <p>Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs.</p> <p>Rights of way for WCH crossing roads at-grade with >16,000 vehicles per day.</p>
High	<p>Private property and housing:</p> <p>Private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data).</p> <p>Existing housing and land allocated for housing (e.g. strategic housing sites) covering >1-5ha and / or >30-150 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>There is substantial severance between community and assets, with limited accessibility provision.</p> <p>Alternative facilities are only available in the wider local planning authority area.</p> <p>The level of use is frequent (weekly).</p> <p>The land and assets are used by the majority (>=50%) of the community.</p> <p>Development land and businesses:</p> <p>Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1 - 5ha.</p> <p>Agricultural land holdings:</p> <p>Areas of land in which the enterprise is dependent on the spatial relationship of land to key agricultural infrastructure.</p>

Sensitivity	Sensitivity criteria
	<p>Access between land and key agricultural infrastructure is required on a frequent basis (weekly).</p> <p>WCH:</p> <p>Regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution.</p> <p>Rights of way for WCH crossing roads at-grade with >8,000 - 16,000 vehicles per day.</p>
Medium	<p>Private property and housing:</p> <p>Houses or land allocated for housing located in a local authority area where the number of households are expected to increase by >6-15% by 2041 (ONS data).</p> <p>Existing housing and land allocated for housing (e.g. strategic housing sites) covering <1ha and / or <30 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>There is severance between communities and their land/assets but with existing accessibility provision.</p> <p>Limited alternative facilities are available at a local level within adjacent communities.</p> <p>The level of use is reasonably frequent (monthly).</p> <p>The land and assets are used by the majority (>=50%) of the community.</p> <p>Development land and businesses:</p> <p>Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering <1ha.</p> <p>Agricultural land holdings:</p> <p>Areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure.</p> <p>Access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly).</p> <p>WCH:</p> <p>Public Rights of Way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys.</p> <p>Rights of way for WCH crossing roads at-grade with >4,000 – 8,000 vehicles per day.</p>
Low	Private property and housing:

Sensitivity	Sensitivity criteria
	<p>Proposed development on unallocated sites providing housing with planning permission/in the planning process.</p> <p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> Limited existing severance between community and assets, with existing Equality Act 2010 compliant accessibility provision. Alternative facilities are available at a local level within the wider community. The level of use is infrequent (monthly or less frequent). The land and assets are used by the minority (>=50%) of the community. <p>Development land and businesses:</p> <ul style="list-style-type: none"> Proposed development on unallocated sites providing employment with planning permission / in the planning process. <p>Agricultural land holdings:</p> <ul style="list-style-type: none"> Areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure. Access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent). <p>WCH:</p> <ul style="list-style-type: none"> Routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes. Rights of way for WCH crossing roads at-grade with <4,000 vehicles per day.
Negligible	<p>Private property and housing:</p> <ul style="list-style-type: none"> N/A. <p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> No or limited severance or accessibility issues. Alternative facilities are available within the same community. The level of use is very infrequent (a few occasions yearly). The land and assets are used by the minority (>=50%) of the community. <p>Development land and businesses:</p> <ul style="list-style-type: none"> N/A. <p>Agricultural land holdings:</p> <ul style="list-style-type: none"> Areas of land which are infrequently used on a non-commercial basis. <p>WCH:</p> <ul style="list-style-type: none"> N/A.

Source: DMRB LA 112 Population and human health, Revision 1, Table 11 Environmental value (sensitivity) and descriptions.

Magnitude

13.8.5 The magnitude of impacts will be assessed following the principles below.

Table 13.5 below sets out criteria that will be used to describe and assess the impact on community and health receptors, as outlined in DMRB LA 112 Population and human health, Revision 1.

Table 13.5: Impact magnitude criteria for receptors

Magnitude	Criteria
Major	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of buildings and direct development of land to accommodate highway assets.</p> <p>Introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision.</p> <p>WCH:</p> <p>>500m increase (adverse) / decrease (beneficial) in WCH journey length.</p>
Moderate	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>Partial loss of / damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings.</p> <p>Introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision.</p> <p>WCH:</p> <p>>250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Minor	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>A discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g. amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings.</p> <p>Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision..</p> <p>WCH</p>

Magnitude	Criteria
	>50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.
Negligible	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: Very minor loss or detrimental alteration to one or more characteristics, features or elements. e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings. Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision. WCH <50m increase (adverse) or decrease (beneficial) in WCH journey length.
No change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

Source: DMRB LA 112, Revision 1, Table 3.12 Magnitude of impact and typical descriptions

Significance

13.8.6 Subsequent to identifying an appropriate receptor sensitivity and magnitude of impact using Table 13.4 and Table 13.5 above, the likely significance category and overall significance of effects would be assessed by using the matrix provided within in Table 5.2, along with professional judgment to consider site specific factors that may be of relevance. Table 5.2 does not apply to rating effects on human health, because the significance of effect is reported as negligible, minor, moderate or major.

Human health

13.8.7 There is no formal guidance on considering health within the context of EIA. However, the following legislation, policy, standards and guidelines are considered to be relevant to the assessment of human health effects due to the scheme.

- The Design Manual for Roads and Bridges (DMRB) LA112 Population and Human Health.
- Institution of Environmental Management and Assessment (IEMA) Health in Environmental Impact Assessment: A primer for a proportionate approach.

13.8.8 It is important to note that a health effect does not need to meet all of the sensitivity / magnitude characteristics to be assigned to a specific category.

13.8.9 The sensitivity of a community/population from health point of view shall be reported as¹⁹⁶:

- low;
- medium; or
- high

13.8.10 The likely health outcome(s) will be identified in line with the categories in Table 13.6 below.

Table 13.6: Human health outcome categories

Health outcome category	Health outcome description
Positive	A beneficial health impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse health impact is identified
Uncertain	Where uncertainty exists as to the overall health impact

Source: DMRB LA112 Revision 1, Table 3.32 Human health outcome categories

13.8.11 The magnitude of impacts will be assessed using professional judgement and following the principles below. Table 13.7 below sets out criteria that will be used to describe and assess the impact on community and health receptors, as outlined in DMRB LA 112 Population and human health, Revision 1.

Table 13.7: Impact magnitude criteria

Magnitude of impacts	Criteria
Major (adverse or beneficial)	<ul style="list-style-type: none"> • A strong evidence base that risk factors for a permanent, progressive or irreversible health condition would be affected (positively or negatively) • Permanent or irreversible exposure or change over a long duration • Substantial change (positive or negative) from the baseline position • Highly deprived communities affected • A large widening or narrowing of inequalities • Majority of the population affected (positively or negatively) •

¹⁹⁶ DMRB LA112 Revision 1

Magnitude of impacts	Criteria
Moderate (adverse or beneficial)	<ul style="list-style-type: none"> • A strong evidence base that risk factors for a non-permanent, reversible, non-progressive health condition would be affected (positively or negatively) • A small change (positive or negative) from the baseline position • Severity predominantly related to moderate changes in morbidity • A community with average deprivation affected • A small widening or narrowing of inequalities • Many people in a community affected (positively or negatively)
Minor (adverse or beneficial)	<ul style="list-style-type: none"> • A strong evidence base that risk factors for transient, temporary symptoms (e.g. irritation, nausea or headache) would be affected (positively or negatively) • Short-term duration • Occasional events • Small minority of population affected • A slight change (positive or negative) from the baseline position with evidence available to demonstrate change • A community with low deprivation affected • A slight widening or narrowing of inequalities with evidence available to demonstrate change • Few people in a community affected (positively or negatively)
Negligible	<ul style="list-style-type: none"> • No discernible change in health or wellbeing within normal variations • Very short-term duration • Very few people affected • Immediate reversal once activity complete • No discernible change (positive or negative) from baseline positions • No discernible widening or narrowing of inequalities

Source: DMRB LA 112: Population and human health

13.8.12 A detailed health profile will be developed in line with the health determinants identified in section 3.21 of DMRB LA 112 in future stages of the EIA by interviewing sensitive receptors and undertaking a desk-based analysis of data.

13.9 Assessment assumptions and limitations

13.9.1 The following assumptions and limitations apply:

- The assessment of the potential for significant effects has been carried out against a benchmark of current baseline conditions within the LIA and WIA. As with any dataset, these may be subject to change over time,

which may influence the findings of the assessment and could lead to the assessment being subject to statistical time lag.

- No topic-specific formal consultation or primary research has been undertaken in the production of this chapter.
- It is assumed that the construction process would not render local properties unusable and there would be no displacement of local residents.
- Questionnaires and interviews have not been undertaken with agricultural land holders at this early stage of design so further information on type, husbandry, frequency of use, and existing severance / accessibility issues, for example, is not yet known. Therefore, the assessment will only identify broad agricultural land within the area and land take, and not consider impacts at the land holding scale.
- WCH surveys have not been undertaken to date. If WCH amenities (for example PRoWs) are to be affected, then surveys will be completed in subsequent design stages to inform WCH provision for the scheme and the ES.
- The traffic model is currently being updated; to date, information on traffic flows at any WCH crossings in the study area is not known. This information will be available to inform the ES.

13.10 Summary

13.10.1 There are no scoping questions included in DMRB LA 112.

13.10.2 The proposed scope of the ES is contained within Table 13.8.

Table 13.8: Summary of potential impacts and requirement for further assessment

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Land use and accessibility (including private property and housing; community land and assets; development land and businesses; agricultural land holdings; and walkers, cyclists and horse-riders) Human Health (including health profiles and affected communities;	-	-

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
	health determinants; and likely health outcomes)		
Operation	<p>Land use and accessibility (including private property and housing; community land and assets; development land and businesses; agricultural land holdings; and walkers, cyclists and horse-riders)</p> <p>Human Health (including health profiles and affected communities; health determinants</p>	-	-

14 Road Drainage and the Water Environment

14.1 Introduction

14.1.1 This chapter aims to identify the potential for significant effects of the scheme upon road drainage and the water environment. This chapter has been prepared in accordance with DMRB LA113 Road drainage and the water environment¹⁹⁷. Further assessment will be presented within the ES.

14.2 Legislation and policy

Legislation

14.2.1 The overarching legislation in relation to road drainage and the water environment is provided by:

Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

14.2.2 These regulations aim to protect inland and coastal waters and prevent deterioration of aquatic ecosystems, including groundwaters. A key aim of the Water Framework Directive (WFD) is to achieve ‘good’ ecological status for all waterbodies by 2015, with a secondary aim to gradually reduce the release of pollutants which may pose significant risks to the aquatic ecosystems. The environmental objectives of the WFD are implemented through actions described in the River Basin Management Plans (RBMPs).

14.2.3 The WFD requires EU Member States to consider a single system of water resource management through characterisation, protection and enhancement of water resources considered within the context of a river basin district (RBD). Within England and Wales, 11 RBDs have been identified, including three cross-border RBDs, one of which crosses the borders of England and Scotland. The 2017 Regulations require ‘the appropriate agency’ (the Environment Agency in England) to prepare RBMPs for each RBD, for the approval of ‘the appropriate authority’ (the Secretary of State (SoS) in England).

Land Drainage Act 1991.

14.2.4 The Land Drainage Act 1991 requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The riparian owner must accept the natural flow from upstream but need

¹⁹⁷ Highways England (2020) DMRB LA 113 – Road drainage and the water environment Revision 1 [online] available at: [d6388f5f-2694-4986-ac46-b17b62c21727 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk) (Last accessed June 2022).

not carry out work to cater for increased flows resulting from some types of works carried out upstream, for example a new housing development.

14.2.5 If a riparian owner fails to carry out his responsibilities under the Land Drainage Act, or if anyone else causes a watercourse to become blocked or obstructed, the County and District Councils have powers of enforcement by serving a notice under the Act. If this is ignored, the Council concerned may carry out the necessary works itself and then recharge the person responsible for the full cost incurred.

[Land Drainage Act 1994.](#)

14.2.6 This Act amends the Land Drainage Act 1991 in relation to the functions and duties of internal drainage boards and local authorities. It makes particular provision for duties with respect to Sites of Special Scientific Interest (SSSI).

[Flood and Water Management Act 2010.](#)

14.2.7 The Flood and Water Management Act's aims are:

- Greater security for people and their property from the risk of flooding and coastal erosion by creating clearer structures and responsibilities for managing that risk, building on the Government's response to Sir Michael Pitt's report following the 2007 floods. It improves local leadership on flood risk, improves management of risk from surface runoff and enables better planning for and prediction and warning of floods. It also introduces modern risk-based approaches to reservoir safety as well as greater security of water supply in the event of water company failure, and improved protection of essential supplies during drought.
- Better service for people through new ways of delivering major water and sewerage infrastructure projects and improving complaints and enforcement procedures.
- Greater sustainability by helping people and their communities adapt to the increasing likelihood of severe weather events due to climate change, encouraging sustainable drainage systems in new developments, protecting communities and the environment better from the risk of flooding, protecting water resources and improving water quality.

[The Water Resources Act 1991 \(as amended\)](#)

14.2.8 An Act to consolidate enactments relating to the National Rivers Authority and the matters in relation to which it exercises functions, with amendments to give effect to recommendations of the Law Commission.

The Flood Risk Regulations 2009

14.2.9 These Regulations transposed the European Floods Directive into law for England and Wales and came into force on 10th December 2009. The Floods Directive sets out requirements to manage flood risk from all sources in order to reduce the consequence of flooding on human health, economic activity and the environment.

National Policy

14.2.10 The overarching national policies in relation to road drainage and the water environment are provided by:

[National Policy Statement for National Networks \(NPSNN\): Paragraph 5.90 to 5.115, and Paragraph 5.219 to 5.231.](#)

14.2.11 This policy outlines the policies the applicant, the Examining Authority and the Secretary of State should take into account when taking decisions.

Flood Risk

14.2.12 When determining an application for development consent in relation to flood risk, the policies relating to climate change adaption in paragraphs 4.36 to 4.47 of the NPSNN should be taken into account.

14.2.13 As per paragraphs 5.92, 5.93 and 5.96 of the NPSNN, applications for projects within Flood Zones 2 and 3, or within Flood Zone 1 for projects of 1 hectare or greater should be accompanied by a Flood Risk Assessment (FRA). This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account. Applicants for projects which may be affected by, or may add to, flood risk are advised to seek sufficiently early pre-application discussions with the Environment Agency and, where relevant, other flood risk management bodies such as lead local flood authorities, Internal Drainage Boards, and reservoir owners and operators. Where flood risk is a factor in determining an application for development consent, the Secretary of State should be satisfied, where relevant:

- The application is supported by an appropriate FRA.
- The Sequential Test has been applied as part of site selection and, if required, the Exception Test has also been applied.

14.2.14 If the Environment Agency has concerns and objects to the grant of development consent on grounds of flood risk, the Secretary of State can grant consent but would need to be satisfied before deciding whether or

not to do so that all reasonable steps have been taken by the applicant and the Environment Agency to try and resolve the concerns.

Water Quality and resources

14.2.15 Infrastructure development can have adverse effects on the water environment. As per paragraph 5.220 of the NPSNN, the Government's planning policies make clear that the planning system should contribute to and enhance the natural and local environment by, amongst other things, preventing both new and existing development from contributing to, or being put at unacceptable risk from, or being adversely affected by, water pollution. The Government has issued guidance on water supply, wastewater and water quality considerations in the planning system. Where applicable, an application for a Development Consent Order has to contain a plan with accompanying information identifying water bodies in a River Basin Management Plan (RBMP).

National Planning Policy Framework: Section 3, Section 14, Section 15, and Annex 3.

14.2.16 When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific FRA. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.
- The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.
- It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate.
- Any residual risk can be safely managed.
- Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

14.2.17 Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the Lead Local Flood Authority.
- Have appropriate proposed minimum operational standards.

- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.
- Where possible, provide multifunctional benefits.

Local Policy

14.2.18 The overarching local policies in relation to road drainage and the water environment are provided by:

Newark & Sherwood Local Development Framework Core Strategy & Allocations

14.2.19 The relevant policies within the document are outlined below:

Core Policy 9 – Sustainable Design

14.2.20 The District Council will expect new development proposals to demonstrate a high standard of sustainable design, for water pro-actively managing surface water with Sustainable Drainage Systems and providing resilience against potential impacts of climate change and the varying needs of the community.

Core Policy 10 – Climate Change

14.2.21 The District Council is committed to tackling the causes and impacts of climate change and to delivering a reduction in the District's carbon footprint. The District Council will work with partners and developers to:

- Promote energy generation from renewable and low-carbon sources, including community-led schemes, through supporting new development where it is able to demonstrate that its adverse impacts have been satisfactorily addressed. Policy DM4 'Renewable and Low Carbon Energy Generation' provides the framework against which the appropriateness of proposals will be assessed.
- Ensure that development proposals maximise, where appropriate and viable, the use of available local opportunities for district heating and decentralised energy.
- 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
 - Be efficient in the consumption of energy, water and other resources.

- Steer new development away from those areas at highest risk of flooding, applying the sequential approach to its location detailed in Policy DM5 ‘Design’. Where appropriate the Authority will seek to secure strategic flood mitigation measures as part of new development.
- Where appropriate having applied the Sequential Test move on to apply the Exceptions Test, in line with national guidance. In those circumstances where the wider Exceptions Test is not required proposals for new development in flood risk areas will still need to demonstrate that the safety of the development and future occupants from flood risk can be provided for, over the lifetime of the development.
- Ensure that new development positively manages its surface water run-off through the design and layout of development to ensure that there is no unacceptable impact in run-off into surrounding areas or the existing drainage regime.

Core Policy 10A – Land Drainage Designations

14.2.22 In order to ensure the appropriate management of flood risk as part of new development, the District Council will work with partners to develop Local Drainage Designations in the following locations:

- Lowdham
- Southwell

14.2.23 These designations will set local drainage standards which specified forms of new development will be required to meet. This is to ensure that development positively manages its surface water run-off through the design and layout of new development, in order that there will be no unacceptable impact from run-off on surrounding areas or the existing drainage regime.

14.2.24 The geographic extent, forms of development which will be subject to the designation and the specific standards that proposals will need to meet will be defined through a Local Drainage Designations Supplementary Planning Document.

14.2.25 Where the evidence to support the development of additional Local Drainage Designations in other locations emerges then the District Council will work with partners, to secure their introduction and subsequent implementation, in line with the above.

14.3 Study area

14.3.1 The study area for road drainage and the water environment covers a 1 kilometre radius around the scheme, based on professional judgement. This relates to both surface water, and groundwater. The study area may

be extended where there are sensitive features (protected areas) that may be affected by contaminants transported downstream of the works via surface water bodies, and therefore these features are included in the assessment where appropriate, although at this stage in the assessment no receptors outside the 1 kilometre study area have been identified. This approach ensures that any potential effects of the scheme are sufficiently identified.

14.4 Baseline conditions

14.4.1 Information to assist with defining the existing baseline conditions has been obtained from the following sources:

- Environment Agency’s Catchment Data Explorer¹⁹⁸.
- EA Flood Map for Planning¹⁹⁹.
- South East River Basin Management Plan (RBMP)²⁰⁰.
- Department for Environment Food Rural Affairs (Defra) ‘Magic’ (Multi-agency geographic information for the countryside) interactive map²⁰¹.
- Environment Agency’s published data²⁰².
- United Kingdom Soil Observatory (UKSO) information²⁰³.

14.4.2 The baseline identifies potential receptors and considers the range and interactions of processes which will influence surface and groundwater, meeting the Water Framework Directive (WFD) objectives, and flood risk and drainage. A sensitivity has been assigned to each identified water environment receptor based on DMRB LA113.

Surface water

14.4.3 There are four Main Rivers located within the study area (River Trent, Middle Beck, River Devon, and Slough Dyke (The Fleet)). Currently, the A46 crosses the River Trent twice, and the Slough Dyke (the Fleet) once. There are also ordinary watercourses within the study area, including the Old Trent Dyke which the A46 crosses. The scheme is located within the Trent Valley Internal Drainage Board (IDB) area.

¹⁹⁸ Environment Agency (2021) Environment Agency Data Catchment Explorer [online] Available at: <https://environment.data.gov.uk/catchment-planning/> (Last accessed June 2022).

¹⁹⁹ Environment Agency (2021) Environment Agency Flood Map for Planning [online] available at: <https://flood-map-for-planning.service.gov.uk/> (Last accessed June 2022).

²⁰⁰ Environment Agency (2015) South East River Basin Management Plan [online] available at: [South East river basin district river basin management plan - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/444444/south-east-river-basin-management-plan-2015.pdf) (Last accessed June 2022).

²⁰¹ DEFRA Magic Map. Available at: <https://magic.defra.gov.uk/MagicMap.aspx> (Last accessed June 2022).

²⁰² Environment Agency’s published data. Available at: [Public registers \(data.gov.uk\)](https://data.gov.uk) (Last accessed June 2022).

²⁰³ UKSO. Available at: [UK Soil Observatory \(bgs.ac.uk\)](https://www.ukso.ac.uk) (Last accessed June 2022).

14.4.4 Table 14.1 lists the surface watercourse receptors identified within the study area, including distance to the scheme and their importance, which has been assigned based on whether or not the watercourse has a WFD classification and its Q95 flow, following DMRB LA 113 methodology. Where Q95 flow data is not readily available a conservative assumption has been made using professional judgement.

14.4.5 There are no WFD lake waterbodies within the study area, however, there are numerous non-WFD lakes/ponds. These are listed below:

- Farndon Ponds: located adjacent to Farndon Harbour approximately 0.9 kilometres west of the scheme.
- Three ponds adjacent to the Kelham and Averham Floodplain Compensation Area (FCA).
- Ponds adjacent to Staythorpe Power Station: located approximately 0.7 kilometres east of the scheme, but separated from the scheme by the River Trent.
- Three ponds approximately 0.9 kilometres north of the A46 and east of the A616 associated with Smeatons Lakes Camping site.
- Two bodies of water adjacent to Smeatons Lakes and the River Trent, the purposes of these are unclear. The closest of these waterbodies is approximately 0.5 kilometres north of the scheme (not separated by the River Trent),
- Four bodies of water to the north of the River Trent confluence, and south of the A1. These are separated from the scheme by the River Trent and it is unclear what the purpose of these waterbodies are. The closest of these waterbodies is approximately 0.3 kilometres west of the scheme.
- Three marinas within the study area: Farndon Marina lies approximately 0.6 kilometres west of the scheme and upstream at the point where the A46 crosses the River Trent, Newark Marina is approximately 0.96 kilometres downstream of where the A46 crosses the River Trent, and Kings Waterside and Marina is adjacent to the A46 boundary (approximately 2.5 kilometres downstream of where the A46 crosses the River Trent near Farndon, and 0.8 kilometres upstream of where the A46 crosses the River Trent near Robert Dukes Avenue).

Table 14.1: Surface watercourses within the study area²⁰⁴

Watercourse name	Approximate distance from scheme²⁰⁵	Type of watercourse	WFD waterbody ID	Q₉₅ Levels (m³/s)²⁰⁶	Description	Sensitivity of receptor²⁰⁷
River Trent	0 kilometres - The A46 crosses this watercourse twice.	Main River	Trent from Soar to Beck (GB104028053110)	28.9	This waterbody splits into two, upstream of Newark-on-Trent and rejoins downstream of Newark-on-Trent.	Very high as the watercourse has a WFD classification and Q ₉₅ level greater than 1m ³ /s. The scheme is essential infrastructure, and the flood risk relating to the scheme is associated with the River Trent.
Middle Beck	0.80 kilometres south-east (upstream) of the southern extent of the scheme.	Main River	Middle Beck Catchment (tributary of Devon) (GB104028052633)	Unknown	This waterbody joins the River Devon within the study area.	High as the watercourse has a WFD classification. The Q ₉₅ level is unknown, however as it appears to be a narrow watercourse which joins the River Devon, it is assumed to have a Q ₉₅ level similar to the River

²⁰⁴ The table is organised reading south to north of the scheme extent to show which watercourses interact with the scheme from an upstream to downstream perspective.

²⁰⁵ The distance has been taken from the point of the watercourse closest to the scheme.

²⁰⁶ Q₉₅ values taken from closest point on the watercourse. 'Unknown' Q₉₅ values are where the Q₉₅ values are not readily available for these watercourses.

²⁰⁷ The importance of the waterbodies were assigned based on whether or not the watercourse has a WFD classification and its Q95 flow, following DMRB LA 113 methodology.

Watercourse name	Approximate distance from scheme ²⁰⁵	Type of watercourse	WFD waterbody ID	Q ₉₅ Levels (m ³ /s) ²⁰⁶	Description	Sensitivity of receptor ²⁰⁷
						Devon (less than 1m ³ /s.) There is no fluvial flood risk to the scheme associated with this watercourse.
River Devon	0.1 kilometres, east (upstream) of the southern extent of the scheme.	Main River	Devon from Cotham to Trent (GB104028052632)	0.132	This waterbody joins the River Trent within the study area.	Very high as the watercourse has a WFD classification but the Q ₉₅ level is less than 1m ³ /s. The scheme is essential infrastructure, and the scheme is located within an area of Flood Zone 3 associated with the River Devon.
Old Trent Dyke	0 kilometres - The A46 crosses this watercourse three times.	Ordinary Watercourse	None	Unknown	This watercourse is a tributary of the River Trent.	Medium as the watercourse does not have a WFD classification. It is assumed the Q ₉₅ level is greater than 0.001 m ³ /s.
Unnamed watercourse (1)	0 kilometres – The A46 crosses this	Ordinary Watercourse	None	Unknown	This watercourse is a tributary of the River Trent upstream of the	Low as this watercourse does not have a WFD

Watercourse name	Approximate distance from scheme ²⁰⁵	Type of watercourse	WFD waterbody ID	Q ₉₅ Levels (m ³ /s) ²⁰⁶	Description	Sensitivity of receptor ²⁰⁷
	watercourse once.				B6326 bridge. This watercourse may be a feeder into the Old Trent Dyke. At this stage, it is not known what the relationship between these two watercourses is.	classification and appears to be heavily modified (culverted under development). It is assumed the Q ₉₅ level is less than 0.001 m ³ /s.
Misson Drain	0.4 kilometres north (downstream) of the Flood Compensation Area proposed in Kelham.	Ordinary	None	Unknown	This watercourse is a drain into the River Trent flowing through Kelham and connecting to Broadgate Lane feeder	Low as this watercourse does not have a WFD classification and appears to be a drainage channel (potentially for agricultural purposes). It is assumed the Q ₉₅ level is less than 0.001 m ³ /s.
Broadgate Lane Feeder	0 kilometres – adjacent to the Flood Compensation Area proposed in Kelham.	Ordinary	None	Unknown	This watercourse is a drain from fields north of Kelham, connecting to Mission Drain and the River Trent.	Low as this watercourse does not have a WFD classification and appears to be a drainage channel (potentially for agricultural purposes). It is assumed the Q ₉₅

Watercourse name	Approximate distance from scheme ²⁰⁵	Type of watercourse	WFD waterbody ID	Q ₉₅ Levels (m ³ /s) ²⁰⁶	Description	Sensitivity of receptor ²⁰⁷
						level is less than 0.001 m ³ /s.
Unnamed watercourse (2)	0 kilometres – The A46 crosses this watercourse once.	Ordinary	None	Unknown	This watercourse drains into the River Trent downstream of where the A46 crosses.	Medium as the watercourse does not have a WFD classification. It is assumed the Q ₉₅ level is greater than 0.001 m ³ /s.
Slough Dyke (The Fleet)	0 kilometres – The A46 crosses this watercourse immediately west of Brownshills roundabout.	Main	Slough Dyke Catchment (tributary of Trent) (GB104028053111)	Unknown	This watercourse flows through the north-east of Newark-on-Trent and Winthorpe before joining the River Trent downstream.	High as the watercourse has a WFD classification. The Q ₉₅ level is unknown, however it appears to be culverted under Newark-on-Trent, and assuming it would not have a flow rate higher than the River Devon. It is assumed to have a Q ₉₅ level less than 1m ³ /s.

Flood risk

14.4.6 The scheme is located across areas within Flood Zone 2 (land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding) and Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding; or land having a 1 in 200 or greater annual probability of sea flooding), with all aspects of the A46 north of Newark-on-Trent located within Flood Zone 1 (land having a less than 1 in 1,000 annual probability of river or sea flooding). These Flood Zones are associated with the River Trent.

14.4.7 There are areas of medium risk of surface water flooding (between 1 in 30 and 1 in 100 chance of flooding each year), as defined by surface water flood risk mapping²⁰⁸ however the majority of the scheme is located within areas of very low risk of surface water flooding (between 1 in 100 and 1 in 1000 chance of flooding each year). There is a section in the northern extent of the scheme, adjacent to Alexander Avenue, where there is an area of medium risk associated with the ordinary watercourse being culverted under the A46.

14.4.8 Flood risk has been assigned a very high importance based on almost the entirety of the study area being within Flood Zone 2 and 3.

Groundwater

14.4.9 The entirety of the scheme is located within the Lower Trent Erewash Secondary Combined (GB40402G990300) groundwater WFD waterbody.

14.4.10 The majority of the scheme overlies Triassic Rock bedrock considered to be a low productivity aquifer, as flow is virtually all through fractures and other discontinuities. In addition, approximately 0.6 kilometres to the north east of the scheme, the study area is underlain by Lias group mudstone which has no groundwater. For further information on the bedrock and superficial geology of the area, refer to Chapter 10 Geology and Soils. As the aquifer is considered to be low productivity (not a principal aquifer ('High importance' or unproductive strata 'Low importance'), groundwater has been assigned an importance of medium.

14.4.11 There are no Source Protection Zones (SPZs), drinking water protected areas or drinking water safeguard zones within the study area.

²⁰⁸ Environment Agency (2022) Check the long term flood risk for an area in England [online]. Available at: [Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/check-the-long-term-flood-risk-for-an-area-in-england) (Last accessed August 2022).

Designated sites

14.4.12 There are two LNRs located within the study area:

- Farndon Ponds LNR: located approximately 0.8 kilometres to the east of Farndon Junction. Whilst this site is hydraulically connected to the River Trent, it is upstream of the scheme.
- Devon Park Pastures LNR: located approximately 500 metres east of Farndon Junction. This site is adjacent to the River Devon, however, upstream of the River Trent and the scheme.

14.4.13 A Ground Water Dependent Terrestrial Ecosystem (GWDTE) Assessment was undertaken during the earlier options appraisal stage of the scheme and did not identify any GWDTEs within the study area. Therefore, these LNRs are not considered to be GWDTEs but are included within the assessment as they are both water dependent.

14.4.14 There are no Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), or Special Protected Area (SPAs) located within the study area.

14.4.15 There are three authorised landfill sites within the study area. Two of these landfills are located adjacent to the A46 as part of the British Sugar Company, and the third is located to the east of the A616, approximately 0.8 kilometres north of Cattle Market Junction. The risk of contaminated land and the risk to soils have been scoped-in (see Chapter 10 Geology and Soils). Therefore, mobilisation of sediment and contaminants will be considered further. For further information on the potential of contaminated land, see Chapter 10 Geology and Soils.

14.5 Potential impacts

Construction

Surface water

14.5.1 There is the potential for surface water quality to be affected through contaminants arising from construction activities entering surface watercourses. These activities include excavation, deposition of soils, sediments, or other construction materials to accommodate new watercourse crossings; spillage of fuels or other contaminating liquids; and, mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled surface runoff.

14.5.2 There is the potential for adverse impacts due to localised damage to channel and riparian features and disruption to the natural hydraulic and

sediment transport processes, due to the modification and construction of culverts and bridges during construction for the scheme.

Flood risk

14.5.3 There is the potential for an increase in flood risk within the scheme extent and the surrounding areas due to the potential for construction activities to alter the flow paths of surface water or increase the amount of surface water run-off in localised areas. An increase in flood risk within the scheme extent and the surrounding areas could also occur due to any changes in topography and/or earthworks which could change the overland flows during storm events.

Groundwater

14.5.4 Ground and earthworks during construction may cause disruptions to the groundwater flow region. This may cause adverse impacts associated with interruptions of flow, leading to either a reduction or loss of water supply to abstractions.

14.5.5 There is the potential for adverse impacts from contamination of groundwater by the mobilisation of contaminants within the soils, through accidental spillages or direct contact with construction materials or piling operations which could create pathways to groundwater. In addition, there is the risk of contamination of aquifers through indirect groundwater receptors such as springs, streams and / or abstractions.

Water Framework Directive

14.5.6 The potential adverse impacts to channels and riparian features and disruption to the natural hydraulic and sediment transport processes, also have the potential to affect the Water Framework Directive status of the waterbodies.

Designated sites

14.5.7 Changes to surface water qualities and volumes during construction could adversely impact the LNRs through contaminated surface water run-off.

Operation

Surface water

14.5.8 Pollution of surface water from discharge of routine run-off may lead to long-term degradation of water quality. These contaminants within the runoff typically include vehicle emissions (including atmospheric deposition), vehicle part wear and vehicle leakages, catalytic converters, road surface erosion, and seasonal and regular maintenance practices.

Possible contaminants include particulate solids, hydrocarbons (diesel, petroleum, lubricating oil leaks, and grease), heavy metals (especially copper and zinc, but also cadmium, iron, lead and chromium in lesser amounts), oxides of nitrogen, sulphates, rubber, asbestos, tyre wear deposits including lead, zinc, and hydrocarbons, and de-icing during cold weather. All these contaminants have the potential to have an adverse effect on the water quality of the receiving watercourse.

Flood risk

14.5.9 Potential impacts to flood risk from the presence of permanent infrastructure within the flood plain and the resultant decrease in areas to store water.

14.5.10 Potential increase in flood risk from constriction to the natural flow of water and diverting the water storage elsewhere.

14.5.11 Potential increase in surface water flooding through the increase in impermeable surface.

14.5.12 Changes in surface water run-off as a result of changes in topography or flow patterns, which may increase the risk of surface water flooding.

Groundwater

14.5.13 Permanent below-ground infrastructure may cause a change in existing groundwater flow regime, resulting in an interruption to flow. This may lead to the loss of water supply to springs and streams.

14.5.14 New drainage systems have the potential to interrupt flow by reducing recharge to the underlying aquifer.

Water Framework Directive

14.5.15 Infrastructure within or adjacent to watercourses have the potential to cause direct adverse morphological impacts, which could result in a less dynamic flow, loss of sediment continuity, increased sedimentation, habitat severance, potential barriers for fish migration, and loss of habitats for macrophytes through shading. These adverse impacts could affect the WFD status of the watercourse if unmitigated.

Designated sites

14.5.16 Changes to surface water qualities and volumes during operation could adversely impact the LNRs through contaminated surface water run-off or increased surface water flood risk.

14.6 Design, mitigation and enhancement measures

Design measures

- 14.6.1 Design measures to reduce the impact of the scheme on the road drainage and water environment include: surface water management / drainage systems to control surface water run-off, and the use of Sustainable Drainage Systems (SuDs), in line with the SuDS hierarchy and attenuation ponds.
- 14.6.2 The Highways England Water Risk Assessment Tool (HEWRAT) will be completed to support the Environmental Statement, and suitable measures (including a detailed drainage design) will be implemented. The drainage design will include pollution prevention measures to control and prevent polluted run-off, this will be informed by the HEWRAT assessments.
- 14.6.3 The scheme involves work within Flood Zone 2 and Flood Zone 3; design measures to mitigate for this include locating compounds outside of Flood Zones 2 and 3 and minimising flood plain working, where possible. A report titled “Flood Compensation Calculations – Fourth Iteration” was produced at the previous design stage. The report outlined the estimated volume of floodplain that would be displaced by the proposed road construction. The report also looked at sizing a potential floodplain compensation site adjacent to the village of Kelham. Prior to the completion of the ES, further work will be carried out to assess potential floodplain compensation sites and identify appropriate flood risk mitigation measures.

Mitigation measures - Construction

- 14.6.4 During construction, a Second Iteration Environmental Management Plan will be put in place to manage the potential effects of the scheme on water resources and to ensure the scheme will comply with current policies/regulations that aim to protect water resources. Construction activities will be managed by best practices measures in accordance with Construction Industry Research and Information Association (CIRIA) Guidelines.
- 14.6.5 Guidance on best practice in relation to pollution prevention and water management is set out in the following:
- CIRIA’s ‘Environmental good practice on site’²⁰⁹

²⁰⁹ Audus, Charles and Evans (2010) Environmental Good Practice on Site (Third Edition) (C692).

- CIRIA's 'Control of water pollution from linear construction projects: Technical Guidance'²¹⁰
- Environment Agency's 'Protect groundwater and prevent groundwater pollution'²¹¹,
- Environment Agency's Pollution Prevention Guidelines (PPG)5 'Works and maintenance in or near water', PPG6 'Working at Construction and Demolition Sites', PPG7 'The safe operation of refuelling facilities', and PPG13 'Vehicle washing and cleaning'²¹².

14.6.6 Monitoring of the watercourses at risk of pollution will be carried out during the construction phase. At the time of writing, consultation with the Environment Agency is underway to determine sampling locations and requirements for pre-construction monitoring. Types of assessment may include visual assessments for oil and silt, as well as laboratory and in-situ testing from sampling points located upstream and downstream of the scheme, in particular where the scheme crosses watercourses.

14.6.7 Discharges of trade effluent or unclean water to a body of surface water may require an environmental permit to be acquired from the Environment Agency.

14.6.8 Any piling works required for the scheme will be subject to appropriate risk assessments. Method statements detailing piling operations will cover the potential to cause pollution to the underlying aquifer and potential mobilisation of contaminated soil.

14.6.9 The construction works will minimise in-channel working and riparian vegetation removal, and include measures for temporary watercourse diversions where necessary.

14.6.10 The scheme will require work to be carried out within Flood Zone 2 and Flood Zone 3. A Flood Risk Assessment (FRA) will be undertaken to understand the risk of flooding during construction and to ensure appropriate mitigation is implemented within the Second Iteration Environmental Management Plan.

14.6.11 The scheme potentially impacts a number of WFD waterbodies. A WFD compliance assessment will be undertaken to understand the extent

²¹⁰ Murnane, Heap and Swain (2006) Control of water pollution from linear construction projects; Technical Guidance.

²¹¹ Environment Agency (2017) Protect groundwater and prevent groundwater pollution [online] available at: <https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution> (last accessed April 2022).

²¹² The Environment Agency PPGs were formally withdrawn on 17 December 2015, however, they nonetheless provide clear and useful best practice advice. The archived PPGs are available at: <https://webarchive.nationalarchives.gov.uk/ukqwa/20140328090931/http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx>.

to which the proposed scheme could impact on the current and future target WFD status of these waterbodies. Where potential adverse effects are identified, an assessment of these will inform what mitigation measures need to be incorporated into the design and construction methods of the proposed scheme to remove or minimise the effect.

Mitigation measures - Operation

14.6.12 Alterations to the road network should provide adequate drainage to accommodate potential changes in surface run-off, including an allowance for climate change in accordance with the DMRB CG 501 - Design of highway drainage systems²¹³ standard, and through consultation with the Environment Agency and the Lead Local Flood Authority (Nottinghamshire County Council).

14.6.13 The scheme involves work with Flood Zone 2 and Flood Zone 3, therefore the scheme design will incorporate floodplain compensation sites and explore the potential of other mitigation measures to compensate for increases in surface water run-off due to increased impermeable surfacing. At this stage, the plans for the additional mitigation measures and the details on the design and extents of floodplain compensation sites are still to be determined.

Enhancement measures

14.6.14 Enhancement measures for road drainage and the water environment will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

14.7 Description of the likely significant effects

Construction

14.7.1 There is the potential for significant adverse effects on the water quality of surrounding surface waterbodies from the potential discharge of pollutants into watercourses during construction activities. Of particular concern would be construction activities (for example new watercourse crossings) associated with the River Trent (a receptor of 'Very High' importance) and/or within Flood Zone 3. The waterbodies identified within the study area range from receptors of 'Very High' importance to 'Low' importance but all watercourses in the study area are hydraulically connected. Therefore, adverse effects on a minor watercourse (for example a

²¹³ National Highways (2020) DMRB CG 501 – Design of highway drainage systems. Available at: <https://www.standardsforhighways.co.uk/dmrbs/search/ada3a978-b687-4115-9fcf-3648623aaff2> (last accessed April 2022).

drainage channel) also has the potential to affect downstream waterbodies.

- 14.7.2 There is the potential for a significant adverse effect on flood risk within the scheme extent and the surrounding areas due to the potential for construction activities to alter the flow paths of surface water or increase the amount of surface water run-off in localised areas. An increase in flood risk within the scheme extent and the surrounding areas could also occur due to any changes in topography and/or earthworks which could change the overland flows during storm events. Flood risk during construction will be managed through the Environmental Management Plan.
- 14.7.3 There is the potential for significant adverse effects on the Lower Trent Erewash Secondary Combined (GB4042G990300) WFD groundwater waterbody and the low productive aquifer. The scheme has the potential to result in deterioration in water quality and impact the groundwater flow through piling and other subsurface construction activities.
- 14.7.4 It is not expected that the LNRs will be impacted by the scheme. Farndon Ponds LNR is adjacent to the River Trent, however it is located upstream of the scheme and therefore there is not a surface water pathway for the scheme to impact the LNR. Devon Park Pastures LNR has a surface water connection, however as the LNR is located greater than 1km from the scheme, it is not considered for this to have a credible pathway for a change in water quality to impact this LNR.
- 14.7.5 With the presence of WFD waterbodies, waterbody crossings, and encroachment onto the floodplain, the effects from construction activities on surface water and groundwater could be significant adverse if unmitigated. These effects could include disruption in flows and changes to /sediment transport which could affect the hydromorphology of the watercourse. However, water quality and flood risk impacts from road construction activities are typically temporary and can be mitigated through good engineering and design practices as outlined in Section 14.6 above.

Operation

- 14.7.6 At this stage, the drainage design of the scheme is not available, however, there is the potential for adverse effects from contaminated surface water run-off entering surface and groundwater waterbodies. It is anticipated that appropriate design measures will be incorporated to reduce this effect.
- 14.7.7 The redirection of surface water run-off and increase in impermeable surface also have the potential to increase the risk of surface water

flooding which could result in a significant adverse effect. The scheme is exploring opportunities for FCAs in order to reduce the effect of flooding.

14.7.8 The construction of permanent below-ground structures and/or deep foundations have the potential to have a significant adverse effect on groundwater flow by forming barriers for groundwater flow. Surface water flows and sediment transportation could also be affected.

14.7.9 Implementation of appropriate mitigation measures within the design (such as adequate drainage design and incorporation of the floodplain compensation sites within design) would minimise the significance and spatial scale of operational effects.

14.8 Assessment methodology

14.8.1 The scope of the construction works and the potential for significant direct and indirect effects on the water environment requires further assessment to be undertaken. The assessment will be undertaken in accordance with DMRB LA 113 - Road drainage and the water environment.

14.8.2 Information from an existing WFD compliance assessment for the scheme has been used within this chapter to understand the WFD presence within the study area. The WFD compliance assessment will be refined based on the updated scheme design to assess if the WFD receptors could be affected by the scheme. The results will be presented as a technical appendix to the ES.

14.8.3 In relation to flood risk, a report titled “Flood Compensation Calculations – Fourth Iteration” was produced at the previous design stage. The report outlined the estimated volume of floodplain that would be displaced by the proposed road construction. The report also looked at sizing a potential floodplain compensation site adjacent to the village of Kelham. Prior to the completion of the ES, further work will be carried out to assess potential floodplain compensation sites and identify appropriate flood risk mitigation measures.

14.8.4 An FRA will also be undertaken for the scheme to understand the potential risk of flooding because the majority of the scheme is within Flood Zones 2 and 3. The outcomes of this assessment will determine how, if any, mitigation will be implemented into the design to minimise the effect of flood risk. The results will be presented as a technical appendix to the ES. The HEWRAT assessment will be completed to inform the ES and drainage design to ensure design is compliant with water quality standards. Consultation has been undertaken with the Environment Agency to discuss the requirements of water quality monitoring, this will be developed further, and a strategy produced. At this stage, it is

recommended for quarterly sampling to be undertaken prior to construction to understand the existing baseline water quality.

14.8.5 Guidance, standards and best practice will be followed, with particular reference to:

- DMRB LA 113 - Road drainage and the water environment²¹⁴.
- The Planning Inspectorate’s Advice Note Eighteen ‘The Water Framework Directive’²¹⁵.
- The Environment Agency’s groundwater protection guides covering requirements, permissions, risk assessments and controls²¹⁶, previously covered by the Environment Agency’s groundwater protection: principles and practice²¹⁷.

Assessment of sensitivity

14.8.6 Table 14.2 sets out the criteria that will be used to estimate the importance of the receptors as outlined in DMRB LA 113.

Table 14.2: Estimating the importance of water environment receptors

Importance	Typical criteria	Typical examples	
Very high	Nationally significant attribute of high importance	Surface water	<ul style="list-style-type: none"> • Watercourse having a WFD classification shown in a RBMP and $Q_{95} > 1.0 \text{ m}^3/\text{s}$. • Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/ Species protected by EC legislation LA 108 [Ref 1.N].
		Groundwater	<ul style="list-style-type: none"> • Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation LA 108 [Ref 1.N]. • Groundwater locally supports Ground Water Dependent Terrestrial Ecosystems (GDWTE). • SPZ1.

²¹⁴ Highways England (2020) DMRB LA 113 – Road drainage and the water environment Revision 1 [online] available at: [d6388f5f-2694-4986-ac46-b17b62c21727 \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk) (Last accessed June 2022).

²¹⁵ The Planning Inspectorate (2020) Advice Note Eighteen: The Water Framework Directive. [online] available at: [Advice Note Eighteen: The Water Framework Directive | National Infrastructure Planning \(planninginspectorate.gov.uk\)](https://planninginspectorate.gov.uk).

²¹⁶ Environment Agency (2017) Groundwater protection guides covering requirements, permissions, risk assessments and controls [online] available at: [Groundwater protection - GOV.UK \(www.gov.uk\)](https://www.gov.uk) (Last accessed June 2022).

²¹⁷ Environment Agency (2013) Groundwater protection: principles and practice [online] available at: [\[Withdrawn\] Groundwater protection: principles and practice GP3 - GOV.UK \(www.gov.uk\)](https://www.gov.uk).

Importance	Typical criteria	Typical examples	
		Flood risk	<ul style="list-style-type: none"> Essential infrastructure or highly vulnerable development.
High	Locally significant attribute of high importance	Surface water	<ul style="list-style-type: none"> Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m³/s. Species protected under EC or UK legislation LA 108 [Ref 1.N].
		Groundwater	<ul style="list-style-type: none"> Principal aquifer providing a locally important resource or supporting river ecosystem. Groundwater locally supports GWDTE. SPZ2.
		Flood risk	<ul style="list-style-type: none"> More vulnerable development.
Medium	Of moderate quality and rarity	Surface water	<ul style="list-style-type: none"> Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001m³/s.
		Groundwater	<ul style="list-style-type: none"> Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3.
		Flood risk	<ul style="list-style-type: none"> Less vulnerable development.
Low	Lower quality	Surface water	<ul style="list-style-type: none"> Watercourses not having a WFD classification shown in a RBMP and Q95 <0.001m³/s.
		Groundwater	<ul style="list-style-type: none"> Unproductive strata.
		Flood risk	<ul style="list-style-type: none"> Water compatible development.

Source: DMRB LA 113 – Road drainage and the water environment Revision 1. Table 3.70

Assessment of magnitude

14.8.7 The magnitude of impact on the receptors from the scheme will be assessed in accordance with the criteria presented in Table 14.3 below.

Table 14.3: Estimating the magnitude of an impact on an attribute

Magnitude	Criteria	Typical examples	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water	<ul style="list-style-type: none"> • Failure of both acute-soluble and chronic sediment related pollutants in HEWRAT and compliance failure with EQS values. • Calculated risk of pollution from a spillage >2% annually (spillage assessment). • Loss or extensive change to a fishery. • Loss of regionally important public water supply. • Loss or extensive change to a designated nature conservation site. • Reduction in water body WFD classification.
		Groundwater	<ul style="list-style-type: none"> • Loss of, or extensive change to an aquifer. • Loss of regionally important water supply. • Potential high risk of pollution to groundwater from routine run-off – risk score >250 (Groundwater quality and run-off assessment). • Calculated risk of pollution from spillages >2% annually (spillage assessment). • Loss of, or extensive change to the GWDTE or baseflow contribution to protected surface water bodies. • Reduction in water body WFD classification. • Loss or significant damage to major structures through subsidence or similar effects.
		Flood risk	Increase in peak flood level (> 100mm).
Moderate adverse	Results in some measurable change in attributes,	Surface water	<ul style="list-style-type: none"> • Failure of either acute-soluble and chronic sediment related pollutants in HEWRAT • Calculated risk of pollution from a spillage >1% annually <2% annually (spillage assessment).

Magnitude	Criteria	Typical examples	
	quality or vulnerability		<ul style="list-style-type: none"> • Partial loss in productivity of a fishery. • Degradation of regionally important public water supply or loss of major commercial / industrial / agricultural supplies. • Contribution to reduction in water body WFD classification.
		Groundwater	<ul style="list-style-type: none"> • Partial loss or change to an aquifer. • Degradation of regionally important public water supply or loss of significant commercial / industrial / agricultural supplies. • Potential medium risk of pollution from spillages >1% annually <2% annually (spillage assessment). • Partial loss of the integrity of GWDTE. • Contribution to reduction in water body WFD classification. • Damage to major structure through subsidence or similar effects or loss of minor structures.
		Flood risk	<ul style="list-style-type: none"> • Increase in peak flood level (> 50mm).
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water	<ul style="list-style-type: none"> • Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. • Calculated risk of pollution from spillages >0.5% annually and <1% annually. • Minor effects on water supplies.
		Groundwater	<ul style="list-style-type: none"> • Potential low risk of pollution to groundwater from routine run-off – risk score <150. • Calculated risk of pollution from >0.5% annually and <1% annually. • Minor effects on an aquifer, GWDTEs, abstractions and structures.
		Flood risk	<ul style="list-style-type: none"> • Increase in peak flood level (> 10mm).

Magnitude	Criteria	Typical examples	
Negligible	Results in some measurable change in attributes but of insufficient magnitude to affect the use or integrity	The proposed project is unlikely to affect the integrity of the water environment.	
		Surface water	<ul style="list-style-type: none"> • No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). • Risk of pollution from spillages <0.5%.
		Groundwater	<ul style="list-style-type: none"> • No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
		Flood risk	<ul style="list-style-type: none"> • Negligible change to peak flood level (<+/- 10mm).
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water	<ul style="list-style-type: none"> • HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater	<ul style="list-style-type: none"> • Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk is <1% annually). • Reduction of groundwater hazards to existing structures. • Reductions in waterlogging and groundwater flooding.
		Flood risk	<ul style="list-style-type: none"> • Creation of flood storage and decrease in peak flood level (>10mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water	<ul style="list-style-type: none"> • HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. • Calculated reduction in existing spillage by 50% or more (when existing spillage >1% annually).

Magnitude	Criteria	Typical examples	
			<ul style="list-style-type: none"> • Contribution to improvement in water body WFD classification.
		Groundwater	<ul style="list-style-type: none"> • Calculated reduction in existing spillage by 50% or more (when existing spillage >1% annually). • Contribution to improvement in water body WFD classification. • Improvement in water body catchment abstraction management strategy (or equivalent) classification. • Support to significant improvements in damaged GWDE.
		Flood risk	<ul style="list-style-type: none"> • Creation of flood storage and decrease in peak flood level (>50mm).
Major beneficial	Results in major improvement of attribute quality	Surface water	<ul style="list-style-type: none"> • Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse. • Improvement in water body WFD classification.
		Groundwater	<ul style="list-style-type: none"> • Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. • Recharge of an aquifer. • Improvement in water body WFD classification.
		Flood risk	<ul style="list-style-type: none"> • Creation of flood storage and decrease in peak flood level (>100mm).
No change		<ul style="list-style-type: none"> • No loss or alteration of characteristics, features or elements; no observable impact in either direction. 	

Source: DMRB LA 113 Road drainage and the water environment Revision 1. Table 3.71

Assessment of significance

14.8.8 Following on from identifying an appropriate receptor sensitivity and magnitude of impact using Table 14.2 and Table 14.3, the likely significance category and overall significance of effects would be assessed by using the matrix provided within Table 5.3 in Chapter 5.

14.8.9 The assessment will be undertaken in accordance with DMRB, LA 113 - Road drainage and the water environment and DMRB LA 104 – Environmental assessment and monitoring.

14.9 Assessment assumptions and limitations

14.9.1 This report has been prepared using publicly available information, and existing assessments undertaken as part of the previous stage of the scheme.

14.9.2 Currently there is a proposed FCA in the Kelham area and an area south of the A46 close to the Old Trent Dyke. These FCAs have been developed based on existing information about the scheme and as such are subject to refinement as the design progresses. To demonstrate that the floodplain compensation sites are effective, analytical flood modelling will be carried out.

14.9.3 No water or sediment sampling has been carried out to date.

14.9.4 It has been assumed that the available information on surface water and groundwater quality is representative of the general conditions.

14.9.5 Q₉₅ values for water courses within the study area have been taken from the closest point on the watercourse. 'Unknown' Q₉₅ values are where the Q₉₅ values are not readily available for these watercourses.

14.10 Consultation

14.10.1 In relation to water quality, consultation has taken place with the Environment Agency to agree the scope of the water quality monitoring that is proposed during development of the scheme design, and during construction (see Chapter 4 for further details).

14.10.2 In relation to flood risk, the floodplain mitigation will have to be approved by the Environment Agency, a statutory stakeholder. Therefore, three meetings have been held with the EA to date to collate the information required to design the mitigation and throughout the preparation of the Flood Risk Assessment.

14.10.3 Further consultation will be undertaken throughout the preparation of the ES.

14.11 Summary

14.11.1 In line with LA 113, responses to the following scoping questions in Table 14.4 have been provided to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 14.4: Road Drainage and the Water Environment scoping questions

Scoping question	Answer
Does the project have the potential to affect an existing watercourse in terms of water quality, hydromorphology or water quantity?	Yes, the scheme will involve water-crossings, and works adjacent to watercourses.
Does the project have the potential to affect a floodplain?	Yes, the scheme will involve works within the River Trent floodplain. It is expected for FCAs to be incorporated as part of the design to accommodate changes in flood water storage.
Does the project have the potential to cross an existing watercourse where upstream flooding is an existing problem or where there has been significant development in the upstream catchment since the crossing was built?	Yes, the scheme will cross the River Trent which has a large floodplain associated with it. The majority of the scheme will be located within Flood Zone 3.
Does the project have the potential to change either the road drainage or natural land drainage catchments?	Yes, the scheme will alter the existing road drainage of the A46.
Does the project have the potential to lead to an increase in traffic flow of more than 20%?	Yes, traffic modelling undertaken at a previous stage of the scheme suggest the traffic flow is expected to increase above 20%.
Does the project have the potential to change the number or type of junctions?	Yes, the scheme involves works to alter the layout of a number of junctions.
Is any of the project located within flood zone 2, flood zone 3 or a source protection zone?	Yes, the majority of the scheme is located within either Flood Zone 2 or Flood Zone 3.
Can earthworks result in sediment being carried to watercourses?	Yes, construction activities associated with watercourse crossings and adjacent to watercourses have the potential to result in the mobilisation of sediment into watercourses.

Scoping question	Answer
Can earthworks alter the groundwater flow regime?	Potentially, piling activities during construction and the presence of permanent below-ground structures have the potential to alter the groundwater flow regime.
Does the project have the potential to allow drainage discharges to the ground?	Yes, however appropriate drainage design will be incorporated within the scheme design to reduce the risk of contaminated discharges.

14.11.2 The proposed scope of the ES is contained within Table 14.5.

Table 14.5: Proposed scope of the Road Drainage and Water Environment chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Surface water Flood risk WFD waterbodies Groundwater (contaminated land/contaminated soils/groundwater flow).	LNRs	The LNRs are not GWDTes. Farndon Ponds is upstream of the scheme, and Devon Park Pastures LNR is considered to be at a suitable distance downstream for any contaminants to have dispersed and not be a credible pathway.
Operation	Surface water Flood risk WFD waterbodies Groundwater (contaminated soils/groundwater flow)	Groundwater quality impacts from authorised / historic landfills LNRs	Refer to Chapter 10 Geology and Soils for reasons why authorised / historic landfills have been scoped out. The LNRs are not GWDTes. Farndon Ponds is upstream of the scheme, and Devon Park Pastures LNR is considered to be at a suitable distance downstream for any contaminants to have dispersed and not be a credible pathway

15 Climate

15.1 Introduction

15.1.1 The impact of anthropogenic greenhouse gas (GHG) emissions on the global climate will result in adverse and irreversible impacts on the UK and its infrastructure, beyond natural climate variability²¹⁸. As a result, UK infrastructure will be susceptible to climate variation throughout its lifespan, with the impact greater on projects with a longer lifespan.

15.1.2 This scoping chapter will align with the requirements of DMRB LA 114²¹⁹ and contain the following sections:

- Greenhouse gas (GHG) impact assessment – effects on climate change of GHG emissions arising from the proposed scheme in its construction and operation phases, including how the project will affect the ability of Government to meet its carbon reduction plan targets.
- Climate change resilience assessment – the resilience of the proposed scheme to climate change impacts, including how the proposal will take account of the projected impacts of climate change.

15.1.3 The potential requirement for further assessment will be identified within this chapter. Where necessary, further assessment will be presented within the ES.

15.2 Legislation and policy

Legislation

Climate Change Act 2008 (as amended)²²⁰

15.2.1 On 27th June 2019 the UK government amended the Climate Change Act (2008) and set a legally binding target to achieve net zero GHG emissions from across the UK economy by 2050. In October 2021 the UK government released their net-zero strategy, further outlining how this reduction is to be achieved.

²¹⁸ IPCC, (2022): Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Lösche, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösche, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

²¹⁹ National Highways (2021). *Design Manual for Roads and Bridges – Sustainability and Environment LA 114 (Climate)* available at: <https://www.standardsforhighways.co.uk/dmrb/search/d1ec82f3-834b-4d5f-89c6-d7d7d299dce0> (last accessed July 2022).

²²⁰ UK Parliament (2012), *Climate Change Act 2008* available at: [Climate Change Act 2008 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/2008/27) (Last accessed July 2022).

15.2.2 The UK has in place carbon budgets for five-year periods up to 2037, see Table 15.1. The UK is currently in the third carbon budgetary period (2018-2022), the budget for which is 2,544 MtCO_{2e}. The UK cannot legally emit more GHGs than this within the budgetary period. The carbon budget for the 2023–2027 budgetary period is 1,950 MtCO_{2e}, and the budget for 2028-2032 is 1,725 MtCO_{2e}. The sixth carbon budget requires a 63% reduction in emissions from 2019 to 2035 (78% relative to 1990)²²¹. Whilst budgets are not set beyond this, there is a legal requirement for the UK to reach 0 MtCO_{2e} by 2050.

Table 15.1: UK carbon budgets²²²

Carbon budgets	Carbon budget level (MtCO _{2e})	Reduction below 1990 levels
Third Carbon Budget (2018-2022)	2,544	36% by 2020
Fourth Carbon Budget (2023-2027)	1,950	51% by 2025
Fifth Carbon Budget (2028-2032)	1,725	57% by 2030
Sixth Carbon Budget (2033-2037)	965	78% by 2035

Infrastructure Planning (Environmental Impact Assessment) Regulations 2017²²³

15.2.3 The EIA Regulations require: ‘A description of the likely significant effects of the project on climate (for example the nature and magnitude of GHG emissions).’

BSI (British Standards Institution) PAS 2080 – Carbon management in infrastructure in 2016²²⁴

15.2.4 This Publicly Available Specification (PAS) includes requirements for all value chain members to show the right leadership and to establish effective governance systems for reducing whole life carbon through the use of a carbon management process. The individual value chain requirements in the carbon management process are structured around the following components:

- Setting appropriate carbon reduction targets.

²²¹ UK Parliament (2021) *The Carbon Budget Order 2021* available at <https://www.legislation.gov.uk/ukksi/2021/750/contents/made> (Last accessed July 2022).

²²² UK Parliament (2012), *Climate Change Act 2008* available at: [Climate Change Act 2008 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukksi/2008/19/contents/made) (Last accessed July 2022).

²²³ UK Parliament (2017) *Infrastructure Planning (Environmental Impact Assessment) Regulations* available at <https://www.legislation.gov.uk/ukksi/2017/572/contents/made> (Last accessed July 2022).

²²⁴ BSI (2016). ‘PAS 2080 – Carbon Management in Infrastructure’ available at: <https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/> (Last accessed July 2022).

- Determining baselines against which to assess carbon reduction performance.
- Establishing metrics (e.g. Key Performance Indicators) for credible carbon emissions quantification and reporting.
- Selecting carbon emissions quantification methodologies (to include defining boundaries and cut off rules).
- Reporting at appropriate stages in the infrastructure work stages to enable visibility of performance.
- Continual improvement of carbon management and performance.

National policy

National Policy Statement for National Networks (NPSNN)

15.2.5 The NPSNN Paragraph 4.43 requires ‘The applicant should demonstrate that there are no critical features of the design of new national networks infrastructure which may be seriously affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections’.

15.2.6 Paragraph 5.17 of the NPSNN states that ‘it is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet the targets of its carbon reduction target plan.’ However, the paragraph goes on to say that applicants should provide evidence of the carbon impact of the project and an assessment against the Government’s carbon budgets.

15.2.7 Paragraph 5.18 of the NPSNN states that development consent might be refused if it would have a material impact on the Government reaching its reduction targets. The government must ensure that any carbon increases from road development do not compromise their overall carbon reduction commitment.

15.2.8 Paragraph 5.19 of the NPSNN outlines the need for appropriate mitigation measures to be implemented in both design and construction. The effectiveness of such mitigation will be considered by the Secretary of State in order to ensure the carbon footprint is not ‘unnecessarily high’, with the adequacy of the measures constituting a material factor in the decision-making process.

Department for Transport: Decarbonising Transport – setting the challenge (2020)²²⁵

15.2.9 The document presents transport modes and their current GHG emissions, the existing strategies and the policies already in place to deliver against current targets. It covers the projected trajectory of the forecast GHG emissions from transport to the fifth carbon budget (2028-2032) and beyond, based on the firm and funded commitments outlined. The document describes the challenge in meeting carbon budgets and net zero by 2050 and split the challenge into six strategic priorities. The document sets out the work approach through which interested parties and communities around the UK will collaborate to take urgent action on climate change, as well as delivering the substantial co-benefits of decarbonisation.

Department for Transport: Highways England: Licence – Secretary of State for Transport statutory directions and guidance to the strategic highways company (2015)²²⁶

15.2.10 Part 4, paragraph 4.2 at section (g) commits National Highways to minimise the environmental impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment; and at section (h) to conform to the principles of sustainable development.

National Highways

National Highways Net Zero (2021)

15.2.11 In addition to the UK government, National Highways have outlined their net zero strategy to achieve net zero²²⁷;

- Corporate emissions – net zero by 2030.
- Maintenance and construction emissions – net zero by 2040.
- Road user emissions – net zero by 2050.

²²⁵ DfT (2020) Decarbonising Transport – setting the challenge https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/932122/decarbonising-transport-setting-the-challenge.pdf (Last accessed July 2022).

²²⁶ DfT (2015) Highways England: Licence – Secretary of State for Transport statutory directions and guidance to the strategic highways company [Highways England: licence \(publishing.service.gov.uk\)](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/511111/highways-england-licence.pdf) (Last accessed August 2022).

²²⁷ National Highways (2021) Net zero highways: our 2030 / 2040 / 2050 plan available at <https://nationalhighways.co.uk/media/eispcjem/net-zero-highways-our-2030-2040-2050-plan.pdf> (Last accessed July 2022).

National Highways: Preparing for climate change on the strategic road network - third adaptation report under the Climate Change Act (2022)²²⁸

15.2.12 The third report, published under the Climate Change Act's (2008) Adaptation Reporting Power (ARP):

- Re-evaluates significant climate risks threatening the safe operation of England's SRN using more up-to-date climate projections
- Assesses progress against previously identified adaptation actions; and
- Identifies areas for improvement and appropriate actions

15.2.13 Building on advice from the Climate Change Committee's CCRA3 report, the report aims to address the increased risk brought to the UK's Strategic Road Network with the overarching vision that in 2050 'The SRN is resilient to climate change and incidents, such as flooding, poor weather conditions, blockages on connecting transport networks'. The report carries out a risk assessment of likely highways impacts which include, but are not limited to

- Overwhelming of drainage due to fluvial (river) and pluvial (surface) and groundwater flooding
- Ground saturation affecting stability of geotechnical assets
- Destabilisation of earthworks due to standing water
- Waterlogging of pavement surface

National Highways: Strategic business plan 2020-2025 (2020)²²⁹

15.2.14 The Strategic business plan 2020-2025 sets out National Highways' response to government's second Road Investment Strategy (RIS2)²⁴⁵. It presents the careful balancing between maintaining and operating the strategic road network (SRN) safely and providing new capacity where it is needed. It supports government's ambition to achieve net zero UK carbon emissions by 2050. It notes that National Highways has a shared responsibility to tackle climate change and is dedicated to minimising the greenhouse gases generated from the activities within National Highways' control including designing the schemes and services to be carbon and energy efficient, reducing carbon footprint through initiatives such as introducing energy-saving measures for maintenance depots and using low-energy lighting and control systems for motorways.

²²⁸ National Highways (2022) *Preparing for climate change on the strategic road network - third adaptation report under the Climate Change Act* available at <https://nationalhighways.co.uk/media/z1ndodqx/preparing-for-climate-change-on-the-strategic-road-network.pdf> (Last accessed July 2022).

²²⁹ National Highways (2020) *Strategic Business Plan* available at <https://nationalhighways.co.uk/strategic-business-plan/> (last accessed July 2022).

Local policy²³⁰

15.2.15 The three councils which make up the East Midlands (Leicester City Council, Leicestershire County Council and Nottingham City Council) have all signed the UK100 Net Zero Pledge, with a statement to 'bring our council emissions to net zero by 2030 and we will work with our residents and businesses to bring our wider communities' emissions in line with net zero as soon as possible (and by 2045 at the latest)²³¹.

Newark and Sherwood Local Development Framework Core Strategy Development Plan (amended 2019)²³²

15.2.16 The Development Plan outlines the approach to sustainable development, including the promotion of development that maximises resource efficiency. Core Policy 10 is a commitment to tackling the causes of climate change by delivering a reduction in the District's overall emissions. Relevant commitments are to: 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.

Topic-specific guidance

Institute of Environmental Management & Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (2022)²³³

15.2.17 Whilst DMRB LA114 remains the sole standard which the scoping chapter will speak to, the IEMA guidance will be used to assist, as it provides a complementary narrative to some elements of DMRB LA114. IEMA states that this guidance is to assist greenhouse gas (GHG) practitioners with addressing GHG emissions assessment, mitigation and reporting in statutory and non-statutory Environmental Impact Assessment (EIA). It is a revision of the 2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance.

²³⁰ Whilst the local Policy is included, for information, the project will legally report to the UK's official Carbon Budget and Net-zero Target Date as expressed in DMRB LLA114.

²³¹ East Midlands Chamber (2020) Press Release available at <https://www.emc-dnl.co.uk/news/2020/12/10/uk100-net-zero-pledge-regional-leaders/#:~:text=The%20figureheads%20of%20three%20councils%20in%20the%20East,those%20of%20their%20residents%20and%20businesses%20by%202045>. (Last accessed July 2022).

²³² Newark & Sherwood District Council (2019) *Amended Core Strategy DPD* available at <https://www.newark-sherwooddc.gov.uk/amendedcorestrategy/> (Last accessed July 2022).

²³³ IEMA (2022) *Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition* available at <https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions> (Last accessed July 2022).

15.3 Study Area

Effects on climate

15.3.1 The study area captures the emission of GHGs resulting from the scheme in its construction and operation phases. The study area is not limited to the geographic extent of the scheme itself, as many emissions will result from upstream, downstream, and off-site activities such as materials production. DMRB LA 114 requires that the assessment and reporting shall identify the scale and nature of GHG emissions across the whole project life cycle, taking into account design and mitigation measures already incorporated into the project.

15.3.2 The effects on climate relate to the potential impacts of the scheme on the climate through an increase in GHG emissions. It captures all six GHGs defined by the Kyoto Protocol²³⁴ but for the purpose of this report they will be considered analogous and will be referred to as 'GHG emissions', reported in terms of carbon dioxide equivalent (CO_{2e}).

Construction

15.3.3 For construction, the study area will comprise GHG emissions associated with scheme construction related activities / materials and their associated transport including:

- Raw material supply.
- Manufacture.
- Transport to and from site.
- Construction / Installation process (for construction related processes the study area will consider emissions associated with the construction site area).

Operation

15.3.4 The operational road user assessment will consider carbon emissions associated with users of the road within a study area that is consistent with the affected road network (ARN) which will be defined by the traffic modelling output for the scheme. The ARN will consider roads which meet any of the following criteria.

- a change of more than 10% in AADT;
- a change of more than 10% to the number of heavy-duty vehicles; and
- a change in daily average speed of more than 20 km/hr.

²³⁴ United Nations Climate Change (2021). 'What is the Kyoto Protocol?' available at: https://unfccc.int/kyoto_protocol (last accessed June 2022).

15.3.5 The operational maintenance study area also will include

- Maintenance activities.
- Repair of existing assets.
- Replacement of existing assets.

Resilience of scheme to climate change

15.3.6 The resilience of the scheme to the impact of climate change in the future, including future extreme weather events such as hot days, cold days, heatwaves, and storms, as well as longer-term weather changes in temperature and precipitation, will also be assessed in the ES. The study area will be based on the scheme boundary including any construction compounds and temporary land take.

15.4 Baseline conditions

Effects on climate

15.4.1 The baseline for the effects on climate as detailed in DMRB LA 114 requires scheme specific information, including existing maintenance requirements and operational emissions from road users. At this stage this is not available and will be provided within the ES. In lieu of this information a more generic baseline for context of the UK and regional emissions have been supplied along with the construction emissions estimated for the preliminary design for context of the level of emissions. This is considered the baseline design emissions but not the without scheme baseline.

15.4.2 UK emissions are measured territorially (within the geographical boundaries of the UK), residentially (emissions by UK residents and UK-registered businesses, whether they happen in the UK or overseas), and as a full 'carbon footprint' (carbon footprint estimates account for emissions through the supply chain of all goods and services consumed in the UK wherever they are produced in the world, so allow for emissions from UK imports but exclude emissions arising from UK produced goods that are exported).

15.4.3 In 2018, the latest year that all three measures are available, territorial emissions were 468 million tonnes of carbon dioxide equivalent (Mt CO_{2e}), with residence emissions 569 Mt CO_{2e} and footprint emissions 703 Mt CO_{2e}.

15.4.4 In Nottinghamshire County, where the project is located, in 2019 the emissions for all roads was estimated at 1,673.3 kt CO_{2e}. This is on a

downward trend from previous years as there were 1,698.2 kt CO₂e in 2018 and 1,735.9 kt CO₂e in 2017²³⁵.

15.4.5 The UK has in place carbon budgets for five-year periods up to 2037, see Table 15.1. The UK is currently in the third carbon budgetary period (2018-2022), the budget for which is 2,544 MtCO₂e. The UK cannot legally emit more GHGs than this within the budgetary period. The carbon budget for the 2023–2027 budgetary period is 1,950 MtCO₂e, and the budget for 2028-2032 is 1,725 MtCO₂e. The sixth carbon budget requires a 63% reduction in emissions from 2019 to 2035 (78% relative to 1990)²³⁶. Whilst budgets are not set beyond this, there is a legal requirement for the UK to reach 0 MtCO₂e by 2050.

15.4.6 Through 2019, GHG emissions from manufacturing and construction in the UK were estimated at 13.2MtCO₂e²³⁷, decreasing from 66MtCO₂e recorded in the previous year²³⁸. Although the data accounts for manufacturing in addition to construction, this gives the best indication of the proportion of UK GHG emissions associated with construction. Data is not available for the UK construction sector alone, but the World Green Building Council has found that building materials and construction were responsible for around 11% of global energy related GHG emissions in 2018²³⁹.

Future projections

15.4.7 The projections from the Department for Business, Energy & Industrial Strategy (referred to as the BEIS projections) show a decline in total GHG emissions to 2040 (GHG emissions are projected to fall by 24% from 2019 levels). In 2018, 97% of transport's final energy consumption was from oil-based fossil fuels but by 2040 this is projected to fall to 89% due to an increase in electric vehicles and increasing use of biofuels²⁴⁰. In 2021, the UK government pledged to end the sale of new petrol and diesel vehicles

²³⁵ Calculated from UK Local authority and regional data (2019) available at [UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019) (Last accessed July 2022).

²³⁶ UK Parliament (2021) *The Carbon Budget Order 2021* available at <https://www.legislation.gov.uk/ukksi/2021/750/contents/made> (Last accessed July 2022).

²³⁷ Department for Business, Energy & Industrial Strategy (2021). *Annex 2: 2019 UK Greenhouse Gas Emissions, final figures by Standard Industrial Classification* available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/995865/annex-2-1990-2019-uk-ghg-emissions-final-figures-by-sic.pdf (Last accessed July 2022).

²³⁸ Climate Change Committee (2020). *Sector summary – Manufacturing and construction* available at: <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Manufacturing-and-construction.pdf> (Last accessed July 2022).

²³⁹ World Green Building Council (2019). *Bringing Embodied Carbon Upfront* available at: <https://www.worldgbc.org/embodied-carbon> (Last accessed July 2022).

²⁴⁰ Department for Business, Energy & Industrial Strategy (2020). Updated energy and emissions projections 2019 available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931323/updated-energy-and-emissions-projections-2019.pdf (last accessed July 2022).

by 2030 and that all new cars and vans will be required to be fully zero emission at the tailpipe by 2035. Furthermore, the UK government consulted to phase out all new, non-zero emission road vehicles and heavy goods vehicles by 2040 at the latest. Because of these changes, the BEIS projections are likely to be updated to meet these new policy goals. The BEIS projections show that the Third Carbon Budget is very likely to be achieved with headroom of approximately 26MtCO_{2e}. However, the projections show shortfalls for the Fourth Carbon Budget and Fifth Carbon Budget of 188MtCO_{2e} and 253MtCO_{2e} respectively. Meanwhile, the Committee on Climate Change (CCC), have stated that GHG emissions will need to fall more rapidly than these targets²⁴¹. An ambitious Sixth Carbon Budget has also been accepted by the UK government to allow the UK to meet net-zero carbon by 2050, with a commitment to a reduction of almost 80% by 2035 compared to 1990 levels.

15.4.8 The CCC have also determined a balanced net-zero pathway for construction and manufacturing that includes a reduction of 43% by 2030, 75% by 2035, and 90% by 2040 to achieve a 97% reduction by 2050²⁴². The pathway considers a proportion of the reduction will come from improved resource efficiency in production and material substitution. Therefore, significant effort is required to ensure that all contributing emissions are reduced as far as possible through the design, construction, and operational elements of all projects.

Carbon baseline

15.4.9 A carbon assessment of the baseline design has been undertaken making use of the preliminary scheme design developed for the preferred route announcement and to supplement previous environmental assessment work. The estimated baseline emissions of the scheme are 254,536 tCO_{2e} split between material, plant and transport as shown in Table 15.2.

²⁴¹ Climate Change Committee (2020). *The Sixth Carbon Budget – The UKs path to Net-Zero*. available at: <https://www.theccc.org.uk/publication/sixth-carbon-budget/> (last accessed July 2022).

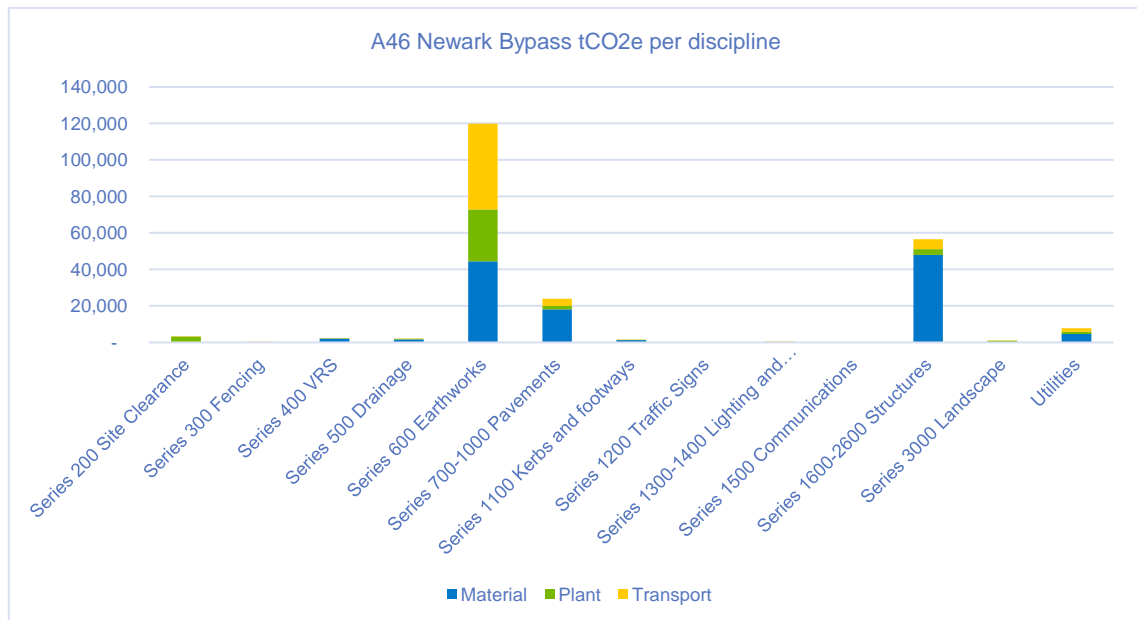
²⁴² Climate Change Committee (2020). *Sector summary – Manufacturing and construction* available at: <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Manufacturing-and-construction.pdf> (last accessed July 2022).

Table 15.2 Split of carbon emissions by scope type (including 23% uplift)

Lifecycle stage	Carbon emissions tCO ₂ e (inc. uplift)	Percentage of total
Material (A1-3)	152,051	60%
Plant (A5)	40,406	16%
Transport (A4)	62,079	24%

15.4.10 The carbon emissions were broken down into series numbers, corresponding to work packages, to make the quantities easier to track and manage. The breakdown of these figures can be seen in Figure 15.1. This indicates the majority of the emissions are from earthworks, pavements and structures which should be the focus of the carbon reduction efforts.

Figure 15.1: tCO₂e by discipline



Resilience of the scheme to climate change

15.4.11 The Met Office provides information on observed and future climate change relative to the baseline period of 1961-1990, based on the latest scientific understanding United Kingdom Climate Projections 2018 (UKCP18). The project site sits within the Midlands region. Observed trends in the UK climate are as follows:²⁴³

- The UK's climate is changing. Recent decades have been warmer, wetter and sunnier than the 20th century.

²⁴³ Kendon et al (2021) State of the UK Climate 2020 available at <https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.7285> (last accessed July 2022).

- 2020 was third warmest, fifth wettest and eight sunniest on record for the UK. No other year has fallen in the top-10 for all three variables for the UK.
- The UK has warmed at a broadly consistent but slightly higher rate than the observed change in global mean temperature.

Current climate

15.4.12 Mean annual temperatures over the region vary from around 8 °C to just over 10 °C. The highest values occur in the lower Severn valley, whilst the lowest occur at the higher altitudes such as the Peak District. This places the Midlands in the middle of the UK mean temperature range of 7-11°C²⁴⁴. According to the Met Office, due to the Midlands' distance from the regulating effects of the sea, the annual range is more pronounced than in most parts of the UK. Sharp winter frosts are common and there are occasional very hot summer days, particularly in the south and east of the region. These temperature extremes of both winter and summer are a key characteristic of the Midlands climate. As a result of this, the average number of days with air frost in the Midlands varies from about 40 a year in the lower Severn valley to over 60 a year in the Peak District and sheltered areas of the Welsh Marches. Ground frost occurs on average on about 100 to 125 days per year, with a similar distribution to air frost.

15.4.13 The wettest areas in the Midlands, with an average of over 800 mm per year, are along the Welsh border, in the Cotswolds and, especially, in the Peak District; the highest altitudes exceed 1000 mm. In contrast, the more sheltered areas of the South and East Midlands are the driest with less than 600 mm per year in parts of Northamptonshire, the lower Trent valley and the Avon valley. This is 80% lower than the highest rainfall area in the UK, but still 300-500mm greater than the driest parts.

15.4.14 Periods of prolonged rainfall can lead to widespread flooding, especially in winter and early spring when soils are usually near saturation.

Future climate projections

15.4.15 The projected future climate is likely to follow the UK wide trend of drier summers, wetter winters and an increase in average mean temperature. It is also likely that changes to the climate will lead to a temporal and severity increase of weather events such as storms, heavy rainfall, droughts and heatwaves.

²⁴⁴ UK Met Office (2018) *Midlands: climate* available at <https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/midlands-climate---met-office.pdf> (last accessed July 2022).

15.4.16 UKCP18 Representative Concentration Pathway (RCP) 8.5 for the East Midlands region estimates the following changes (see Table 15.2):

Table 15.2: UKCP18 RCP (8.5) Projections for the East Midlands in 2080-2099²⁴⁵

Variable	10th percentile change	50th percentile change	90th percentile change ²⁴⁶
Mean annual temperature (°C)	2.4	4.1	5.9
Mean winter temperature (°C)	1.5	3.5	5.7
Mean summer temperature (°C)	2.6	5.2	7.8
Mean winter precipitation (%)	-1	20	47
Mean summer precipitation (%)	-69	-35	-2

15.5 Potential Impacts

Effects on climate

15.5.1 This section will highlight the potential impacts on climate that could occur as a result of the scheme. The impacts identified are scoped in or out to allow for further consideration later on in this scoping report.

Construction

15.5.2 The main impact on climate during construction would be the release of GHG which contribute towards altering the UK's climate beyond what would be expected from natural variation.

15.5.3 The impact will be caused by GHG released by:

- Diesel and HVO plant and machinery.
- Construction process stage; including transport to/from works site and construction / installation processes.
- Materials production.
- Land use change as a result of habitat loss to accommodate the scheme.
- Changes to traffic flows causing increased congestion during construction.

Operation

15.5.4 The main impact on climate during operation would be the release of GHG which contribute towards altering the UK's climate beyond what would be expected from natural variation.

²⁴⁵ Met Office (2018) United Kingdom Climate Projections, available at <https://ukclimateprojections-uk.metoffice.gov.uk/ui/home> (last accessed July 2022)

²⁴⁶ Used in place of H++ Scenario. Where necessary for safety critical infrastructure the 90th percentile or H++ scenario of RCP 8.5 will be used for the assessment. This scenario represents the less likely but upper plausible limits of climate change.

15.5.5 The impact will be caused by GHG released by:

- Changes in vehicle distributions and speed limits.
- Maintenance activities.
- Repair activities (from accidents/fire and flood).
- Replacement of assets.
- Refurbishment of assets.

Resilience of the scheme to climate change

Construction

15.5.6 The climate of the study area has already changed from its natural state, as a result of climate change and will change significantly over the lifetime of the project. Whilst the scheme's construction (planned to commence 2025) is not expected to be so far in the future that the climate will adversely change further prior to construction, climate change is expected to impact construction. This assessment has considered the climate projections provided in Section 15.4. UKCP18 predicts a 50% likelihood of a 0.8 degree rise in annual temperature from 2010-2029 it has been deemed large enough to potentially impact construction and scoped in for further assessment.

15.5.7 Furthermore, if construction coincides with extreme weather event(s) such as drought or storms there may potentially be further construction impacts.

15.5.8 Climate events and the anticipated impacts associated with each against the scheme during construction are presented in Table 15.3 below.

Table 15.3: Climate event and anticipated impacts during construction

Climate Event	Impact
Increased winter precipitation	<ul style="list-style-type: none"> • Damage to construction site and equipment through loss of stability in ground surface. • Risk of flooding
Changes in the future precipitation regime (varying from drought conditions to heavy rainfall)	<ul style="list-style-type: none"> • Increasing the risk to earthworks stability • Risk of flooding
Increase yearly average temperature	<ul style="list-style-type: none"> • Safer driving conditions in winter if less frost and ice
Increased summer temperature	<ul style="list-style-type: none"> • Damage to plant and machinery in adversely hot temperatures • Risk to workforce in extreme heat •

Climate Event	Impact
Extreme weather events	<ul style="list-style-type: none"> • Damage to plant and machinery in adversely hot temperatures, flooding and high winds • Risk to workforce in extreme heat/flooding

Operation

15.5.9 The climate of the study area has already changed from its natural state, as a result of climate change and will change significantly over the lifetime of the project. This assessment has considered the climate projections provided in Section 15.4 over the lifetime of the scheme and identified the following risks in Table 15.4 below.

Table 15.4: Climate event and anticipated impacts during operation

Climate Event	Impact
Increased winter precipitation	<ul style="list-style-type: none"> • Increasing sub-surface moisture and inducing premature pavement failure • Increasing standing water, the build-up of particulates on road surfaces, and flood risk • Increase safety risk for active travel users e.g. cyclists • Increase in occurrence of pot holes (by weakening the soil beneath the carriageway) increasing maintenance requirements and associated traffic disruption
Changes in the future precipitation regime (varying from drought conditions to heavy rainfall)	<ul style="list-style-type: none"> • Causing pavements to heave. • Increasing the risk to earthworks stability.
Increase yearly average temperature	<ul style="list-style-type: none"> • Reduced freeze thaw erosion which could damage underground assets, in turn reducing maintenance requirements and associated traffic disruption. • Safer driving conditions in winter if less frost and ice.
Increased summer temperature	<ul style="list-style-type: none"> • Greater risk of joint, bearing or surface failure • Accelerating the weathering of road markings • Increased temperatures which may be greater than the rated equipment tolerance and lead to equipment failure • Increased likelihood of disease, and changing precipitation patterns including greater frequency of drought • May cause soil instability (intensify and extend soil moisture deficits and impact groundwater levels and

Climate Event	Impact
	<p>earth pressures) increasing maintenance requirements and associated traffic disruption.</p> <ul style="list-style-type: none"> • Greater risk of soils drying out and increasing erosion. This causes sedimentation within the schemes drainage infrastructure that reduces its drainage capacity and so increases the risk of flooding which causes traffic disruption. Additional maintenance work to prevent flooding may also cause traffic disruption
Extreme weather events	<ul style="list-style-type: none"> • Impact to signs from high winds • Safety concerns associated with extreme weather which may result in reduced likelihood of maintenance • Impacts on electrical equipment include more regular lightning strikes and extreme hot temperatures causing thermal over loading of circuits. Repair and maintenance cause traffic disruption
Longer vegetation growing season	<ul style="list-style-type: none"> • Leading to increased need for maintenance (due to warmer winters and wetter summers)

Environmental receptors

15.5.10 Potential operational impacts on environmental receptors that are related to, or could be intensified by, climate change will be assessed as cumulative effects. These will be summarised in the climate vulnerability chapter and will be developed in parallel with the assessments for the other environmental topics. Examples of potential impacts on environmental receptors include:

- Warmer winters reducing the requirement for road salting with benefits for water quality in nearby surface water bodies.
- Drier summers, with occasional heavy convectional rainfall, resulting in water quality in nearby surface water bodies becoming more vulnerable to impacts from first flush events. This is when long periods of dry weather enable contaminants to build up on road surfaces which then mobilise in surface water runoff following a heavy rainfall event and enter aquatic systems via surface water runoff and drainage infrastructure en-masse. Pollutants in this runoff can be harmful to aquatic life.
- Hotter and drier summers lowering river water levels. In the future water quality impacts related to the scheme’s surface water drainage discharges could increase as the capability of these watercourses to dilute discharges reduces.

- Operational impacts on air quality from scheme traffic emissions. In the future, impacts caused by the scheme's vehicle emissions could be intensified as hotter summers brought on by climate change will increase the formation of ground-level ozone.

15.6 Design, mitigation and enhancement measures

Effects on climate

Design measures

15.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in LA104. The first principle being to avoid adverse effects if at all possible, before seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report.

15.6.2 The effective assessment and management of impacts on climate offers the opportunity to reduce the impact of projects on climate by minimising the magnitude of GHG emissions as far as possible. The project will work with the 80:20 rule in mind where targeted interventions into the largest 20% of causes can impact a large proportion (80%) of the scheme.

15.6.3 A Carbon Management Plan (CMP) has been produced for the scheme to act as a live document that will be updated as the scheme progresses through design. This ensures the consideration of carbon reduction through all phases of the scheme. It outlines the process to be followed to reduce carbon, the methodology for the carbon assessment, and will be updated with progress made through the design. The following high-level approach to mitigation (as defined within PAS 2080²⁴⁷) will be applied and developed, with a particular focus on the hotspots identified through the carbon assessment:

- Build nothing: evaluate the basic need for an asset and explore alternative approaches to achieve outcomes set by the asset owner / manager.
- Build less: evaluate the potential for re-using and / or refurbishing existing assets to reduce the extent of new construction required.
- Build clever: consider the use of low carbon solutions (including technologies, materials, and products) to minimise resource

²⁴⁷ BSI (2016). 'PAS 2080 – Carbon Management in Infrastructure' available at: <https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/> (last accessed July 2022).

consumption during the construction, operation, and user utilisation stages of the asset.

- Build efficiently: use techniques that reduce resource consumption during the construction and operational phases.

15.6.4 To aid design development, value engineering and management workshops have taken place. These are an effective way to bring about carbon improvements involving key project stakeholders across the design team. An iterative design process will be undertaken to maximise reuse and refurbishment throughout the scheme's life as well as to identify opportunities to manage ecological assets (retention, creation and enhancement) to provide carbon sinks.

Mitigation measures - Construction

15.6.5 The procurement team have set requirements for subcontractors and suppliers to engage with them to include:

- Low / zero carbon solutions.
- Competency / Training requirements
- Reporting expectations.
- Collaboration requirements.

15.6.6 A construction Carbon Management Plan will be completed in conjunction with the Second Iteration Environmental Management Plan and will include the following topics:

- Procurement.
- Materials and resource management on site.
- Change process for low / zero carbon solutions.
- Low / zero carbon plant and management.
- Construction techniques and competency.
- Training matrix.

15.6.7 During construction, opportunities relating to land use change will also be purposed where the retention and management of carbon sinks such as woodland will be retained and soil disturbance minimised where possible.

Mitigation measures – Operation

15.6.8 The scheme will be designed to ensure the lifetime operation is as efficient as possible ensuring a whole-life low carbon scheme supporting the National Highways ambitions.

15.6.9 Opportunities identified during the design and construction of the scheme during operation will be captured within the Opportunities Log and handed over for the operating agency to pursue.

Enhancement measures

15.6.10 Enhancement measures for effects on climate will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

Resilience of the scheme to climate change

Design Measures

15.6.11 The design will consider the climatic changes where appropriate to ensure the scheme is resilient to future changes in climate and extreme weather events. The design guidance ensures the consideration of temperature ranges and precipitation levels.

15.6.12 Examples of possible embedded mitigation measures include best practice design and construction techniques, such as:

- Climate change allowances will be incorporated into the design of drainage infrastructure, flood compensation areas and river crossings / modifications.
- The use of polymer modified bitumen in surface course of pavements and heavy-duty macadam in the binder and base course to improve resilience to rutting in hot weather.
- Embankments to be designed from slope-stability analysis using site specific soil parameters, and compacted and constructed in line with best practice to avoid unexpected ground movements (for example linked to long term changes in ground water levels).
- Sediment traps to prevent silt build up blocking drainage infrastructure
- Protection of electrical equipment from lightning strikes using Surge Protection Devices.
- New safety infrastructure (technology) to mitigate possible future increases in exposure to dangerous driving conditions, for example more regular heavy rainfall events.

Mitigation measures - Construction

15.6.13 Climate change is not expected to impact construction, as such no specific mitigation measures are proposed.

Mitigation measures – Operation

15.6.14 The design measures create a road surface and infrastructure which is resilient to the potential impacts identified in Section 15.5.

Enhancement measures

15.6.15 Enhancement measures for resilience of the scheme to climate change will be considered as part of the ongoing EIA and design development, and will be reported in the ES.

15.7 Description of the likely significant effects

Effects on climate

15.7.1 For both construction and operational effects on climate, it is unlikely that the scheme will result in GHG emissions that would be defined as significant considering the GHG emissions from the scheme are unlikely to have a material impact on the government achieving its carbon targets. That said, in line with the UK government's Carbon Reduction Plan, the scheme will seek to reduce GHG emissions as far as practicable to contribute to the UK's net reduction in GHG emissions and maximise the potential for reducing GHG emissions. Assessing the level of GHG emissions associated with the scheme is key in assisting and focusing the reduction effort. A carbon assessment will be carried out using the methodology identified in Section 15.8 below and detailed in the ES.

Resilience of the scheme to climate change

15.7.2 Section 15.4 and 15.5 5 identified a number of potential impacts of the scheme to climate change during construction and operation.

15.7.3 As sufficient data on the proposed mitigations does not yet exist, all potential significant effects are scoped in for further assessment in the ES.

15.8 Assessment methodology

Effects on climate

Construction

15.8.1 The full assessment of the construction effects on climate will include an assessment of GHGs emitted during construction using credible and recognised calculation methodologies and tools. These include:

- The Mott MacDonald Moata Carbon Portal which is PAS 2080 certified will be used to undertake the embodied carbon assessment.

- The Royal Institute of Chartered Surveyors (RICS)²⁴⁸ guidance and assumptions on the transport of materials to site will be used where actual supplier information is not known.
- Environmental Product Declarations (EPDs)²⁴⁹ detailing the emissions for certain design aspects where appropriate for bespoke items.
- The Woodland Carbon Code (WCC)²⁵⁰ and Natural England research²⁵¹ for the soil carbon change unless an alternative site-specific methodology is determined.

15.8.2 GHG emissions will be assessed using a calculation-based methodology as per the below equation:

$$\text{Activity data} \times \text{GHG emissions factor} = \text{GHG emissions value}$$

15.8.3 Activity data will be sourced from three primary sources when undertaking an assessment after the baseline has been set:

- BIM model which will have first-hand data on the amounts of materials and other data pertaining to each of the assets.
- QS data used to produce bills of materials that will be available at certain points in the design process. This will be used to make sure all activities have been captured in the same way for carbon as in cost.
- Supply chain data will be used to help define the specifications of certain materials and to define the travel and plant assumptions for the works.

15.8.1 In selecting activity data, the project will aim to use that data which is the most complete, up-to-date and referenceable. During the design process, it may be necessary to use interim data in order to support decision making. As far as possible this will follow the same criteria however there may be cases where assumptions are required.

15.8.2 Emission factor data will be selected based on its overall applicability to the project. A number of criteria will be applied:

- Age: the most recently published data will be preferred.
- Geography: data which applies to the location of actual suppliers and/or activities will be preferred.

²⁴⁸ RICS (2017). *Whole life carbon assessment for the built environment*, RICS professional statement.

²⁴⁹ An Environmental Product Declaration (EPD) 'quantifies environmental information on the lifecycle of a product to enable comparisons between products fulfilling the same function'.

²⁵⁰ Forestry Commission (2021). *Using the WCC Carbon Calculation Spreadsheet Version 2.4*.

²⁵¹ Natural England (2021). *Carbon Storage and Sequestration by Habitat 2021 (NERR094)* available here: <http://publications.naturalengland.org.uk/publication/5419124441481216> (last accessed June 2022).

- Technology: data which represent the actual product/activity in question will be preferred.
- Methodology: data which follow a published methodology or product category rules will be preferred.
- Competency: data which are produced from proficient entities will be preferred.

15.8.3 Ultimately, there may be trade-offs between these criteria. The choices made by the carbon consultant will be documented in accompanying reports and where necessary sensitivity analysis will be undertaken.

15.8.4 The construction carbon assessment will be presented against the following life cycle stages (modules) consistent with the principles set out in PAS 2080. The scope of assessment includes lifecycle stages A1-3, A4, A5 as presented in Table 15.5.

Table 15.5: Construction lifecycle stage activities

Life cycle stage	Activities incorporated
Product stage (modules A1-A3)	The extraction, processing and manufacturing of all materials required for the permanent assets. This includes all energy and carbon emissions from manufacturing plants, primary and secondary manufacturing stages as well as any transport emission between these stages.
Construction process stage -transport to site (module A4)	The transportation of all materials required for the permanent assets and construction equipment to site from the point of production (or point of storage in the case of plant and machinery).
Construction process stage -construction and installation (module A5)	<p>Construction site works activities including:</p> <ul style="list-style-type: none"> • temporary work, ground works and landscaping; • materials storage and any energy or otherwise need to maintain necessary environmental conditions; • transport of materials and equipment on site; • installation of materials and products into the infrastructure asset; • emissions associated with site water demand; • waste management activities (transport, processing, final disposal) associated with waste arising from the construction site; • emissions from land use change; and • production, transportation, and waste management of materials/products lost during works.

Operational

15.8.5 The assessment of operational effects on climate will include:

- A road user assessment: the carbon dioxide equivalent (CO_{2e}) emissions will be calculated from the updated traffic model over a 60-year appraisal period presenting the net GHG emissions: the difference in GHG emissions between the do minimum and do something scenarios which will provide the traffic GHG impact figures for appraisal within the ES, using emission factor toolkit version 11 in line with LA 114.
- A routine maintenance assessment: covering planned maintenance and repair.
- An assessment of the GHG emissions associated with the electricity requirements for the operation of the scheme. This will utilise data determined through design and publicly available emission factors for grid electricity. Future grid decarbonisation trajectories will be used. An assessment of the sequestration resulting from woodland planting based on the WCC guidance and tools, based on available data.

15.8.6 The operational carbon assessment will be presented against the following life cycle stages (modules). The scope of assessment includes lifecycle stages B1, B2, B4, B6 and B9 as presented in Table 15.6.

Table 15.6: Construction lifecycle stage activities

Life cycle stage	Activities incorporated
Use stage – Use (module B1)	New stores of carbon e.g. carbon sequestration from scheme planting
Use stage – Maintenance (module B2)	The production, transportation (to and from the site) and end of life processing of all materials required for preventative maintenance. The electricity, fuel and water for regular preventative maintenance
Use stage – Replacement (module B4)	The production, transportation (to and from the site) and end of life processing of all materials required to replace any assets or any components within assets that have a design life of less than 60 years.
Use stage – Operational Energy Use (module B6)	The electricity used to run any scheme lighting, highways communications.
Use stage – User utilisation of infrastructure (module B9)	Direct exhaust emissions from vehicles. Assessment to be undertaken inline with WebTAG guidance and requirements.

Significance of effect

15.8.7 The assessment of significance will follow DMRB LA 114 Climate as this is currently the most relevant methodology for highways schemes on the strategic road network (SRN).

15.8.8 DMRB LA 114 states that ‘projects shall only report significant effects where increases in GHG emissions will have a material impact on the ability of government to meet its carbon reduction targets’. It also notes that the National Policy Statement for National Networks (NPSNN)²⁵² reports that ‘it is very unlikely that the impact of a road project will, in isolation, affect the ability of government to meet its carbon reduction plan targets’ and that in this context ‘it is considered unlikely that projects will, in isolation, conclude significant effects on climate’.

15.8.9 The assessment will include a comparison of estimated GHG emissions arising from the scheme with UK carbon budgets and the associated reduction targets in line with DMRB LA 114. The results of this comparison will be presented following the format of Table 3.18 in DMRB LA 114.

15.8.10 To support DMRB LA114, the IEMA guidance suggests that the carbon footprint of a project should be contextualised with relevant budgets and mitigated against. Both the DMRB LA 114 standard and IEMA guidance advise contextualising the carbon footprint of the scheme by comparing to carbon budgets, as well as a focus on carbon reduction.

Resilience of the scheme to climate change

15.8.11 A qualitative methodology for assessing the resilience of the scheme assets and construction processes to climate change has been produced in line with DMRB LA 114. The assessment will identify hazards induced by climate change for the scheme design receptors because of the projected climate changes detailed in Section 15.4. The likelihood of these impacts occurring (see Table 15.7) is defined to determine the significance. Professional experience and judgement through collaboration between climate change specialists and the design team will be used to determine these factors.

Table 15.7: Criteria for determining likelihood of impacts occurring

Likelihood category	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.

²⁵² Department for Transport (2014). ‘National Policy Statement for National Networks’. available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf (last accessed June 2022).

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 four 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).

Source: Table 3.39a DMRB LA 114.

Table 15.8: Criteria for determining measure of consequence

Consequence category	Description
Very large adverse	Operation - national level (or greater) disruption to strategic route(s) lasting more than one week.
Large adverse	Operation - national level disruption to strategic route(s) lasting more than one day but less than one week or regional level disruption to strategic route(s) lasting more than one week.
Moderate adverse	Operation - regional level disruption to strategic route(s) lasting more than one day but less than one week.
Minor adverse	Operation - regional level disruption to strategic route(s) lasting less than one day.
Negligible	Operation - disruption to an isolated section of a strategic route lasting less than one day.

Source: Table 3.39b DMRB LA 114.

Significance of effect

15.8.12 The criteria for determining the significance of effect for the resilience of the scheme is shown in Table 15.9. The likelihood and consequence of the impact is combined to determine the sensitivity of the receptor. The sensitivity is then combined with the magnitude of effect to allow determination of whether the effect is significant or not significant.

Table 15.9: Significance matrix

		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	NS	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

NOTE NS = Not significant; S = Significant.

Source: Table 3.41 DMRB LA 114.

15.9 Assessment assumptions and limitations

Effects on climate

15.9.1 The construction assessment will be based on the available information provided by the design team. However, assumptions will be necessary to ensure the aspects can be assessed. Assumptions may include selection of the closest match in the Mott MacDonald Moata Carbon Portal, assumptions on dimensions and on material type. A list of the key assumptions will be detailed within the assessment results.

15.9.2 The operational assessment will be based upon outputs from the WebTAG assessment. The assumptions and limitations of this approach will be detailed within the relevant report.

15.9.3 The assessment of land use change will be based upon the level of information available at the time on proposed planting and woodland removal. Where necessary assumptions on the details of the woodland will be made. In addition, the WCC tool will be utilised, and assumptions may be necessary for the yield class, age of trees, soil disturbance and other details.

Resilience of the scheme to climate change

15.9.4 Information on the climate baseline and future projections are based on freely available information from third parties, including the historical meteorological variables recorded by the Met Office and the UK Climate Projections (UKCP18) developed by the Met Office.

15.9.5 Climate projections are not predictions or forecasts but simulations of potential scenarios of future climate, under a range of hypothetical GHG emissions scenarios and assumptions. Therefore, the results from running

the climate models cannot be treated as exact or factual, but projection options. They represent internally consistent representations of how the climate may evolve in response to a range of potential forcing scenarios, and their reliability varies between climate variables. Scenarios exclude outlying surprise or disaster scenarios in the literature, and any scenario necessarily includes subjective elements and is open to various interpretations. Generally, global projections are more certain than regional, and temperature projections are more certain than those for precipitation. Furthermore, the degree of uncertainty associated with all climate change projections increases for projections further into the future.

15.9.6 Accordingly, any further research, analysis or decision-making should take account of the nature of the data sources and climate projections, and should consider the range of literature, additional observational data, evidence, and research available, and any recent developments in these.

15.10 Consultation

15.10.1 In relation to flood risk and drainage design, the design and flood risk assessment will be produced in accordance with the climate change requirements of the Environment Agency and the LLFA. The FRA shall use the latest climate change allowances. Meetings are ongoing as part of the Flood and Drainage Steering Group.

15.10.2 Consultation will continue through the key stakeholder engagement exercises throughout the development of the scheme design and ES (refer to Chapter 4 for further details).

15.11 Summary

15.11.1 In line with LA114, responses to the following scoping questions have been provided in Table 15.10 to gain an understanding of the need to undertake further assessment and have informed the scope of the ES.

Table 15.10: Climate scoping questions

Scoping question	Answer
1) Are construction GHG emissions (or GHG-emitting activity), compared to the baseline scenario (i.e. when compared to GHG emissions and energy use associated with existing maintenance activities), increasing by >1%?	Yes, the increase in emissions will likely be greater than 1%. Estimates of existing maintenance emissions will be included as part of the ES.
2) During operation, will roads meet or exceed any of the following criteria?	Whilst a road user assessment has not been carried out to date, it is anticipated that these conditions will be met for a

a) a change of more than 10% in AADT; b) a change of more than 10% to the number of heavy duty vehicles; and c) a change in daily average speed of more than 20 km/hr.	proportion of the road links, and a traffic assessment is required, as per LA114.
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15.11.2 The proposed scope of the ES is contained within Table 15.11.

Table 15.11: Proposed scope of the Climate chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Effects on climate. Resilience of the scheme to climate change.	N/A	N/A
Operation	Effects on climate Resilience of the scheme to climate change	Decommissioning of the scheme at its end of life.	Assumed that the scheme will be maintained and used for longer than the 60-year assessment period of the scheme, as per Section 2.3 of DMRB LA 114.

16 Assessment of cumulative effects

16.1 Introduction

16.1.1 Combined and cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project, identified as:

- Combined effects (synergistic) from a single project (the interrelationship between different environmental factors).
- Cumulative effects (additive) from different projects (with the project being assessed).

16.1.2 This chapter draws upon guidance and standards provided within the Planning Inspectorate's (PINS) Advice Note Seventeen: Cumulative Effects Assessment²⁵³, the Design Manual for Roads and Bridges (DMRB) LA 104 – Environmental assessment and monitoring²⁵⁴ and the National Policy Statement for National Networks (NPSNN)²⁵⁵.

16.1.3 The previous chapters presented within this report have identified that further assessment is required for a number of environmental factors, which would be presented within the Environmental Statement (ES). As DMRB LA 104 states that cumulative effects should be assessed when the conclusions of individual environmental factor assessments have been reached and reported, no assessment of cumulative effects has currently been made within this report. Instead, this chapter provides an overview of the baseline, potential impacts, and methodology of assessment for combined and cumulative effects, with further assessment recommended to be included within the ES.

16.2 Legislation and policy

16.2.1 European Directive 3011/92/EU, as amended by European Directive 2014/52/EU, requires environmental impact assessments to identify, describe and assess significant environmental effects arising from the interaction between the following factors: population and human health;

²⁵³ The Planning Inspectorate (2019) Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects [online] available at: [Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects | National Infrastructure Planning \(planninginspectorate.gov.uk\)](https://www.planninginspectorate.gov.uk/advice-note-seventeen-cumulative-effects-assessment-relevant-to-nationally-significant-infrastructure-projects/) (Last accessed June 2022).

²⁵⁴ National Highways (2020) LA 104 – Environmental assessment and monitoring [online] available at: [0f6e0b6a-d08e-4673-8691-cab564d4a60a \(standardsforhighways.co.uk\)](https://standardsforhighways.co.uk/0f6e0b6a-d08e-4673-8691-cab564d4a60a/) (Last accessed June 2022).

²⁵⁵ Department for Transport (2014) National Policy Statement for National Networks [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf (last accessed June 2022).

biodiversity; land; soil; water; air and climate; material assets; cultural heritage and the landscape.

16.2.2 Schedule 4 of the Infrastructure Planning EIA Regulations 2017 requires an EIA to identify and assess the likely significant cumulative effects of a development, either cumulatively with other developments or the in-combination environmental effects on receptors. The requirement to assess the cumulative effects of development is also set out in Regulation 5(2)(e) of the 2017 Regulations. This regulation states that the EIA must identify, describe and assess in an appropriate manner the direct and indirect significant effects of the proposed development arising from the interaction between the following factors: population and human health; biodiversity; land, soil, water, air and climate; material assets, cultural heritage and the landscape.

16.2.3 The NPSNN states “In considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account ...its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.”

16.3 Study area

Combined effects

16.3.1 The study area for the assessment of combined effects of the scheme, for both construction and operation, is defined by the study areas identified within the relevant environment chapters of this report, ranging from 200 metres (for Air Quality) to 30 kilometres (for Biodiversity).

16.3.2 In terms of the combined effects of climate, a qualitative assessment of these effects will be included as part of the Climate chapter.

Cumulative effects

16.3.3 The potential for cumulative effects is where the Zone of Influence (ZOI) for the scheme overlaps with the ZOI for other development. This ZOI will vary from topic to topic. The study area for the identification of ‘other development’ for inclusion in the assessment of cumulative effects is based upon thresholds and spatial areas. These thresholds and spatial areas are based upon professional judgement and take into account the nature and location of the scheme and the ZOI for individual environmental topics, as outlined in Table 16.1 below.

16.3.4 These thresholds and spatial areas are based upon professional judgement and take into account the nature and location of the scheme

and the ZOI for individual environmental topics, as outlined in Table 16.1 below.

Table 16.1: Environmental factor zone of influence

Environmental factor	Zone of Influence (ZOI)
Air Quality	<p>Construction: The ZOI will be 200 metres from construction activities for construction dust and emissions. A ZOI for construction traffic will be determined based on a review of other development proposals and their construction programmes.</p> <p>Operation: The affected road network plus adjoining roads within 200 metres will define the ZOI. As the operational phase traffic data includes traffic associated with other developments, the air quality impact assessment to be included in the ES will inherently be a cumulative impact assessment.</p> <p>See Chapter 6 Air Quality for further information.</p>
Cultural heritage	<p>Construction and Operation: A 1 kilometre buffer around the scheme extent for designated heritage assets and a 500 metre buffer around the scheme extent for non-designated heritage assets. A Zone of Theoretical Visibility (ZTV) will be produced to inform the cultural heritage assessment which may include sensitive assets beyond the 1km study area.</p> <p>See Chapter 7 Cultural heritage for further information.</p>
Landscape and visual ²⁵⁶	<p>Construction and Operation: 1 kilometre ZOI for landscape and visual impacts. However, the study area will be extended for any receptors sitting outside of the 1 kilometre which have the capacity to experience significant effects as a result of the scheme. These effects which may be influenced by the scheme include:</p> <ul style="list-style-type: none"> • Integrated receptors in the scheme’s construction works and their visual footprint • The wider landscape setting and visual envelope • Areas visible by the scheme and the extent of representative viewpoints • Where applicable, the full extent of adjacent or affected landscape receptors of special value • The extent of adjacent or affected visual receptors and the visual amenity of the area

²⁵⁶ The methodology adopted for the LVIA requires that any impacts associated with the presence of new infrastructure are taken into account during the operational stage assessment, and therefore differs from the approach used for other topic assessments. The cumulative effects assessment therefore considers a ‘worst case’ scenario in respect of landscape and visual impacts

Environmental factor	Zone of Influence (ZOI)
	<p>The final ZOI will be informed by a range of computer-generated Zones of Theoretical Visibility which will be prepared in accordance with Guidelines for Landscape and Visual Impact Assessment, and verified by site visit.</p> <p>See Chapter 8 Landscape and visual effects for further information.</p>
Biodiversity	<p>Construction and Operation: A 2 kilometre ZOI for all internationally and nationally designated nature conservation sites²⁵⁷.</p> <p>See Chapter 9 Biodiversity for further information.</p>
Geology and Soils	<p>Construction and Operation: All locations where physical works and ground disturbance would take place, plus a 500 metre buffer.</p> <p>See Chapter 10 Geology and Soils for further information.</p>
Material assets and waste	<p>Construction: ZOI will be defined by the influence of the scheme, rather than through a set geographical location. Feasible sources of construction material will focus primarily on the Order Limits and the region within which waste management facilities are located and from where construction materials may be sourced. This area will initially focus on Nottinghamshire County Council and, where required, the East Midlands region.</p> <p>Operation: use of materials and waste management issues have been scoped out of the assessment.</p> <p>See Chapter 11 Material assets and waste for further information.</p>
Noise and Vibration	<p>Construction: The construction noise and vibration ZOI is defined by proximity of closest identified receptors to the A46 construction works, following which an appropriate buffer will be established around receptors. The specific location of construction work areas is still to be confirmed.</p> <p>Operation: The operational noise and vibration ZOI is defined by other cumulative developments which will be included in the traffic model that will accompany the application. As the operational phase traffic data includes traffic associated with other developments, the noise and vibration impact assessment</p>

²⁵⁷ A 30 kilometre ZOI will be used specifically for sites within the National Site Network designated for bat populations within the HRA.

Environmental factor	Zone of Influence (ZOI)
	<p>to be included in the ES will inherently be a cumulative impact assessment.</p> <p>See Chapter 10 Noise and Vibration for further information.</p>
<p>Population and human health</p>	<p>Construction and Operation: When assessing impacts on land-use and accessibility, the study area will be based on the Order Limits including compounds and temporary land take, as well as a 500 metre area surrounding the Order Limits. Where effects are either identified outside of the 500m area or are unlikely to occur within the 500 metre area, the study area has been amended accordingly.</p> <p>The human health baseline study area has been determined by the local authorities and wards which are either directly or indirectly affected by the Scheme. The local authority of Newark and Sherwood District Council makes up the study area for the human health baseline assessment.</p> <p>See Chapter 13 Population and human health for further information.</p>
<p>Road drainage and the water environment</p>	<p>Construction and Operation: 1 kilometre ZOI for waterbodies. This is extended where there are sensitive features downstream of the works. For groundwater bodies, the ZOI is the potential zone of impact.</p> <p>See Chapter 14 Road drainage and the water environment for further information.</p>
<p>Climate</p>	<p>Construction and Operation: For construction, the study area will comprise GHG emissions associated with project construction related activities / materials and their associated transport. For operation, the study area will be consistent with the ARN defined by the traffic model.</p> <p>See Chapter 15 Climate for further information.</p>

16.3.5 Consultation with local authorities will be undertaken as part of the ES to agree a list of proposed developments to be included within the cumulative effects assessment. To enable a reasonable and proportionate assessment, the following selection criteria will be used to identify and determine ‘other development’ which could result in potential cumulative effects with the scheme:

- Nationally Significant Infrastructure Project’s (NSIP’s) on the PINS’ Programme of Projects.
- Road projects which have been confirmed over a similar timeframe.

- Other development projects under construction or with valid planning permissions, and for which formal EIA is a requirement or for which non– statutory EIA has been undertaken.
- Proposals in adopted Development Plans, with a clear identified programme for delivery.

16.3.6 The developments in the above categories will only be considered in the assessment if they are considered to be ‘reasonably foreseeable’ and ‘committed’, in line with the requirements in DMRB LA 104.

16.4 Baseline conditions

16.4.1 The baseline for each environmental factor is described in detail for air quality, cultural heritage, landscape and visual, biodiversity, geology and soils, material assets and waste, noise and vibration, population and human health, road drainage and the water environment, and climate, all contained in the preceding chapters of this report (Chapters 6 to 15).

16.4.2 The assessment of cumulative effects arising from the route options in combination with other schemes primarily constitutes a desk-top study of planning documents broadly covering the location of schemes considered relevant to the assessment. This broadly focuses on the collection of information relating to the background of relevant projects, their expected timelines and likely environmental impacts. The search of planning history and development plans was previously undertaken in December 2020 by visiting the information held on-line by NSDC and Nottinghamshire County Council. This information will be revisited to identify the proposed major developments within the study area and to inform the baseline for the cumulative effects assessment within the ES.

16.4.3 The scheme traffic modelling will also include assessment of other development to determine changes in operational traffic. These developments will also be used to inform the baseline for the cumulative effects assessment within the ES.

16.5 Potential impacts

Combined effects

Construction

16.5.1 During construction, there is the potential for combined effects to receptors as a result of the scheme due to the potential effects reported within the preceding chapters (Chapters 6 to 15). Receptors may experience combined effects from altered highway arrangements, traffic flows, or as a result of construction activity, plant and machinery. Receptors could receive a combination of amenity effects such as visual impact, noise,

vibration, and air quality which may be significant. Changes in journey time/distance and changes in amenity during construction may combine to give risk to significant severance effects. Combinations of effects may require additional mitigation.

Operation

16.5.2 During operation, there is the potential for combined effects to receptors as a result of the scheme due to the potential effects reported within the preceding chapters (Chapters 6 to 15). Combined effects may result from changes in landscape, noise, vibration, and air quality associated with new or altered highway infrastructure and/or traffic flows which may be significant. Combinations of effects may require additional mitigation.

Cumulative effects

Construction

16.5.3 During construction, there would be the potential for cumulative effects on all receptors, as a result of the scheme with any of the other developments, for which the construction stages overlap. Further investigation into other developments is required before potential cumulative effects during construction may reasonably be identified. The nature of effects will be dependent on the nature, scale, and location of other development. The types of cumulative effects that could occur may relate to amenity effects from other development in close proximity to the scheme, and traffic effects from other projects located further from the scheme.

Operation

16.5.4 Once operational there would be the potential for cumulative effects to receptors, including (but not limited to) habitats, protected species, agricultural land, noise and air quality. However, further investigation into other developments is required before potential cumulative effects during operation may reasonably be identified. The nature of effects will be dependent on the nature, scale, and location of other development. The types of cumulative effects that could occur may relate to amenity effects from other development in close proximity to the scheme, and traffic effects from other projects located further from the scheme.

16.6 Design, mitigation and enhancement measures

Design measures

16.6.1 The development of the scheme design shall be an iterative process undertaken as part of an integrated design team to adhere to the principles of the design and mitigation hierarchy outlined in DMRB LA 104. The first principle being to avoid potential adverse effects if at all possible, before

seeking to minimise or mitigate for any unavoidable impacts through a well-developed mitigation strategy. Embedded mitigation incorporated into the scheme design development to date is outlined in Chapter 2 Section 2.6 of this report as well as in individual receptor chapters where relevant.

Construction

16.6.2 For both combined and cumulative effects during construction, best practice mitigation measures included in the Second Iteration Environmental Management Plan would ensure that effects are reduced as far as possible.

Operation

16.6.3 Combined effects would be reduced as far as possible through the implementation of best practice mitigation which would be identified following the assessment to be included within the ES.

16.6.4 In relation to cumulative effects, it is assumed that mitigation would be provided by the other developments to offset any significant environmental effects and monitoring of significant effects would also be in place for those other developments that have gone through the statutory EIA process. This would reduce the likelihood of significant cumulative effects during operation.

Enhancement Measures

16.6.5 Enhancement measures will be considered as part of the ongoing EIA and design development, and will be considered and reported in the Cumulative Effects chapter of the ES.

16.7 Description of the likely significant effects

Construction

16.7.1 With best practice mitigation measures in place, effects are not anticipated to be significant. However, an assessment of combined and cumulative effects during construction will be scoped into the ES, following completion of environmental assessments contained within the ES (for combined effects), and further understanding of other developments within the vicinity (for cumulative effects).

Operation

16.7.2 With best practice mitigation measures in place, and any further mitigation developed by other developments to offset any significant environmental effects, effects are not anticipated to be significant. However, an assessment of combined and cumulative effects during operation will be

scoped into the ES, following completion of environmental assessments contained within the ES (for combined effects), and further understanding of the other developments within the vicinity (for cumulative effects).

16.7.3 The details of any monitoring required for anticipated significant adverse effects will be included as part of the ES.

16.8 Assessment Methodology

16.8.1 The assessment for combined and cumulative effects within the ES will be undertaken for the scheme for both the construction and operation phases.

Combined Effects Methodology

16.8.2 The assessment methodology for combined effects will involve the identification of impact interactions associated with the proposed scheme upon separate environmental receptors, to better understand the overall environmental effect of the scheme.

16.8.3 The significance of construction and operational phase environmental effects will be brought forward from the preceding chapters of the ES into matrices, providing an overview of the potential effects on individual receptors. The assessment will consider adverse effects, after design mitigation has been taken into account. The significance of combined effects upon each environmental receptor group will then be made based upon the balance of scores and using professional judgement.

16.8.4 The methodology for the assessment of combined effects will follow DMRB LA 104. For the purposes of the assessment, combined effects of Moderate Adverse or Moderate Beneficial and above will be considered significant.

Cumulative Effects Methodology

16.8.5 The assessment methodology for cumulative effects will involve the identification of incremental changes likely to be caused by potential 'other developments' together with the scheme.

16.8.6 The assessment of cumulative effects will follow PINS Advice Note Seventeen: Cumulative Effects Assessment with the four stages of assessment:

- Stage 1: Establish the NSIP's ZOI and identify a long list of 'other developments'.
- Stage 2: Identify shortlist of 'other developments' for the cumulative effects assessment.
- Stage 3: Information gathering.

- Stage 4: Assessment.

16.8.7 The ES will set out the methodology, recognising the requirements of the DMRB LA 104, NPSNN and advice on development of threshold criteria in Advice Note Seventeen: Cumulative Effects Assessment, giving particular regard to the size and spatial influence of developments on the proposed project.

16.8.8 In accordance DMRB LA 104, the assessment of cumulative effects will report on:

- Roads projects which have been confirmed for delivery over a similar timeframe.
- Other development projects within 2 kilometres of the scheme with valid planning permissions or consent orders, and for which EIA is a requirement.
- Proposals in adopted development plans within 2 kilometres of the scheme with a clear identified programme for delivery.

16.8.9 The search areas for other developments have been chosen to allow a proportionate assessment. The search areas will be reviewed as the traffic modelling is updated. At this stage no consultation has been undertaken to agree the list of other developments included in the assessment.

16.8.10 Rather than reporting every interaction, the methodology for the assessment of cumulative effects will concentrate on the significant effects, and will aim to differentiate between permanent, temporary, direct, indirect and secondary effects, positive or negative.

16.8.11 For the purposes of the cumulative effects assessment, in the event that the respective construction phases of other developments coincide with the scheme, it will be assumed that the cumulative effects from traffic could be mitigated to avoid significant effects, for example restrictions on routing and programming of construction traffic. Similarly, it is assumed that appropriate avoidance, mitigation and compensation to offset potential disturbance and collision risk impacts to legally protected and priority species will be employed at the identified committed developments given the planning and legal obligations that must be met when such species are present.

16.8.12 The search areas for other developments have been chosen to allow a proportionate assessment at this option selection stage. The search areas will be reviewed at the next stage as and when the Traffic Model Uncertainty Log is developed. At this stage no consultation has been undertaken to agree the long or short list of developments included in the assessment.

16.8.13 Where significant cumulative effects, beyond those identified as residual effects from the scheme in isolation, have been identified, additional mitigation measures will be developed to avoid significant effects.

16.8.14 The significance of cumulative effects upon each environmental resource will then be made based on the balance of scores and using professional judgement. An on-balance approach will be taken when identifying the overall cumulative effect for the proposed scheme in conjunction with the other proposed major developments.

Significance Criteria

16.8.15 The assessment of significance of the combined and cumulative effects will be determined in accordance with requirements in DMRB LA 104. Typically, the greater the environmental sensitivity or value of the receptor or resource, and the greater the magnitude of impact, the greater the effect. In this way, the consequences of a highly valued resource suffering a major detrimental impact would be a very large adverse effect.

16.8.16 For the purposes of the cumulative effects assessment, the value of a resource and magnitude of impact will be determined according to the criteria set within the preceding chapters of the ES. The significance of effect will then be carried forward from preceding chapters to enable an on-balance assessment of combined significance upon environmental receptors, as well as to identify the significance of cumulative effects with other developments. Typical descriptors of cumulative significance are included within Table 16.2, which reflects this on balance approach. Overall significance will be determined with mitigation included, as shown in Table 5.3 contained in Chapter 5 of this report.

16.8.17 Significance descriptors have also been aligned with the considerations included within Advice Note Seventeen: Cumulative Effects. Accordingly, where impacts are likely to be temporary, the overall significance of effect is considered to be reduced compared to a permanent impact on a receptor of the same value. Equally, localised and infrequent impacts are likely to be of lower magnitude than those that cover a greater geographical scale and / or regularly occur, resulting in a reduced significance of effect. Effects can be additive (such as the loss of two pieces of woodland of 1ha, resulting in 2ha cumulative woodland loss) or synergistic (two discharges combining to have an effect on a species not affected by discharges in isolation).

16.8.18 Where an effect is Moderate or above (Adverse or Beneficial), it is deemed to be significant (see Table 16.2).

Table 16.2: Combined and cumulative significance criteria

Significance	Definition
Very Large (Adverse or Beneficial)	<p>Where the combined effects of the scheme or cumulative effects of the scheme in association with other existing or more than likely/ near certain future major development upon an individual or collection of environmental receptors would be highly significant. Effects would be:</p> <ul style="list-style-type: none"> • Permanent and widespread for receptors of very high value
Large (Adverse or Beneficial)	<p>Where the combined effects of the scheme or cumulative effects of the scheme in association with other existing or more than likely/ near certain major future developments upon an individual or collection of environmental receptors would be highly significant. Effects would be:</p> <ul style="list-style-type: none"> • Permanent and widespread for receptors of high value • Localised for a receptor of very high value or • Temporary for a receptor of very high value
Moderate (Adverse or Beneficial)	<p>Where the combined effects of the scheme or cumulative effects of the scheme in association with other existing or more than likely/ near certain major development upon an individual or collection of environmental receptors would be significant. Effects would be:</p> <ul style="list-style-type: none"> • Permanent and widespread for receptors of medium value • Localised for receptors of high value or • Temporary for a receptor of high value
Slight (Adverse or Beneficial)	<p>Where the combined effects of the scheme or cumulative effects of the scheme in association with other existing or more than likely/ near certain future major developments upon an individual or collection of environmental receptors would be noteworthy but not significant. Effects would be:</p> <ul style="list-style-type: none"> • Permanent and widespread for receptors of low value • Localised for receptors of medium value or • Temporary for a receptor of medium value
Neutral	<p>Where the combined effects of the scheme or the cumulative effects of the scheme in association with other existing or more than likely/ near certain future major developments would not be discernible.</p>

16.9 Assessment assumptions and limitations

16.9.1 At this stage of assessment, the proposed major other developments within the area have not been identified. Therefore, the environmental effects that would result from other developments have not been identified. The assessment of potential effects is therefore limited at this stage and has focused on some of the main receptors that could be affected as a result of both combined and cumulative effects. The likely residual effects and proposed mitigation for each of the other developments would be identified and incorporated into the cumulative effects assessment of the ES.

16.10 Summary

16.10.1 The proposed scope of the ES is contained within Table 16.3, and further summarised in the below text.

Table 16.3: Proposed scope of the combined and cumulative assessment chapter of the ES

Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Construction	Combined Effects and Cumulative Effects	N/A	N/A
Operation	Combined Effects and Cumulative Effects	N/A	N/A

16.10.2 The methodology for the assessment of combined and cumulative effects has been considered within this chapter. It is recommended that the assessment for combined and cumulative effects is undertaken as part of the ES following completion of environmental assessments contained within the ES (for combined effects), and further understanding of the other developments within the vicinity (for cumulative effects).

16.10.3 The approach to the assessment within the ES needs to align with the standards outlined in the DMRB LA 104 - Environmental assessment and monitoring, and the PINS Advice Note Seventeen: Cumulative Effects Assessment.

17 Summary

17.1 Summary of Assessment Scope

17.1.1 The proposed scope of the ES is summarised within Table 17.1 below.

Table 17.1: Proposed scope of the ES

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Chapter 6 Air Quality	Construction	Dust Traffic emissions	Construction plant emissions	Guidance from the IAQM notes that effects from on-site plant exhausts would likely not be significant. Given the nature of the site plant, effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore been scoped out as the impacts would be <i>de minimis</i> and not significant.
	Operation	Traffic emissions	-	-
Chapter 7 Cultural Heritage	Construction	Built heritage. Upstanding designated and non-designated assets. Buried archaeology	-	-

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
		Historic Landscape		
	Operation	Built heritage. Upstanding designated and non-designated assets. Historic Landscape.	Buried archaeology	Buried archaeology will be unaffected during operation.
Chapter 8 Landscape and Visual Effects	Construction	Visual Effects Landscape Character	-	-
	Operation	Visual Effects Landscape Character	-	-
Chapter 9 Biodiversity	Construction	Designated sites Habitats Protected species	-	-
	Operation	Designated sites Habitats	-	-

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
		Protected species		
Chapter 10 Geology and Soils	Construction	Geology Contaminated Land Agricultural Land Classification soils		
	Operation	-	Geology Contaminated land Agricultural Land Classification soils	No operational impacts are anticipated, and no further assessment is required.
Chapter 11 Material Assets and Waste	Construction	Use of materials	-	
		Generation of waste		-
	Operation	-	Use of materials	No further assessment is required as maintenance activities will be infrequent and consequently expected volumes of materials will be minimal.
			Generation of waste	No further assessment is required as operational activities would unlikely generate large volumes of waste requiring treatment or disposal.

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
Chapter 12 Noise and Vibration	Construction	Noise and vibration	-	-
	Operation	Noise	Vibration	DMRB LA111 note: Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects.
Chapter 13 Population and Human Health	Construction	Land use and accessibility (including private property and housing; community land and assets; development land and businesses; agricultural land holdings; and walkers, cyclists and horse-riders)	-	-
		Human Health (including health profiles and affected		

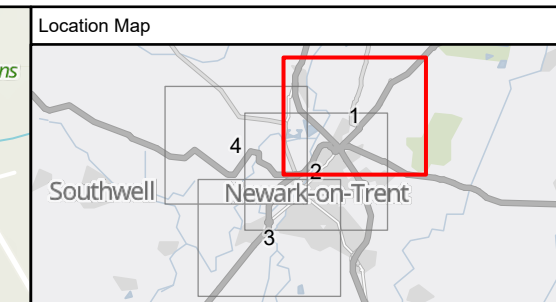
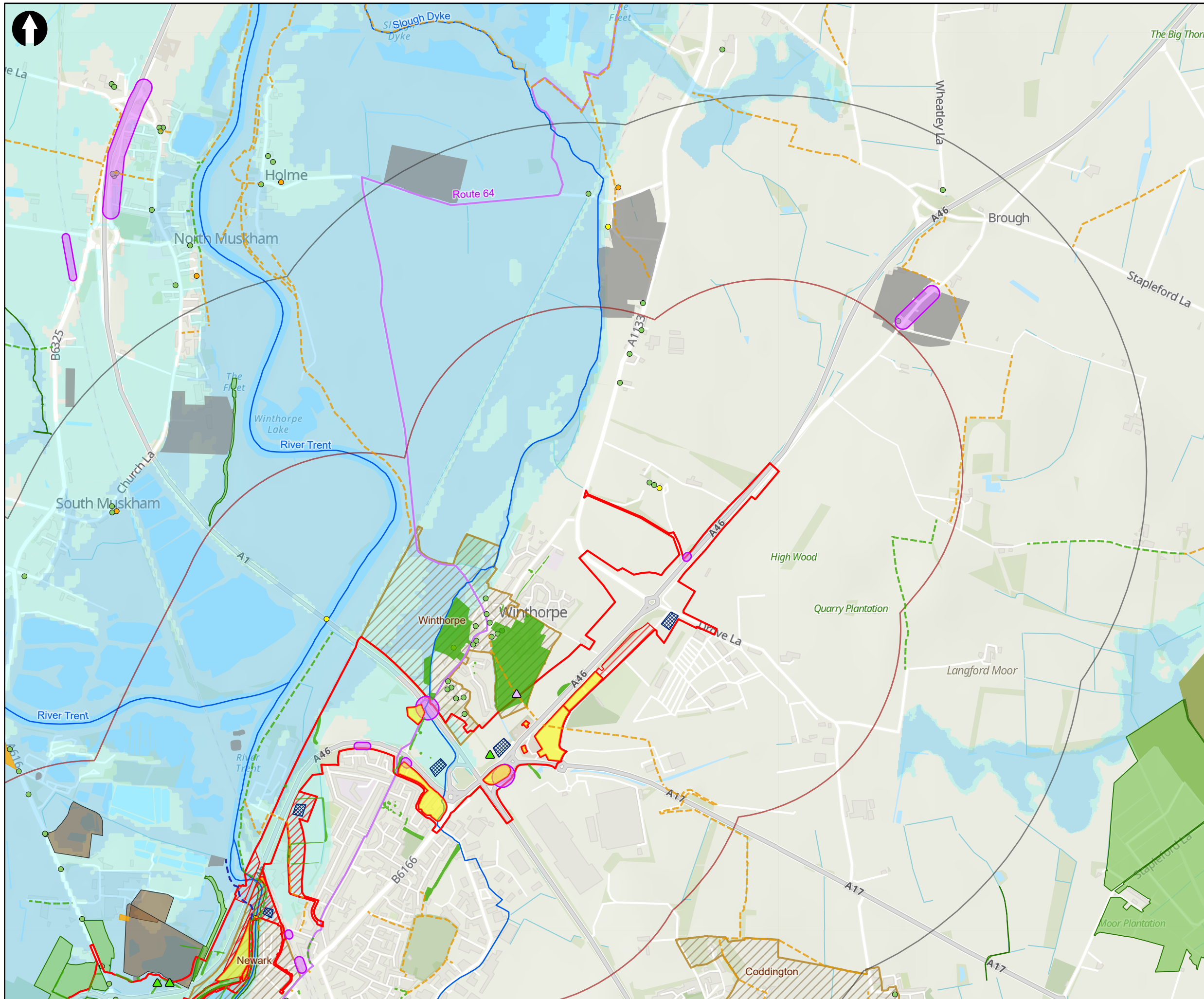
Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
		communities; health determinants; and likely health outcomes)		
	Operation	Land use and accessibility (including private property and housing; community land and assets; development land and businesses; agricultural land holdings; and walkers, cyclists and horse-riders)	-	-
		Human Health (including health profiles and affected communities; health		

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
		determinants; and likely health outcomes)		
Chapter 14 Road Drainage and Water Environment	Construction	Surface water	LNRs	The LNRs are not GWDTEs. Farndon Ponds is upstream of the scheme, and Decon Park Pastures LNR is considered to be at a suitable distance downstream for any contaminants to have dispersed and not be a credible pathway.
		Flood risk		
		WFD waterbodies		
		Groundwater (contaminated land / contaminated soils / groundwater flow).		
	Operation	Surface water	Groundwater quality impacts from authorised / historic landfills	Refer to Chapter 10 Geology and Soils for reasons why contaminated land (authorised / historic landfills) have been scoped out during operation.
		Flood risk		
		WFD waterbodies		
		Groundwater (contaminated soils/groundwater r flow)		

Chapter	Stage	Scoped in	Scoped out	Justification for scoping out where applicable
		LNRs		
Chapter 15 Climate	Construction	Effects on climate Resilience of the scheme to climate change		
	Operation	Effects on climate Resilience of the scheme to climate change	Decommissioning of the scheme at its end of life.	Assumed that the scheme will be maintained and used for longer than the 60-year assessment period of the scheme, as per Section 2.3 of DMRB LA 114.

Appendix A: Environmental constraints drawing

The environmental constraints drawing that supports this Environmental Scoping Report is contained overleaf.



Key to Symbols

Preliminary Red Line Boundary	Veteran Tree
Temporary Works Area	Noise Important Area
Indicative proposed satellite compound	Historic Landfill Site
Exclusion zone	Authorised Landfill Site
Preliminary Red Line Boundary (1km buffer)	Local Wildlife Site
Preliminary Red Line Boundary (2km buffer)	Ancient and semi-natural woodland
Grade I Listed Building	Ancient replanted woodland
Grade II* Listed Building	National Cycle Network
Grade II Listed Building	Public Right of Way
Scheduled Monument	Public Right of Way - Bridleway
Conservation Area	Public Right of Way - Footpath
Flood Zone 2	Permissible Public Rights of Way
Flood Zone 3	
Main River	
Tree Preservation Order	

Notes

Source
 Red Line Boundary DF2: Mott MacDonald, 2022.
 PW (HE551478-MOTG-EGN-CONWI_CONW-42-CH-00006 Rev 9).
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07	25/08/2022	TG	Final for Scoping	SBe	SC
06	19/08/2022	TG	Comments Updated	SBe	SC

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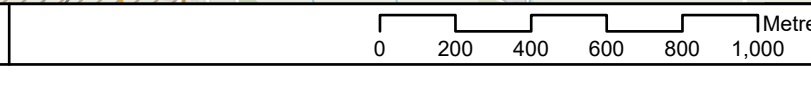
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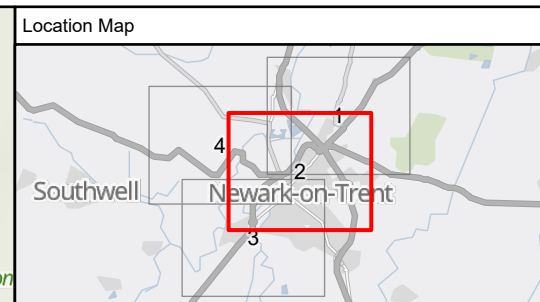
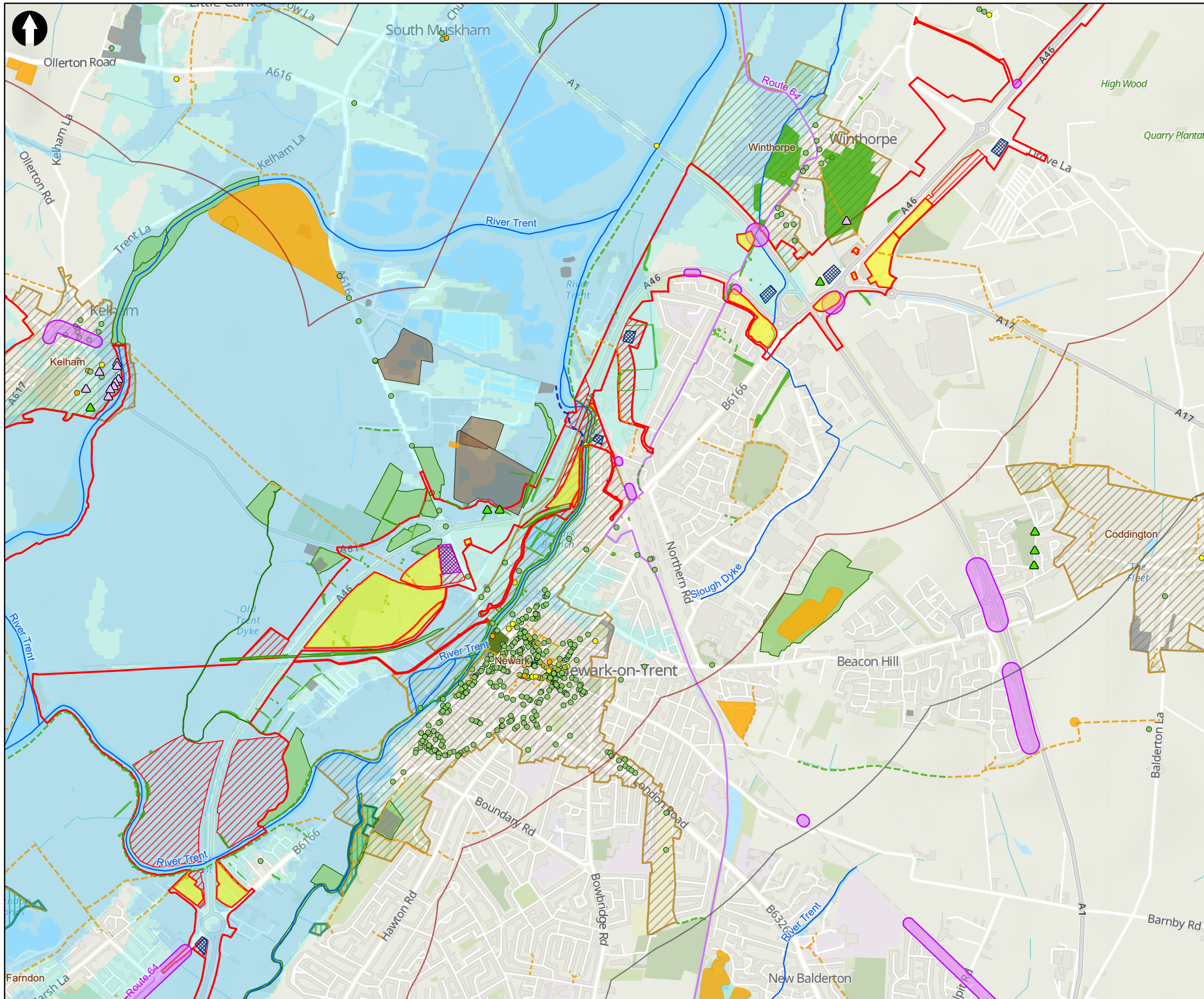
Client
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 Maple Cross
 Rickmansworth
 WD3 9SW

Title
 A46 Newark Bypass
 Environmental Constraints Plan
 Sheet 1 of 4

Designed	S Buckwell	Check	S Bennett
Drawn	T Graham	Coordination	S Buckwell
GIS Check	F Lumb	Approved	S Craciun
Scale at A3	Status	Rev	Security
1:20,000	INF	07	STD



Drawing Number
 HE551478-MOTG-EGN-CONWI_CONW-DR-LE-00002



Key to Symbols

Preliminary Red Line Boundary	Veteran Tree
Temporary Works Area	Notable Tree
Indicative proposed main compound	Noise Important Area
Indicative proposed satellite compound	Historic Landfill Site
Exclusion zone	Authorised Landfill Site
Preliminary Red Line Boundary (1km buffer)	Local Wildlife Site
Preliminary Red Line Boundary (2km buffer)	Local Nature Reserve
Grade I Listed Building	National Cycle Network
Grade II* Listed Building	Public Right of Way - Bridleway
Grade II Listed Building	Public Right of Way - Footpath
Scheduled Monument	Permissible Public Rights of Way
Conservation Area	
Registered Park and Garden	
Flood Zone 2	
Flood Zone 3	
Main River	
Tree Preservation Order	

Notes

Source
 Red Line Boundary DF2: Mott MacDonald, 2022.
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07	25/08/2022	TG	Final for Scoping	SBe	SC
06	19/08/2022	TG	Comments Updated	SBe	SC
Rev	Date	Drawn	Description	Ch'k'd	App'd

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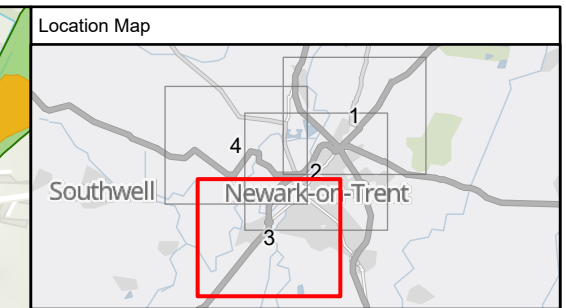
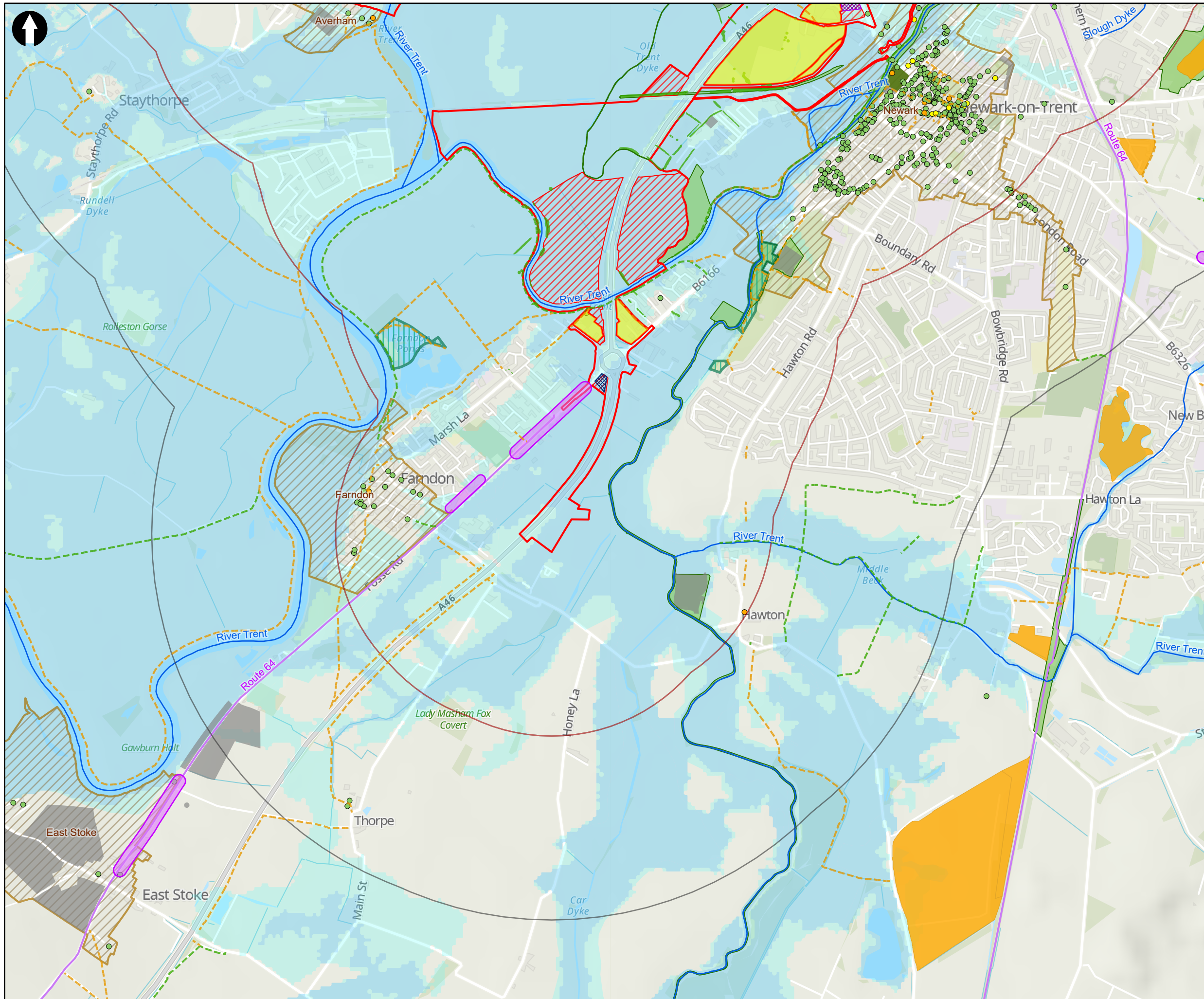
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Title
 A46 Newark Bypass
 Environmental Constraints Plan
 Sheet 2 of 4

Designed	S Buckwell	Check	S Bennett
Drawn	T Graham	Coordination	S Buckwell
GIS Check	F Lumb	Approved	S Craciun
Scale at A3	Status	Rev	Security
1:20,000	INF	07	STD



Key to Symbols

Preliminary Red Line Boundary	Noise Important Area
Temporary Works Area	Historic Landfill Site
Indicative proposed main compound	Local Wildlife Site
Indicative proposed satellite compound	Local Nature Reserve
Exclusion zone	National Cycle Network
Preliminary Red Line Boundary (1km buffer)	Public Right of Way - Bridleway
Preliminary Red Line Boundary (2km buffer)	Public Right of Way - Footpath
Grade I Listed Building	
Grade II* Listed Building	
Grade II Listed Building	
Scheduled Monument	
Conservation Area	
Registered Park and Garden	
Flood Zone 2	
Flood Zone 3	
Main River	
Tree Preservation Order	

Notes

Source
 Red Line Boundary DF2: Mott MacDonald, 2022.
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06	19/08/2022	TG	Comments Updated	SBe	SC
Rev	Date	Drawn	Description	Ch'k'd	App'd

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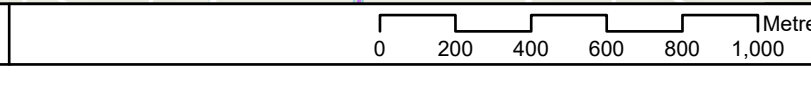
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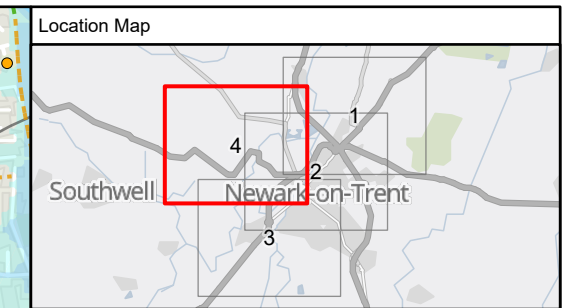
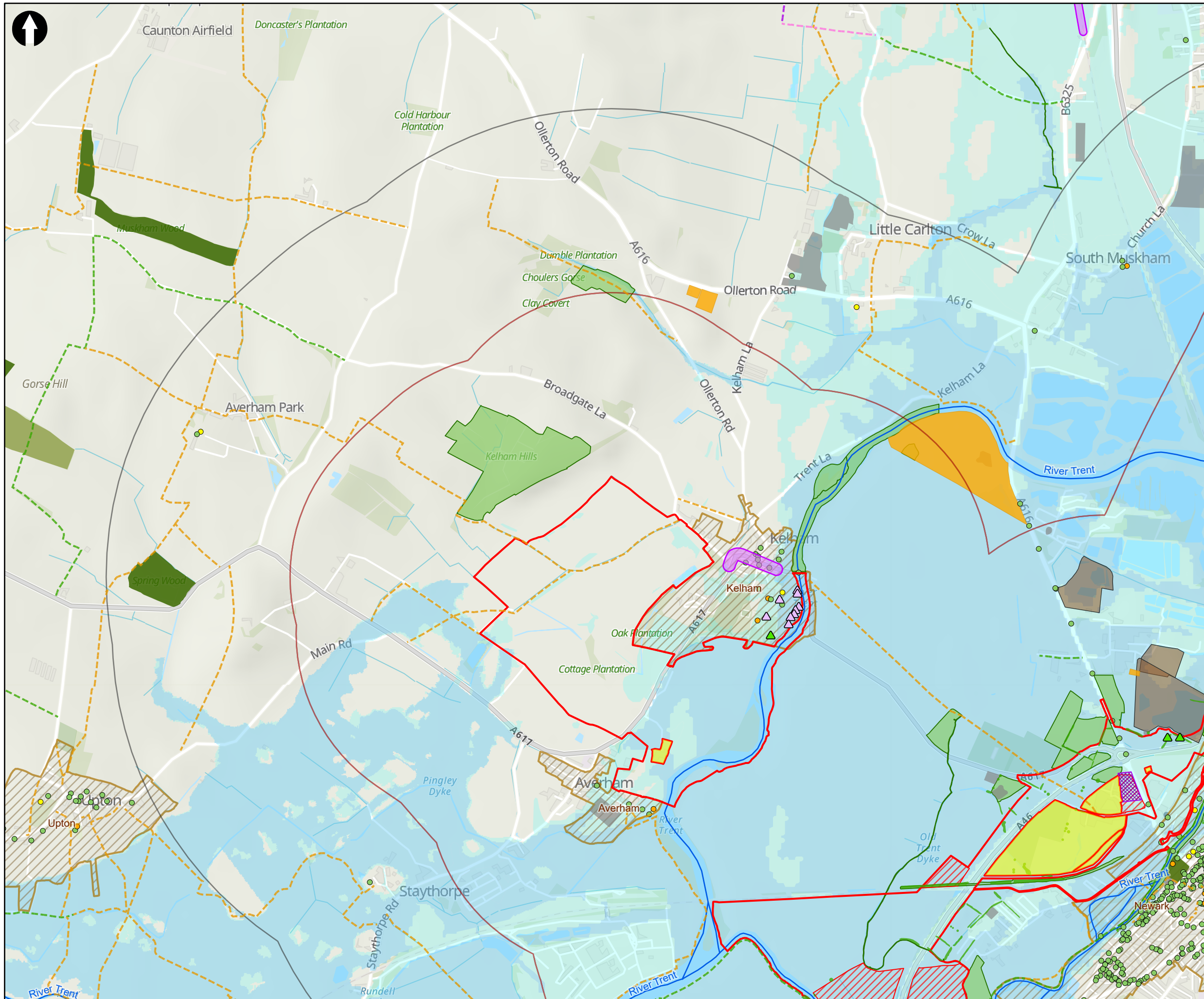
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Title

A46 Newark Bypass
 Environmental Constraints Plan
 Sheet 3 of 4

Designed	S Buckwell	Check	S Bennett
Drawn	T Graham	Coordination	S Buckwell
GIS Check	F Lumb	Approved	S Craciun
Scale at A3	Status	Rev	Security
1:20,000	INF	07	STD





Key to Symbols

Preliminary Red Line Boundary	Veteran Tree
Temporary Works Area	Notable Tree
Indicative proposed main compound	Noise Important Area
Exclusion zone	Historic Landfill Site
Preliminary Red Line Boundary (1km buffer)	Authorised Landfill Site
Preliminary Red Line Boundary (2km buffer)	Local Wildlife Site
Grade I Listed Building	Ancient and semi-natural woodland
Grade II* Listed Building	Ancient replanted woodland
Grade II Listed Building	Public Right of Way
Scheduled Monument	Byway open to all traffic
Conservation Area	Public Right of Way - Bridleway
Registered Park and Garden	Public Right of Way - Footpath
Flood Zone 2	Restricted byway
Flood Zone 3	
Main River	
Tree Preservation Order	

Notes

Source
 Red Line Boundary DF2: Mott MacDonald, 2022.
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06	19/08/2022	TG	Comments Updated	SBe	SC
Rev	Date	Drawn	Description	Ch'k'd	App'd

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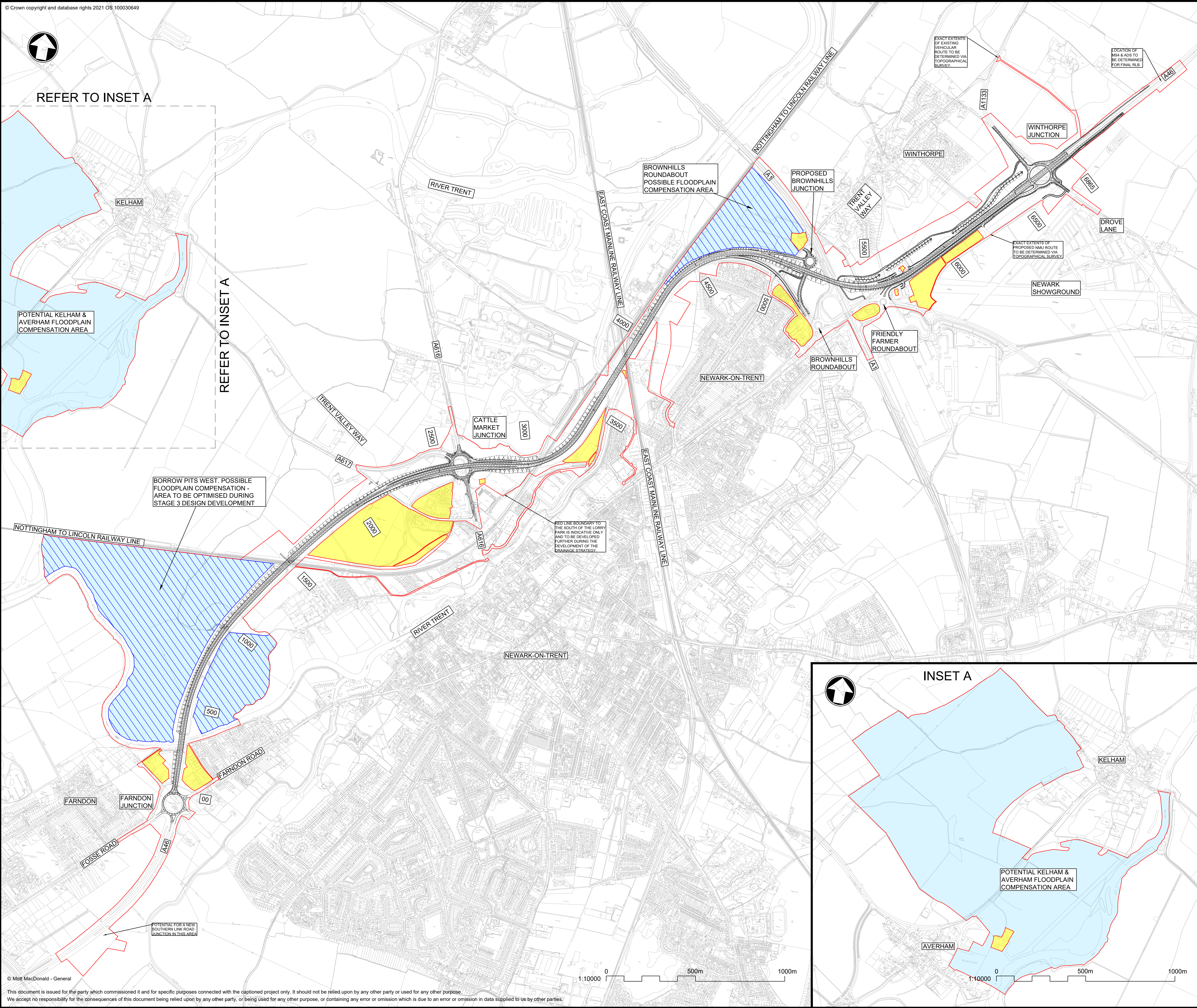
Title

A46 Newark Bypass
 Environmental Constraints Plan
 Sheet 4 of 4

Designed	S Buckwell	Check	S Bennett
Drawn	T Graham	Coordination	S Buckwell
GIS Check	F Lumb	Approved	S Craciun
Scale at A3	Status	Rev	Security
1:20,000	INF	07	STD

Appendix B: Draft Red Line Boundary drawing

The draft red line boundary drawing that supports this Environmental Scoping Report is contained overleaf.



REFER TO INSET A

REFER TO INSET A

BORROW PITS WEST POSSIBLE FLOODPLAIN COMPENSATION AREA TO BE OPTIMISED DURING STAGE 3 DESIGN DEVELOPMENT

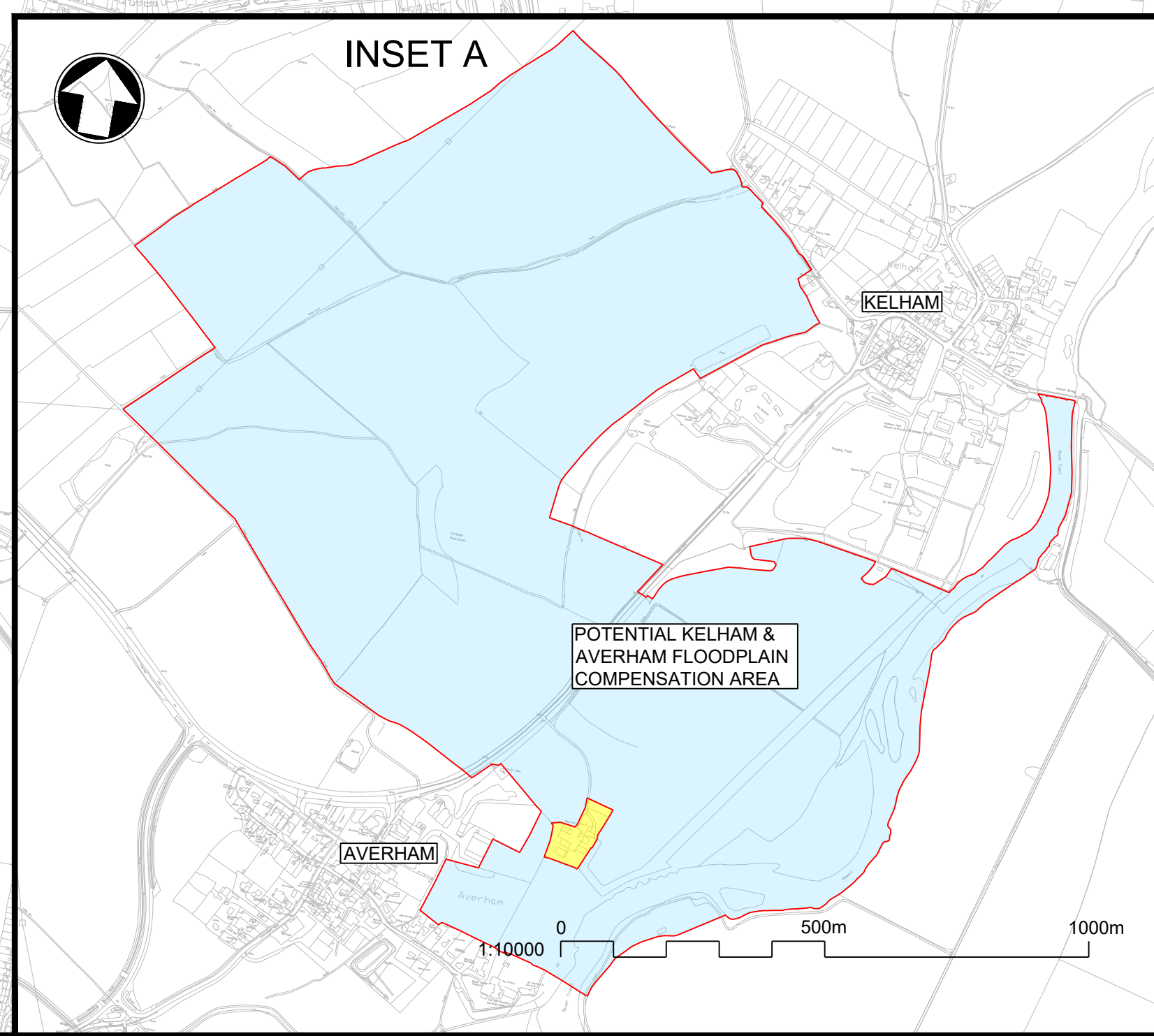
RED LINE BOUNDARY TO THE SOUTH OF THE LORRY PARK IS INDICATIVE ONLY AND TO BE DEVELOPED FURTHER DURING THE DEVELOPMENT OF THE DESIGN STRATEGY

EXACT EXTENTS OF EXISTING VEHICULAR ROUTE TO BE DETERMINED VIA TOPOGRAPHICAL SURVEY

LOCATION OF HIGH & A&S TO BE DETERMINED FOR FINAL RLB

EXACT EXTENTS OF PROPOSED R&M ROUTE TO BE DETERMINED VIA TOPOGRAPHICAL SURVEY

POTENTIAL FOR A NEW SOUTHERN LINK ROAD JUNCTION IN THIS AREA



- Notes
- The design shown here is preliminary. The design is subject to change as it develops through Stage 3.
 - All dimensions are in metres unless otherwise stated.
 - Land proposed to be acquired or used for the scheme permanently or temporarily is shown indicatively at this stage, with an appropriate level of confidence commensurate with the preliminary status of the design.
 - Capacity and operational safety at junctions is currently under assessment and therefore further amendments to junction layouts may be required.
 - Departures for the mainline geometrical alignment are not yet confirmed and therefore some alterations may be required.
 - The design strategy is to tie into the southern edge of the existing A46. Earthworks are shown in some places on this drawing which represents the current design, however the intention is that these will be removed as the design develops.
 - A topographical survey covering the full extents of the red line boundary shown here was not available at the time this drawing was produced. Therefore, assumptions were made for the red line boundary in some locations and have potential for further change.
 - Kelham/Averham, Brownhills, and the West Borrow Pits floodplain compensation areas are required to offset the impact of the scheme.
 - Hydraulic modelling to be undertaken to confirm exact location and extent of floodplain compensation required.

- Key:
- Preliminary Design
 - Preliminary Design - Earthworks
 - Preliminary Red Line Boundary (RLB)
 - RLB - Exclusion Zone
 - RLB - Borrow Site
 - Floodplain Compensation Area

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	29/06/22	Design Fix A1 - for Environmental Assessment	RC	EJ	SC
P02	07/07/22	EW02 - 2.4	DL	JS	SC
P03	08/07/22	EW02 - 2.4	RC	EJ	---
P04	04/08/22	Design Fix A2 - For Environmental Assessment	RC	JS	---
P05	16/08/22	Draft RLB for Environmental Scoping	BH	JS	SC
P06	24/08/22	Design Fix B - For Environmental Scoping	RC	EJ	SC
P07	25/08/22	Design Fix B - For Environmental Scoping	RC	EJ	SC

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Client

national highways

Drawing Status: Suitable for Review & Comment

Status: S3

Project Title: A46 Newark Bypass

Drawing Title: A46 - Preliminary Design and Draft Red Line Boundary to support Environmental Scoping

Scale	Designed	Drawn	Checked	Approved
1:10000	J. Sarjant	R. Cagney	E. Joyce	S. Craciun
Original Size	Date	Date	Date	Date
A1	25/08/22	25/08/22	25/08/22	25/08/22
Drawing Number	Originator	Volume	Project Ref. No.	
HE551478 - MOTG	- LLO -		HE551478	
Drawing Location	Type	Role	Revision	
CONWI_CONW	- DR - CH -	00001	P07	

Appendix C: List of visual receptors

Visual receptors currently proposed for inclusion within the assessment include:

1. Residential receptors on Marsh Ln and Crees Lane
2. Residential receptors on Fosse Rd, Brockton Ave and Linton Cl.
Including Red Rose Care Community
3. Workers and visitors to Lord Ted – Pub and Cavery and other surrounding place of employment.
4. Works and visitors to Farndon Fields and surrounding industrial units
5. Residential receptors on Peebles Rd, and Riverside Rd.
6. Users of PRoW and residential receptors on The Ivies, The Oseries, The Weavers, The Maltsters and Lamb Cl
7. Users of PRoW Newark BW1 and BW2
8. Users of PRoW Newark BW5
9. Users of Newark Marina Ltd
10. Residential receptors, road users and pedestrians on Mill Gate Street
11. Users of Riverside Car Park and surround recreational facilities
12. Visitors to Newark Castle and Gardens
13. Residential receptors and road users on Great North Rd and Bar Gate
14. Users of Newark Ransome and Marles Cricket Club
15. Users of Newark Rugby Club
16. Users of PRoW Newark FP14
17. Residential receptors on Sandhills Park, Sandhills Cl, Kelham Rd and Cullen Cl
18. Residential receptors on Great N Rd and works and visitors to the British Sugar Factory
19. Visitors to Smeatons Lakes Touring, Caravan and Fishing Park
20. Users of King Waterside and Marina
21. Business and road users of North Gate Street
22. Users of PRoW Newark BW6 and residential receptors
23. Residential receptors along Wolsey Rd and Fleming Dr
24. Users of PRoW Newark FP48
25. Residential receptors on Robert Dukeson Ave, John Pope Way, Halliwell Cl, Stephen Rd and Alexander Ave. Including Bishop Alexander Primary School
26. Residential receptors on Wheatsheaf Ave, Barley Way, Winthorpe Rd, Pine Cl, Primrose Ave and Harvest Dr. Including users of Premier Inn Newark, Roman Way Beefeater and MacDonalds
27. Users of the recreational route – Trent Valley Way, long distance path
28. Workers and visitors to Bridge Houser Boarding Kennels
29. Workers on the Long Hollow Way industrial site

30. Residential receptors on The Spinney and adjacent All Saints Church Winthorpe
31. Users of PRoW Winthorpe FP2 and FP3
32. Residential receptors on Hargon Ln
33. Residential receptors on Hargon Ln, Pocklington Cres and Branston Cl
34. Users of Holm FP1 and surrounding residential properties
35. Winthorpe Primary School and surrounding properties on Gainsborough Rd
36. Residents and visitors of Langford Hall (A46 entrance)
37. Residents and visitors of Langford Hall (A1133 entrance)
38. Visitors to Newark Showground (Drove Ln entrance)
39. Visitors to Newark Air Museum
40. Users of Newark Indoor Bowls Centre and Golf Centre
41. Visitors to Newark Showground
42. Residents and Visitors to Hawthorn
43. Users of Kelham PRoW FP4
44. Residential receptors and visitors to Latham Farms
45. Residential receptors and visitors to South Muskham Main Street
46. Users of Trent Valley Way between Kelham and A617 at Newark
47. Users of Trent Valley Way and residential receptors at Averham
48. Residential receptors at Kelham
49. Users of Kelham Church and surrounding grounds of Kelham Hall
50. Users of PRoW BW1/BW2 at Upper Water Mouth
51. Road users of A46
52. Road users of B6166 at Farndon
53. Road users of B6326
54. Road users of B6166 at Brownhill
55. Road users of A1
56. Road users of A17
57. Road users of A1133

Appendix D: Habitats

Several areas not yet accessed will require extended phase 1 habitat surveys. The findings of which will inform whether further botanical surveys are required and will be presented within the Environmental Statement (ES).

Priority habitats

Wood pasture

Wood pasture habitat was identified at two sites within the study area at Winthorpe House and Langford Hall. The wood pasture at both Winthorpe House and Langford Hall is comprised of scattered mature coniferous pine *Pinus* spp., as well as deciduous ash *Fraxinus excelsior*, oak *Quercus* spp. and beech *Fagus sylvatica*. The trees are currently actively managed as pollards. The pasture is comprised of species-poor semi-improved grassland and is sward dominant.

Traditional orchard

There is an area of traditional orchard habitat typified by the presence of several mature apple *Malus domestica* and pear *Pyrus communis* trees. This is located adjacent to a residential property and the produce is not grown commercially.

Eutrophic standing water

There is an area of eutrophic standing water which was located within British Sugar land. This large water body is likely to be nutrient enriched by nearby industrial processes.

Lowland meadows

Although this could not be positively identified during the survey due to the time of year, the supplier during the options appraisal stages of the scheme recorded Lowland Meadows habitat (classified as unimproved neutral grassland under JNCC phase 1 habitat coding) directly west of the A616 Great North Road. The species identified during surveys undertaken during the options appraisal stages in 2019 included common knapweed *Centaurea nigra*, common bird's-foot-trefoil *Lotus corniculatus*, meadow vetchling *Lathyrus pratensis*, lady's bedstraw *Galium verum*, rough hawkbit *Leontodon hispidus* and great burnet *Sanguisorba officinalis*. Unimproved grassland was also recorded adjacent to the wetland mosaic habitat directly north-east of the A46.

Coastal and floodplain grazing marsh

This habitat was positively identified at British Sugar land and also west of the A46. Floodplain Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water.

Other habitats

Arable

Arable habitat was ubiquitous throughout the study area and has been identified within Nottinghamshire's Habitat Action Plan²⁵⁸. Arable farmland provides vital habitat for many bird species, both for breeding and over-wintering. Arable fields also provide feeding and roosting opportunities for large numbers of birds such as geese, ducks, wading species and gulls that visit the county in winter.

Amenity grassland

This regularly managed habitat was located throughout the study area generally present in small patches (between 100 metres squared and 250 metres squared) adjacent to commercial, as well as industrial buildings and residential properties. The grassland sward composition was dominated by perennial ryegrass *Lolium perenne* with occasional cock's-foot *Dactylis glomerata* whilst the forbs were comprised of occasional common daisy *Bellis perennis* and ribwort plantain *Plantago lanceolata*.

Improved grassland

This species-poor habitat was present throughout the scheme boundary and is identified by plant species that are known to be tolerant of nutrient rich soils and are often found in agriculturally managed field grazed by livestock. Species that were present within the sward included perennial ryegrass, cock's-foot and Yorkshire fog *Holcus lanatus*. Improved grassland habitat has been identified within Nottinghamshire's Habitat Action Plan²⁵⁸. These grasslands are not without biodiversity interest; they provide nesting opportunities for bird and animal species. Taller permanent improved grasslands can support large populations of small mammals which are vital food sources for birds of prey such as barn owl *Tyto alba*.

Species-poor semi-improved grassland

This habitat was also common throughout the 250 metre and was characterised by the presence of red fescue *Festuca rubra* within the composition of the sward. A full species list of the habitat was not possible, due to the sub-optimal time of the survey.

Semi-natural broad-leaved woodland

There are numerous pockets of semi-natural broad-leaved woodland within the study area. The canopy was generally comprised of semi-mature to mature oak and ash. There were also some woodland areas that had sycamore *Acer pseudoplatanus* and beech present within the canopy layer.

²⁵⁸ Nottinghamshire Biodiversity Action Group. Local Biodiversity Action Plan [online] available at: [Local Biodiversity Action Plan – Nottinghamshire Biodiversity Action Group \(nottsbaq.org.uk\)](http://LocalBiodiversityActionPlan-NottinghamshireBiodiversityActionGroup.nottsbaq.org.uk)

Holly *Ilex aquifolium* and hazel *Corylus avellana* was present within the sub-canopy layers in some parcels, though very local in abundance. Due to the sub-optimal time of the survey, it was impossible to accurately survey the ground flora layer.

Scattered broad-leaved trees

There are numerous scattered broad-leaved trees within the study area. Species present included; ash, oak, sycamore, beech, silver birch *Betula pendula*, horse chestnut *Aesculus hippocastanum*, sweet chestnut *Castanea sativa*, willow *Salix* spp. and poplar *Populus* spp. Some of the trees are currently actively managed by pollarding.

Scattered coniferous trees

Several mature pine trees and Leyland cypress *Cupressocyparis x leylandii* trees were recorded within the study area. Namely at Newark Rugby Club, Newark Cricket Club and within wood pasture at Winthorpe House and Langford Hall.

Standing water (ditches/dykes)

There were a number of ditches and dykes within the study area adjacent to scattered broad-leaved trees, species-poor semi-improved grassland and arable. The Old Trent Dyke lies approximately 600 metres north of the River Trent and passes under the existing A46. Ditch habitats have been identified under Nottinghamshire's Habitat Action Plan.

Standing water (ponds)

There are several ponds located within the study area. Each were subjected to a HSI survey to assess for the suitability of great crested newt populations during the breeding season. Common bulrush *Typha latifolia* was often present within pond habitat.

Running water (river/streams)

Habitats of running water have been identified throughout the scheme, mainly the Rivers Trent and Devon. Rivers and stream habitats have been identified under Nottinghamshire's Habitat Action Plan.

Mixed plantation woodland

An area of mixed plantation woodland was recorded directly westerly adjacent to the A46 close to Winthorpe House. The woodland was comprised of pine species, ash, beech and oak species).

Broad-leaved plantation woodland

There is ubiquitous broad-leaved plantation woodland mainly located adjacent to the A46. It is likely that this planting has been implemented as screening.

Scrub

Scrub habitat is present throughout the study area, both in scattered and dense forms. The dominant species within this habitat was bramble *Rubus fruticosus* agg.

Tall ruderal

Tall ruderal habitat existed within several land parcels and was comprised of mainly willowherb species *Epilobium* spp., creeping thistle *Cirsium arvense*, common nettle *Urtica dioica* and broad-leaved dock *Rumex obtusifolius*.

Buildings

Numerous buildings were recorded. The buildings have been constructed for commercial, administrative, amenity, industrial or residential purposes.

Species-poor intact hedgerow

Species-poor intact hedgerows existed throughout the study area. The habitat was comprised mainly of hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa* with few other species present.

Species-poor intact hedgerow with trees

Several hedgerows had young and semi-mature trees present which were mainly comprised of ash and oak.

Species-poor defunct hedgerow

The habitat exists on field boundaries with hawthorn present as the dominant species.

Dry ditch

This habitat was uncommon throughout the study area, though were located at central OS national grid references SK 78110 53244 and SK 78218 52530.

Appendix E: Protected and notable species

The following species surveys have been undertaken to date, with further surveys required in most cases. All ecological survey findings will be presented within the Environmental Statement (ES).

Bats

Tree and buildings with bat roosting potential were recorded during the extended phase 1 habitat survey within the scheme extent, temporary works areas and within a 250m buffer in January and March 2022.

A total of 19 structures were identified within the areas of land visited during the extended phase 1 habitat survey. Initial inspections of these 19 structures from ground level identified 13 structures have features of low to high potential to support roosting bats.

A total of 136 trees were identified within the areas of land visited during the extended phase 1 habitat survey. Initial inspections of these 136 trees from ground level identified 109 trees have features of low to high potential to support roosting bats. Only trees assessed as having moderate or high potential for roosting bats will undergo climb inspections where safe to do so.

The zone of influence for the scheme to impact bat roosts is considered to be no more than 100 metres during operation or construction. Therefore, further surveys in the form of emergence / re-entry, internal inspections (including tree climbing) will not be undertaken on structures or trees located more than 100 metres from the scheme.

Suitable foraging and commuting habitat is present across the full stretch of the A46 throughout the survey area. In addition to the suitable habitats identified within the boundaries of the survey area, the survey area is also well connected to other suitable habitats within the wider area that are connected to the survey area. These include wider areas of woodland, open standing water, arable land, grassland and linear features such as hedgerows, watercourses and lines of trees.

Due to the presence of suitable foraging and commuting habitat within the survey area and the connectivity of the survey area to suitable habitat within the wider area, the survey as a whole is considered to have a moderate suitability to support foraging and commuting bat species, with reference to the Bat Conservation Trust (BCT) Guidelines²⁵⁹.

²⁵⁹ Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). Bat Conservation Trust, London. [online], available at: https://cdn.bats.org.uk/uploads/pdf/Resources/Bat_Survey_Guidelines_2016_NON_PRINTABLE.pdf?v=1542281971.

Additional surveys including further preliminary roost assessments in newly accessible areas, bat activity surveys by way of walked transects and static detector monitoring and further assessment of structures and trees deemed to have suitability for bats are currently ongoing and will inform the Environmental Statement.

Birds

Scrub, woodland, wetland, arable habitat and grassland, found throughout the survey area offer suitable breeding habitat for bird species. The large water body/eutrophic standing water habitat at the Newark sugar factory is optimal habitat for wintering bird species.

Scrub, woodland, wetland and farmland offer suitable habitat for breeding bird populations. Breeding bird surveys have been undertaken through April to June 2022 inclusive, with the final surveys scheduled for July 2022.

Wintering birds were undertaken utilizing the ‘look-see’ method described Bibby *et al* (1992; 2000)²⁶⁰ in January and February 2022.

A total of 68 species were recorded during the over-wintering bird surveys undertaken.

Records of notable species include the following:

- Five Schedule 1 species
- Twelve Section 41 species
- Thirteen species on the Red List Birds of Conservation Concern
- Twenty-four species Amber List Birds of Conservation Concern

Thirty-seven of the species recorded on site are of conservation concern (Red or Amber List Birds of Conservation Concern) and are considered to be range restricted but are common and widespread in England and Wales as per Balmer *et al*²⁶¹.

Additional surveys will include wintering bird surveys in November and December 2022 and will inform the Environmental statement.

Reptiles

Grass snakes *Natrix natrix* requires some cover and a degree of structural diversity²⁶². Therefore, exposed drains that were assessed as having optimal grass snake habitat by the previous supplier during options appraisal stages

²⁶⁰ Bibby, C.J., Burgess, N.D., Hill, D.A., Mustoe, S. and Lambton, S. (1992, 2000) Bird Census Techniques. Academic Press, London, UK.

²⁶¹ Gillings, S., Balmer, D. E., Caffrey, B. J. & Swann, B., 2013. Survey methods and data sources. In: Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (eds), 2013. Bird Atlas 2007–11: The Breeding and Wintering Birds of Britain and Ireland. BTO Books, Thetford, UK. pp.34–45.

²⁶² Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.

can be scoped out. Seasonal water filled hollows within the study area are also likely to be dry during the active summer months and can also be scoped out. Ponds and other watercourses that have a habitat structural diversity close by (scrub, tall vegetation, scattered trees, hedgerows and woodland), offer optimal habitat for grass snakes and other reptile species.

Great crested newts

Habitat suitability Index (HSI) surveys were undertaken within the scheme extent, temporary works areas and within a 250 metre buffer though January to June 2022 inclusive. A total of 22 waterbodies were identified within the survey area, five of which are within the scheme extent and two are within the temporary works areas. Two ponds were dry at the time of HSI surveys. Two waterbodies could not be accessed for further surveys following completion of the HSI surveys due to access constraints. A total of 14 waterbodies were subjected to eDNA surveys in April, May or June 2022 to confirm great crested newt (GCN) presence. At the time of writing this report, the results for one waterbody were waiting to be returned from the laboratory, a total of 12 waterbodies had negative results and one waterbody received an inconclusive result. All waterbodies with negative results are scoped out of further surveys for GCN. The one waterbody with an inconclusive eDNA result and those not accessible beyond HSI surveys, will require eDNA sampling and potentially population class surveys in spring 2023 to inform the Environmental Statement.

Badgers

Badger walkover surveys have been ongoing from January 2022 as additional land becomes accessible. Two badger setts were identified during the initial site walkover survey, one of which was identified by the previous supplier during options appraisal stages of the scheme (documented in the 2019 Preliminary Ecological Appraisal (PEA)). Both of these setts were single-entrance outlier setts with no evidence of recent use by badger. One of these setts had evidence of use by rabbits, which may have occupied the disused sett.

Further badger surveys have been recommended in areas previously accessible and will be undertaken in 2022 to inform a full badger survey report and the Environmental Statement.

Otters

No otter field signs were identified during the extended phase 1 habitat survey or water voles surveys to date. However, the banks of the River Trent and River Devon and immediate surroundings adjacent to the A46, comprise of suitable habitat for otters to commute along the watercourse and construct holts. Further surveys to search for otter field signs will be required to inform the Environmental Statement.

Water voles

Several watercourses within the study area were identified as having suitable habitat for water voles. Suitable habitat is assessed by assessing the following characteristics; bank profile, channel profile, water levels, availability of food sources, vegetation structure, level of shading, disturbance levels, bordering land use and connectivity to other habitats. The previous supplier's survey in 2019 identified suitable habitat at the River Trent where it crosses underneath the A46. However, these habitats can be scoped out as the River Trent at these locations is fast flowing and is not suitable for populations of water voles. No field signs of water voles were recorded during the extended phase 1 habitat survey. Where accessible, the first survey to search for water vole field signs has been undertaken and the second survey will be undertaken after two months. Land not currently accessible will require one survey in spring 2023 (in the next survey period) to ensure two months between both surveys and to inform the Environmental Statement.

Other mammals

No sightings or field signs of hedgehog were recorded during the extended phase 1 habitat survey. Several sightings of brown hare have been recorded as incidental observations during various ecological surveys. Optimal brown hare habitat is a mosaic of arable fields, grasses and hedgerows, whilst hedgehogs favor mosaic of hedges, grassland and woodland habitat. Both mosaic of habitat are ubiquitous throughout the scheme extent and surrounding areas.

White clawed crayfish

No habitat was found during the extended phase 1 habitat survey that was suitable for populations of white clawed crayfish. Freshwater streams less than 1m in depth within the survey area did not have gravel substrate, stones and rocks for shelter and small crevices for foraging.

Invertebrates

Nine LWS were identified as requiring further surveys following a desk study undertaken in March 2022 to identify habitat with potential to support protected or notable terrestrial invertebrate species. These surveys are underway and will be reported in the Environmental Statement. Aquatic invertebrate surveys are also underway and will inform the Environmental Statement.