A46 Newark Bypass

TR010065/APP/7.5

7.5 Scheme Design Report

APFP Regulation 5(2)(q)

Planning Act 2008

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

Volume 7

April 2024

Infrastructure Planning

Planning Act 2008

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

A46 Newark Bypass

Development Consent Order 202[x]

SCHEME DESIGN REPORT

Regulation Number:	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010065
Application Document Reference	TR010065/APP/7.5
Author:	A46 Newark Bypass Project Team, National Highways

Version	Date	Status of Version
Rev 1	April 2024	DCO Application

Table of Contents

Project Information

Client / Employer	National Highways
Project Name	Regional Delivery Partnership – A46 Newark Bypass
Project Number	HE551478
Appointing Party (client)	National Highways
Appointing Party Project Manager	Phil Boffey
Lead Appointed Party (LAP)	Skanska UK Construction Ltd
Project Stage Commencement	PCF Stage 3

1 Introduction

1.1 Purpose of report

1.1.1 This Scheme Design Report (this "Report") is submitted by National Highways (the "Applicant") under section 37 of the Planning Act 2008 (the "2008 Act") to the Secretary of State for Transport via the Planning Inspectorate (the "Inspectorate") for a Development Consent Order (DCO) for the A46 Newark Bypass (the "Scheme"). A detailed description of the Scheme can be found in Chapter 2 (The Scheme) of the Environmental Statement (ES) (TR010065/APP/6.1). The purpose of this Report is to:

- provide a guide to the design decisions that have informed the development of the design for the Scheme.
- assist those reviewing the application documentation by providing a reference document that details the design of the Scheme.
- defines the Scheme's Design Principles for the key aspects of the design, as set out in Annex A Design Principles.
- ensure that the Scheme continues to adhere to the good design policies, both locally and nationally, and that the Design Principles are central to the Scheme's delivery.

1.1.2 This Report also provides evidence of compliance with the design requirements of the National Policy Statement for National Networks (NPSNN) (2014), such as: paragraphs 4.28 to 4.35 that outline criteria for "good design" for national network Infrastructure; and consideration of alternatives in light of paragraphs 3.23 to 3.27. For further details refer to the NPSNN Accordance Tables (TR010065/APP/7.2).

1.2 National Highways Licence

1.2.1 National Highways' Licence[1] includes both statutory directions and statutory guidance issued by the Secretary of State for Transport, as provided for in section 6 of the Infrastructure Act 2015 (which states that the Secretary of State may from time to time give a strategic highways company directions or guidance as to the manner in which it is to exercise its functions).

1.2.2 In relation to design, paragraph 5.26 of the Licence states *"In exercising its functions, the Licence holder **must** have due regard to relevant principles and guidance on good design, to ensure that the development of the network takes account of geographical, environmental and socio-economic context".*

1.2.3 Paragraph 5.27 of the Licence states 'The Licence holder must establish a Design Panel to provide advice to the Licence holder on design issues, and in doing so must ensure that:

[1] Department for Transport (2015) Highways England Licence. Secretary of State for Transport statutory directions and guidance to the strategic highways company. [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/431389/strategic-highwayslicence.pdf (last accessed August 2020).

- *The membership of the Design Panel includes a representation from credible experts and relevant stakeholders, as appropriate;*
- *The Licence holder seeks, and has due regard to, the views of the Secretary of State concerning the purpose, remit and membership of the Design Panel;*
- *The Licence holder seeks advice from the Design Panel:*
  - *on the design of road improvement schemes, where these are in sensitive locations or expected to have a substantial impact on the surrounding landscape;*
  - *on the development of relevant design standards concerning the visual impact of schemes; and*
  - *at any other time where required by the Secretary of State.*
- *The Licence holder has due regard to the advice and general recommendations of the Design Panel, and the particular observations of the Panel on specific schemes.'*

1.2.4 Further information on the Design Panel can be found in section 6.3 of the Report.

1.3 Design Manual for Roads and Bridges (DMRB)

1.3.1 National Highways' principles of good design are set out in 'The road to good design'[2] and compliance with these principles is a requirement of the Design Manual for Roads and Bridges (DMRB) standard GG 103 Introduction and general requirements for sustainable development and design.

1.3.2 GG 103 describes how sustainable development and good road design can be applied to the design of motorway and all-purpose trunk roads, and aligns with a range of global, European and National commitments on sustainable development.

1.3.3 GG 103 states that 'Good road design aims to put people at its heart by designing an inclusive, resilient and sustainable road network; 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'.

1.3.4 DMRB is a suite of documents which contains requirements and advice relating to works on motorways and all-purpose trunk roads for which National Highways is the overseeing organisation.

1.3.5 DMRB embodies the collective experience of the overseeing organisation, their agents, supply chain members and industry bodies. It provides requirements and advice resulting from research, practical experience of constructing and operating motorways and all-purpose trunk roads, and from delivering compliance with legislative requirements. Where a specific requirement within a particular DMRB standard cannot be met, the

[2] Highways England (2018) The road to good design (2018). [online] available at: https://www.gov.uk/government/publications/the-road-to-good-design-highways-englands-design-visionand-principle

Applicant has applied for a Departure from Standard (DfS) from the overseeing organisation.

1.4 Structure of this document

1.4.1 This Report comprises 15 sections as described below:

- Section 1 – introduces this Report
- Section 2 – provides a high-level description of the Scheme
- Section 3 – sets out the policy context
- Section 4 – details the application of National Highways' principles of good road design
- Section 5 – summarises consultation and engagement with others
- Sections 6 to 15 – reviews specific design considerations

2 The Scheme

2.1 Scheme context

2.1.1 In March 2020, the Government's second Road Investment Strategy (RIS2) included a commitment for National Highways to improve the A46 'Trans-Midlands Trade Corridor' between the M5 and the Humber Ports, to create a continuous dual carriageway from Lincoln to Warwick.

2.1.2 The A46 forms part of the strategic Trans-Midlands Trade Corridor between the M5 in the south-west and the Humber Ports in the northeast. The improvements to the A46 corridor are detailed within 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.

2.1.3 The stretch of A46 between the Farndon Roundabout to the west of Newark-on-Trent, and the A1, to the east of Newark-on-Trent, 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.

2.1.4 The Preferred Route Announcement (PRA) for the Scheme was made in February 2022. The preferred option presented at PRA has been developed to form the preliminary design of the Scheme. This preliminary design forms the application for DCO.

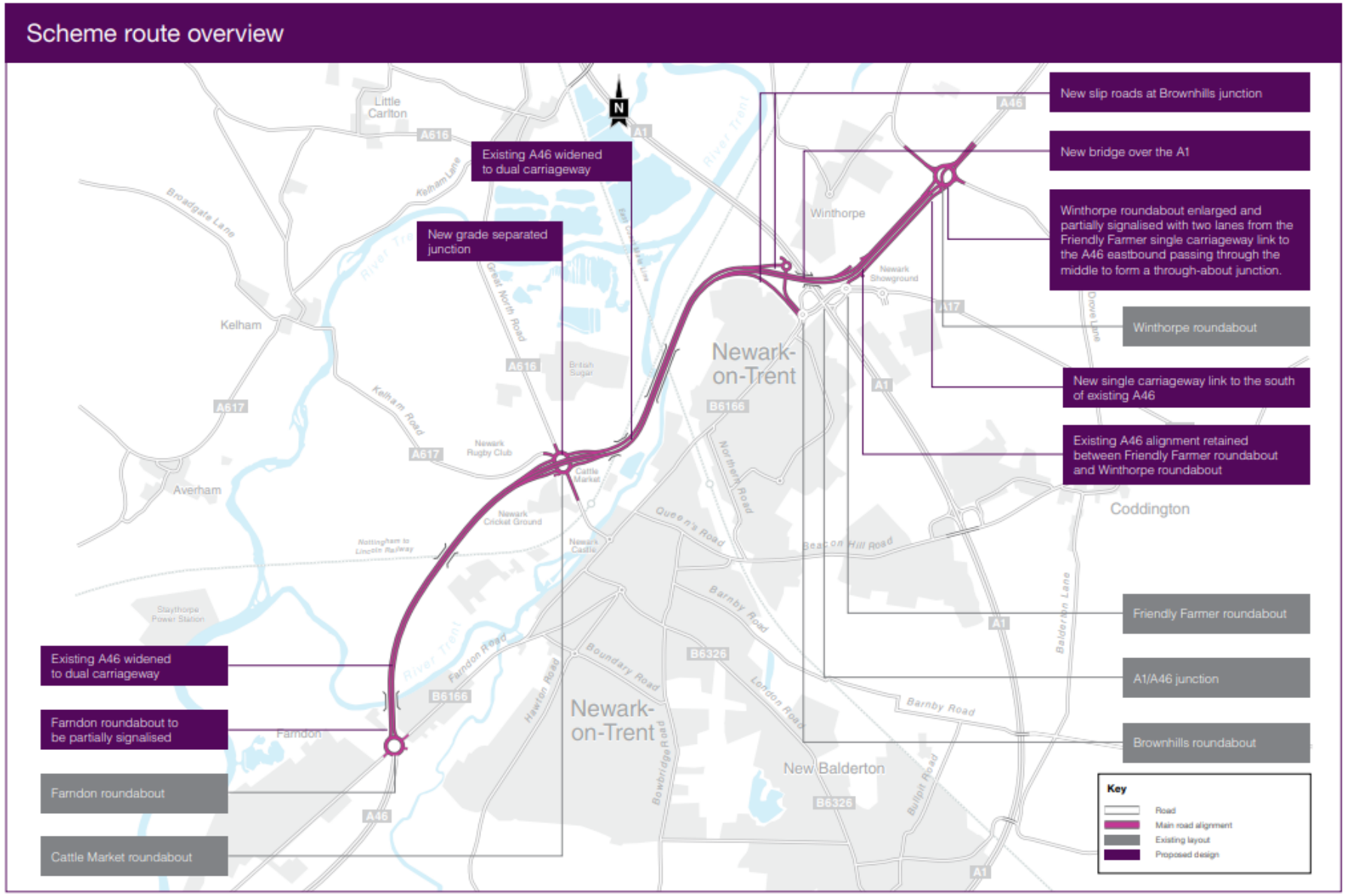
2.1.5 Further details on the need for the Scheme are contained within the Case for the Scheme (TR010065/APP/7.1).

2.2 Scheme location

2.2.1 The Scheme would provide a dual carriageway on the A46 between Farndon and Winthorpe in Nottinghamshire. The Farndon Roundabout is located at the southern extent of the Scheme where the B6166 Farndon Road joins the A46.

2.2.2 The Winthorpe Roundabout is located at the northern extent where the A1133 joins the A46. Along its route, it crosses the A617 and the B6326, at the Cattle Market junction, and the A1 between the Friendly Farmer and Brownhills roundabouts. Figure 1 below shows the location of the Scheme. Further details can also be found on the Location Plan (TR010065/APP/2.1) which shows the Scheme in its wider geographical context.

Figure 1: Scheme location



2.2.3 The Scheme would be situated within the county boundary of Nottinghamshire County Council and within the administrative boundary of Newark and Sherwood District Council.

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

2.2.5 The existing A46, currently a single carriageway, is elevated on embankments due to the low-lying floodplain of the River Trent. This floodplain is located to the west of the A46 for the majority of the affected length, along with a section at the southern end on the eastern side of the A46. Several roundabouts form key junctions along the route, linking local A roads. Road infrastructure is softened by roadside vegetation in places and the River Trent is a strong natural influence within an otherwise built-up landscape. To the north of the A46, farmland dominates, interspersed with small-scale settlements. To the south of the A46, the town of Newark-on-Trent forms a notable urban settlement.

2.3 Scheme aims and objectives

2.3.1 The aim of the Scheme is to increase capacity and reduce traffic congestion on the A46 around Newark-on-Trent. This will directly contribute to the UK, regional and local Government's transport and economic growth plans by improving connectivity from Lincolnshire to the national motorway network, and improving route standard consistency for the A46, providing a consistent high standard dual carriageway between the Midlands and Lincoln.

2.3.2 Scheme-specific objectives have been used to develop the Scheme design which are set out below, Further details on how the Scheme meets these objectives can be found in the Case for the Scheme (TR010065/APP/7.1)

Safety	Improving safety through Scheme design to reduce collisions for all users of the A46 Scheme.
Congestion	Improve journey time and journey time reliability along the A46 and its junctions between Farndon and Winthorpe, including all approaches and A1 slip roads.
Connectivity	Accommodate economic growth in Newark-on-Trent and the wider area by improving its strategic and local connectivity.
Environment	Deliver better environmental outcomes by achieving a net gain in biodiversity and improve noise levels at Noise Important Areas along the A46 between Farndon and Winthorpe Roundabout.
Customer	Build an inclusive Scheme which improves facilities for cyclists, walkers and other vulnerable users where existing routes are affected.

2.4 Scheme description

2.4.1 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, the A1 and local roads.

2.4.2 The Scheme consists of the following principal elements:

- Widening of the existing A46 to a dual carriageway for a distance of 6.5 kilometres 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.
- A new off-line section to bypass the existing Brownhills roundabout and Friendly Farmer roundabout.
- A new grade separated northbound exit slip to a new roundabout providing local access, with a two-way link road on the southern arm to connect with the existing Brownhills roundabout.
- A two-way parallel link road from Friendly Farmer to Winthorpe Roundabout to the southern side of the existing dual carriageway.
- A new bridge structure across the existing A1, located to the north of the existing bridge.
- An upgraded roundabout with partial signal controls at Winthorpe Roundabout.
- Improvements to walker, cyclist and horse-rider (WCH) facilities through safer, enhanced routes.
- Three areas have been identified for floodplain compensation which are being referred to as the Kelham and Averham floodplain compensation area (FCA), Farndon West FCA and Farndon East FCA. In addition, the Farndon East FCA and Farndon West FCA will also be used as borrow pits to support the creation of embankments required for the Scheme.
- Drainage features including attenuation ponds.
- Environmental mitigation including landscape planting.
- Associated accommodation works and maintenance access tracks.

3 Policy context

3.1 Key policy

3.1.1 Key documents relating to the design of the Scheme can be divided into a primary and secondary policy framework. Section 104 of the 2008 Act states that the Secretary of State must decide an application "in accordance with" any relevant, designated NPS and must have regard to any matters they regard as important and relevant, including the National Planning Policy Framework (NPPF) and relevant adopted local development plan policies. In this regard, the primary policy framework comprises the NPSNN and the secondary policy framework comprises the NPPF and relevant adopted local development plan policies.

3.1.2 The Scheme falls within the administrative area of Newark and Sherwood District Council (NSDC), the relevant Local Planning Authority (LPA). Relevant adopted development plans comprise:

- NSDC Amended Core Strategy Development Plan Document (DPD) (March 2019).
- NSDC Allocations and Development Management DPD (July 2013).

3.2 National policy statement for national networks

3.2.1 The NPSNN published in December 2014 and designated in January 2015, is the relevant NPS which sets out the Government's vision and policy for development of the strategic road and rail networks. Further details on the Scheme's compliance with the NPSNN can be found in the NPSNN Accordance Tables (TR010065/APP/7.2).

3.2.2 The draft NPSNN was published for consultation in March 2023 (which concluded in June 2023) and has yet to be designated. This draft NPSNN can be an important consideration for the Secretary of State when making their decision as to whether to grant consent to the DCO. Further details on the Scheme's compliance with the draft NPSNN can be found in the Draft NPSNN Accordance Tables (TR010065/APP/7.3).

3.2.3 Table 3-1 outlines where good design is referenced within the NPSNN.

Table 3-1: NPSNN design policies

Paragraph No.	Description (quoted from NPS)
4.28	Applicants should include design as an integral consideration from the outset of a proposal.
4.29	Visual appearance should be a key factor in considering the design of new infrastructure, as well as functionality, fitness for purpose, sustainability and cost. Applying "good design" to national network projects should therefore

	produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction, matched by an appearance that demonstrates good aesthetics as far as possible.
4.30	It is acknowledged however, that given the nature of much national network infrastructure development, particularly SRFIs, there may be a limit on the extent to which it can contribute to the enhancement of the quality of the area.
4.31	A good design should meet the principal objectives of the scheme by eliminating or substantially mitigating the identified problems by improving operational conditions and simultaneously minimising adverse impacts wherever possible, for example, in relation to safety or the environment. A good design will also be one that sustains the improvements to operational efficiency for as many years as is practicable, taking into account capital cost, economics and environmental impacts.
Paragraph No.	**Description**
4.32	Scheme design will be a material consideration in decision making. The Secretary of State needs to be satisfied that national networks infrastructure projects are sustainable and as aesthetically sensitive, durable, adaptable and resilient as they can reasonably be (having regard to regulatory and other constraints and including accounting for natural hazards such as flooding).
4.33	The applicant should therefore take into account, as far as possible, both functionality (including fitness for purpose and sustainability) and aesthetics (including the scheme's contribution to the quality of the area in which it would be located). Applicants will want to consider the role of technology in delivering new national networks projects. The use of professional, independent advice on the design aspects of a proposal should be considered, to ensure good design principles are embedded into infrastructure proposals.
4.34	Whilst the applicant may only have limited choice in the physical appearance of some national networks infrastructure, there may be opportunities for the applicant to demonstrate good design in terms of siting and design measures relative to existing landscape and historical character and function, landscape permeability, landform and vegetation.
4.35	Applicants should be able to demonstrate in their application how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, applicants should set out the reasons why the favored choice has been selected. The Examining Authority and Secretary of State should

	take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements which the design has to satisfy.

3.3 National planning policy framework

3.3.1 The NPPF (December 2023) sets out the Government's planning policy framework for the whole of England, including the Government's expectation for the content and quality of planning applications and local plan policy. The overall strategic aims of the NPSNN and NPPF are consistent and the NPPF may be an important and relevant matter paragraph 5 of the NPPF states *'The Framework does not contain specific policies for nationally significant infrastructure projects. These are determined in accordance with the decision-making framework in the 2008 Act (as amended) and relevant national policy statements for major infrastructure, as well as any other matters that are relevant (which may include the National Planning Policy Framework).'*

3.3.2 Paragraph 10 states that *'at the heart of the Framework is a presumption in favour of sustainable development'*. Paragraph 131 states that *'Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities.'*

3.3.3 Details of how the Scheme demonstrates principles of good design are included throughout this Report.

3.4 NSIP classification

3.4.1 The Scheme is classified as a Nationally Significant Infrastructure Project (NSIP) as defined under the sections 14(1)(h), 22(1)(b) of the 2008 Act and Section 22 (3) and (4) (as amended by The Highway and Railway (Nationally Significant Infrastructure Project) Order 2013) by virtue of the fact that it meets the following criteria:

- The Scheme comprises the alteration of a highway.
- National Highways Limited is the Strategic Highway Authority for the highway.
- The speed limit will be greater than 50mph and the area of development at 211 hectares exceeds the 12.5 hectares threshold.

3.5 Local policy context

3.5.1 At a local level, every LPA should have an adopted local development plan, which sets out the planning policies and proposals for land use in their area. It is these policies that planning applications for development in the area are determined in accordance with and they should align with the NPPF. In addition to the adopted local development plan, emerging draft local policy may be a material consideration in decision-making. The relevant LPA for the Scheme is NSDC.

3.5.2 Table 3-2 outlines the design related policies relevant to the Scheme within NSDC's local development framework (LDF), including within its Amended Core Strategy DPD (adopted March 2019) and Allocations and Development Management DPD (adopted July 2013).

Table 3-2: Newark and Sherwood LDF design policies

Policy	Description
Amended Core Strategy DPD	
Core Policy 9: Sustainable Design	The Council requires *'new development proposals to demonstrate a high standard of sustainable design that both protects and enhances the natural environment and contributes to and sustains the rich local distinctiveness of the District.'* The policy sets out a series of criterion that developments must meet, including demonstrating effective and efficient use of land, minimise the production of waste, and provide resilience in the long-term, including taking into account the potential impacts of climate change.
Allocations and Development Management DPD	
Policy DM5: Design	The Council will assess all proposals for new development against the criteria of Access, Parking, Amenity, Local Distinctiveness and Character, Trees, Woodland, Biodiversity and Green Infrastructure, Crime and Disorder, Ecology, Unstable Land, Flood Risk and Water Management, and Advertisements.

3.5.3 Details of how the Scheme has achieved compliance with these policies are included throughout this Report.

3.6 The road to good design, National Highways

3.6.1 'The road to good design' (National Highways, 2018) is National Highways' design policy, and outlines the design vision for road schemes.[3]

3.6.2 It outlines three themes to be considered in the development of design:

[3] Good_road_design_Jan_18.pdf (publishing.service.gov.uk)

- **Connecting people:** People are at the heart of our design work, making good roads safe and useful, inclusive and understandable. Good road design reflects users' needs, engages with communities and works intuitively for all.
- **Connecting places:** Good road design demands a deep understanding and response to place, to create a quality aesthetic experience for the user and wider community. This is restrained and environmentally sustainable design, in fitting with the context.
- **Connecting processes:** A successful outcome focussed on people and places requires good design processes. These are collaborative, thorough and innovative, generating long-lasting outcomes that are of benefit to users and the wider community.

3.6.3 It also lists 10 principles of good road design which have been taken into account in the design of the Scheme, including:

1. Makes roads safe and useful
2. Is inclusive
3. Makes roads understandable
4. Fits in context
5. Is restrained
6. Is environmentally sustainable
7. Is thorough
8. Is innovative
9. Is collaborative
10. Is long-lasting

3.6.4 These principles have subsequently become part of DMRB (National Highways, 2019), so therefore it is a requirement of the DMRB to comply with them, as set out in GG 101 'Introduction to the Design Manual for Roads and Bridges'.

3.6.5 Details of the Scheme's compliance with these themes and principles is demonstrated in Section 4 of this Report.

4 Principles of good road design

4.1 Introduction

4.1.1 The ten principles of good road design, outlined in paragraph 3.5.3 Section 3 of this report, along with an overarching objective to reduce carbon emissions, have been considered in developing the Scheme design.

4.1.2 Annex A sets out the Design Principles of the Scheme. Each of the design principles are referenced back to the relevant design interventions in the report and are denoted in brackets e.g. (PEO.01).

4.1.3 A summary of how the Scheme meets 'The road to good design' is set out below against each of the principles of good road design.

4.2 Good road design makes roads safe and useful

4.2.1 "Safety is fundamental to good road design; it is integral to both the usefulness of its function and the confidence of road users and their well-being. Good design creates safe roads which support and link to other wider imperatives, both nationally and locally, and that are fundamentally useful, meeting users' need for mobility effectively". [4]

4.2.2 The design of the junctions and new structures have been considered to create safe environments for both road users and those who will maintain these assets. Junctions have been designed in accordance with DMRB design standards, CD 116 Geometric design of roundabouts and CD 122 Geometric design of grade separated junctions. Safety during maintenance for non-trunk road assets has also been considered through targeted meetings with NCC (Nottinghamshire County Council), the local highway authority, and NSDC (PLA.01-03).

4.2.3 The embedded design features for the Scheme have been developed to create safe and useful solutions and includes:

- Potential safety improvements along the existing A46 through the provision of a dual-carriageway.
- Provision of a grade separated junction at Cattle Market for improved safety.
- Light Emitting Diode (LED) lighting columns at all major junctions, which provide better visibility for road users (LST.09).
- Traffic signals at the following junctions to allow vehicles, walkers, and cyclists to safely enter and navigate them:
    - Farndon Roundabout
    - Cattle Market Junction
    - Brownhills Junction

[4] Good_road_design_Jan_18.pdf (publishing.service.gov.uk)

    - Friendly Farmer eastbound link from Brownhills roundabout
    - Winthorpe Roundabout
- Minimising road safety barriers (which in themselves can be a hazard to road users) by utilising infrastructure, such as passively safe sign posts that are designed to deform, or break, on impact to reduce the severity of injury to a road user in the event of an impact, and limiting the size of mature trees within potentially high risk areas such as the approach to junctions (PLA.03).
- Integrated walking and cycling routes across and along the Scheme, which are 3.0m wide and have a 0.5m separation from the edge of carriageway (PEO.01, 04).
- Signalised pedestrian crossings through Cattle Market junction, the northbound exit slip at Brownhills junction, the existing A46 crossing at Friendly Farmer roundabout and Winthorpe Roundabout (PEO.01, 02, LST.07).
- Proposed provision of average speed camera enforcement to police the 50mph speed limit between Cattle Market junction and Winthorpe Roundabout (LST.01).

4.3 Good road design is inclusive

4.3.1 DMRB standard GG 142 Walking, cycling and horse-riding assessment and review (WCHAR) sets out the WCHAR process for highway schemes on motorways and all-purpose trunk roads. A WCHAR has been undertaken as part of the Scheme and further details can be found in the Transport Assessment (TR010065/APP/7.4).

4.3.2 The outcome of the assessment and the impacts of altering public rights of way (PRoW) and creating new routes to improve safety for WCH users is presented in Chapter 12, Population and Human Health of the ES (TR010065/APP/6.1). The key outcome of the WCHAR was the provision of a 3.0m wide walking and cycling route to Newark Showground entrance from Winthorpe and Newark-on-Trent, where there is currently no provision from Winthorpe and a sub-standard route from Newark-on-Trent. The Scheme has also removed the existing severance from north to south across the A46 corridor (PEO.01-05).

4.3.3 Disability Discrimination Act (DDA) compliant controlled crossings have been designed in accordance with the Department for Transport's (DfT) Inclusive Mobility design manual. These are clearly shown on the General Arrangement Plans (TR010065/APP/2.5) and comprise 3.0m wide routes with 0.5m separation to the carriageway edge (PEO.01-03).

4.3.4 The General Arrangements Plans (TR010065/APP/2.5) and the Streets, Rights of Way and Access Plans (TR010065/APP/2.4) illustrate the locations of:

- The existing PRoW network within and surrounding the Order Limits of the draft DCO (TR010065/APP/3.1).
- PRoW and other routes that would be permanently closed (referred to as being 'stopped up').
- New and improved footpaths, cycle tracks and PRoW that would be delivered as part of the Scheme.

4.3.5 Paragraph 3.15 of the NPSNN states that the Government is committed to providing people with options to choose sustainable modes and making door-to-door journeys by sustainable means an attractive and convenient option. This is essential to reducing carbon emissions from transport.

4.3.6 The new routes to Newark Showground from Newark-on-Trent and Winthorpe will encourage more active travel as part of a wider network of WCH routes connecting to local amenities. The provision of a new walking and cycling link between Hargon Lane and Drove Lane that passes around the north and east sides of Winthorpe Roundabout via new crossings provides the residents of Winthorpe, and users of the Trent Valley Way, a direct link between Winthorpe and Newark Showground (PEO.01-05).

4.3.7 Paragraph 3.17 and 3.22 of the NPSNN outline that applicants should seek to address historical issues of severance to develop sustainable transport options and improve the accessibility of the transport network. The provision of a new walking/cycling link between Hargon Lane and Drove Lane supports these requirements.

4.3.8 Targeted consultation was undertaken between mid-March and mid-April 2023 with the following local stakeholders to ensure the design of active travel routes are inclusive and meet local community and disabled user needs (PRO.01):

- NCC
- NSDC
- Active Travel England
- Local Active Travel Groups
- Local Access Forums with local councillors and Nottinghamshire County Council
- Winthorpe Village 'Think Again' Group

4.3.9 The comments received from this targeted consultation led to the introduction of the Hargon Lane walking and cycling route and the provision of a route around Winthorpe Roundabout which now forms part of the application for DCO. Further details on this targeted consultation can be found in the Consultation Report (TR010065/APP/5.1) (PRO.01).

4.4 Good road design makes roads understandable

4.4.1 The Scheme delivers a solution that is understandable to those using the road with clear advance signing and localised road markings. The

Scheme has been developed with the local stakeholders listed below whilst complying with DMRB (PRO.01, LST.04, LST.05).

- NCC
- NSDC
- Active Travel England
- Local Active Travel Groups
- Local Access Forums with local councillors and Nottinghamshire County Council
- Winthorpe Village 'Think Again' Group
- Local residents and businesses
- Newark Showground

4.4.2 The traffic signs and traffic signals will create clear messaging to enable users to understand the junctions and the road features clearly. For example, an overhead sign gantry has been provided for southbound A46 traffic entering Winthorpe Roundabout to clearly guide them to the A1 and Newark-on-Trent, or to continue along the A46. Traffic signs for WCH routes will be provided that will contribute in the same way (LST.01, LSC.10).

4.5 Good road design fits in context

4.5.1 The existing A46 runs through the centre of the Scheme. The current road is single carriageway and generally elevated on embankment due to the low-lying alluvial floodplain of the nearby River Trent.

4.5.2 The River Trent is a strong natural influence within an otherwise manmade landscape, flowing sinuously in two channels located either side of the existing A46 within the surrounding area. There is a mixed geology of river terrace sand and gravel in Newark-on-Trent, and riverine clay, sands and gravels to the west, overlying various mudstone strata.

4.5.3 Several roundabouts form key junctions along the existing A46, linking with a number of 'A' classified roads locally. The Nottingham to Lincoln railway line and East Coast Main Line (ECML) traverse the area, bringing further infrastructure to the landscape. The Nottingham to Lincoln line crosses the existing A46 twice, once at the south-western Scheme extent and a second time at the north-eastern end of the Scheme extent. The ECML intersects the existing A46 once to the east of the British Sugar Factory.

4.5.4 The existing A46 highway infrastructure is softened by roadside vegetation in places. Exceptions are the railway and watercourse crossings. To the north of the existing A46, farmland of irregular field patterns dominate, interspersed with small-scale settlement. To the south of the existing A46, the town of Newark-on-Trent 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 Skies,[5] identifies Newark-on-Trent as having some of the brightest night lighting levels, gradually reducing away from Newark-on-Trent, moving into a more rural landscape.

4.5.5 The landscape design has sought to integrate the Scheme with the surrounding landscape character, to minimise visual intrusion and minimise impacts.

4.5.6 The landscape design objectives include retaining notable extents of existing planting and providing new planting to replicate existing features and establish visual screening. The environmental mitigation strategy also seeks to reinstate landscape features lost as a result of the Scheme and enhance the landscape context wherever possible (LSC.01). Examples include reinstatement of linear belts of trees and shrubs, woodland, grassland and hedgerows (LSC.02, 13, 14, 15), as shown on the Environmental Masterplan presented in Figure 2.3 of the Environmental Statement Figures (TR010065/APP/6.2).

4.5.7 The landscape design forms part of the essential mitigation for the Scheme and is secured through both the Environmental Masterplan and Register of Environmental Actions and Commitments (REAC) within the First Iteration Environmental Management Plan (EMP) (TR010065/APP/6.5). The First Iteration EMP details how mitigation and management measures would be implemented to manage the environmental effects of the Scheme, identifies actions and commitments, demonstrating compliance with environmental legislation.

4.5.8 The First Iteration EMP (TR010065/APP/6.5) will be developed into the Second Iteration EMP for implementation during construction of the Scheme secured by Requirement 3 of the draft DCO (TR010065/APP/3.1).

4.5.9 Section 11 of this Report provides more detail on the development of the landscape design. Further details can also be found in Chapter 7, Landscape and Visual Effects of the ES (TR010065/APP/6.1).

4.6 Good road design is restrained

4.6.1 Sections 7, 8 and 9 of this Report outline the considerations applied during the design of the junctions, side roads and structures forming the Scheme to minimise the potential impact on existing infrastructure and the environment. The following are other examples of a restrained design:

- The Scheme has been designed to retain existing carriageway and minimise earthworks, thus allowing existing vegetation to be retained. Retained vegetation is highlighted on Figure 2.3 Environmental

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

Masterplan of the ES Figures (TR010065/APP/6.2). For example, a small retaining wall will be provided where the new Brownhills entry slip joins the southbound A46, to enable the existing vegetation to be retained around the Winthorpe estate (LSC.01, 07, 11).

- The design has sought to limit the increase of the vertical alignment of the new highway, junctions, structures and associated infrastructure as far as practicable to minimise landscape and visual impacts. The introduction of Brownhills junctions enabled 400m of high embankment to be removed (LSC.05, 09).
- Lighting columns have been designed to the minimal height necessary and are directional to minimise impact on nearby properties and the wider night sky (LST.01, 09, 10).
- Retention of the existing A46 for the new southbound entry slip from Brownhills junction will allow existing bunds and the majority of established vegetation to be retained (LSC.01).

4.7 Good road design is environmentally sustainable

4.7.1 A number of the measures discussed with regards to other Design Principles are also of relevance to this design principle. In order to avoid duplication, they have not been included under this section. Please refer to the sections titled ‘Good road design fits in context’ and ‘Good road design is restrained’ for further information, particularly in relation to design interventions associated with landscape, cultural heritage and biodiversity considerations. Further information as to specific environmental effects and mitigation measures for each environmental discipline is presented within the Environmental Statement (TR010065/APP/6.1).

Water

4.7.2 The Order Limits of the Scheme have been limited as far as practicable to minimise impacts on the floodplain. For example, steepening slope profiles in suitable areas to reduce built form within the floodplain and consequently reducing land required for floodplain compensation (LSC.06).

- The drainage philosophy has been to maximise the use of sustainable drainage systems and integrating these with the landscaping provisions. Where possible, water will be conveyed to attenuation areas via grass swales with trees and shrub planting integrated into the attenuation features (LSC.07).
- The alignment of the A46 crosses the River Trent twice with an additional crossing for a temporary construction access bridge crossing and consists of seven culvert extensions. Measures have been incorporated into the design including avoiding works within watercourses where possible, reuse and extension of existing culverts rather than creating additional culverts, and providing scour protection (LSC.07).

Geology and soils

4.7.3 The Scheme design has developed to avoid and reduce impacts on geology, soils and contaminated land including:

- The avoidance of a contamination hotspot near Nether Lock that was identified as part of the ground investigation. The design and construction strategy have been modified to ensure that the works would be between the existing ditch and toe of the embankment (and may also use the existing track) only, and there would not be any works within the area of the contamination hotspot.
- The minimisation of the area of permanent and temporary land take of agricultural land within the Order Limits has been a fundamental consideration throughout design.

Noise and vibration

4.7.4 The following embedded mitigation measures have been incorporated into the Scheme design to avoid and reduce impacts from noise and vibration:

- Retention of the existing dual carriageway between Friendly Farmer roundabout and Winthorpe Roundabout and building a new link to the south which will move the A46 away from Winthorpe (when compared with the scheme design at PRA).
- The use of thin surface courses on new carriageways to provide a reduction in road surface noise compared to hot rolled asphalt or concrete.
- Landscape bunds to south of Winthorpe which also provide a benefit to reducing the noise from the new A46.

Resource efficiency

4.7.5 In accordance with the DMRB LA 114,[6] the Applicant has sought to minimise carbon emissions as far as possible in order to contribute to the UK's net reduction in carbon emissions. A hierarchical approach to carbon management has been applied, which applies the principles of build nothing, build less, build clever, build efficiently, as described in PAS 2080: Carbon Management in Infrastructure[7] (PRO.02).

4.7.6 The following measures have been incorporated into the Scheme design to ensure resource efficiency:

- Floodplain compensation is required to mitigate the reduction of the existing floodplain 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

[6] Standards for Highways (2021) DMRB LA114 Climate [online] available at: LA 114 - Climate (standardsforhighways.co.uk) (last accessed April 2023).

[7] BSI (2013) PAS 2080: Carbon Management in Infrastructure.

identifying some areas of land that can be used as a borrow pit to provide the structural fill to the widened embankments therefore reducing the need to send material to landfill and import material from other locations (LSC.06, BPR.01).

- Retrofitting of existing structures, new rail and river crossings and an additional viaduct across the River Trent. Changes were made in the optioneering stages 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 modification of the existing structures and replacement with new (STR.02, 04, 06).
- Repair and reuse of drainage along the existing carriageway.
- Source local fill material have been identified adjacent to the Scheme.
- Verge widths reduced across structures.
- Cross-section of the embankments reduced and the central reserve has been narrowed to reduce the Scheme footprint (LSC.06).

4.8 Good road design is thorough

4.8.1 This design process has included teams of professionals from a wide range of disciplines including engineers, environmentalists, traffic modellers, contractors and legal advisors, as well as the resource available from specialist disciplines within National Highways. This team of professionals has undertaken a collaborative and iterative design process to explore innovative approaches to be included within the Scheme. This has enabled flexibility to incorporate changes into the design, following the findings of surveys, the environmental assessment, consultation and design reviews, to achieve betterment in the design. Specific examples include:

- Development of Winthorpe Roundabout into a through-about that also allowed the existing trees and rookery to be retained (LSC.01).
- Provision of walking and cycling routes around Winthorpe Roundabout with connections to the south from Winthorpe (PEO.04).
- Reduced impact to land owners at the Kelham and Averham, Farndon East and Farndon West FCAs (LSC.06, 08).
- Retention of existing vegetation along the majority of the existing eastern embankment to retain this critical visual barrier to the A46 from Newark-on-Trent (LSC.01, 17).

4.8.2 In addition to statutory consultation, which took place from October to December 2022, during which stakeholders could comment on the proposals, on-going technical meetings were also undertaken with a wide range of stakeholders including:

- NCC
- NSDC
- Newark Showground
- Langford Hall
- Crees Lane resident group

- Think Again action group
- Lindum Group

4.8.3 Further information regarding engagement and the statutory consultation is available in the Consultation Report (TR010065/APP/5.1) and ES (TR010065/APP/6.1).

4.8.4 Throughout the design process, options were developed and screened to identify preferred solutions based on a comparison of the options performance against safety, environmental, engineering, transportation and economic criteria. This process was supplemented by comments from consultation with stakeholders and the public.

4.8.5 Further details on the consideration of alternative route options before determining the preferred route can be found in the Case for the Scheme (TR010065/APP/7.1) and Chapter 3, (Assessment of Alternatives) of the ES (TR010065/APP/6.1).

4.9 Good road design is innovative

4.9.1 Several innovative additions have been incorporated into the design which provide environmental benefits, such as:

- Nature-based solutions (NbS) and Sustainable Drainage Systems (SuDS), including the use of above-surface drainage features such as bioswales and wetlands. This is different to traditional piped systems that convey water to ponds (LSC.07).
- The 'through-about' at Winthorpe, this provides similar capacity to a grade separated junction without the visual intrusion, large footprint and associated long-term maintenance (PRO.02).

4.9.2 The following innovative design solutions are to be explored during detailed design stage:

- The use of warm mix asphalt which reduces the energy input during the production of the material by between 30-40% (PRO.02).
- Assessing the use of more durable thin surface course materials with low noise output (PRO.02).

4.9.3 Further details on the innovative design solutions above can be found in the Drainage Strategy and plans at Appendix 13.4 of the ES Appendices (TR010065/APP/6.13) and the General Arrangement Plans (TR010065/APP/2.5

4.10 Good road design is a collaborative process

4.10.1 The Applicant has encouraged an open dialogue with stakeholders across all stages of the development of the Scheme. This has allowed the Applicant to capture comments on the different options proposed to inform decision-making on the most viable option. Key stakeholders throughout the process have included statutory environmental bodies, such as the Environment Agency (EA) and Natural England.

4.10.2 The Applicant has undertaken an options consultation (December 2020 to February 2021) and statutory consultation (October 2022 to December 2022) with the local community, prescribed consultees, affected land interests and other interested organisations. This has included meetings with landowners, public consultation events and facilitating engagement with user groups for walking, cycling and horse riding and local piscatorial/angling societies (PRO.01). The Applicant has engaged the NCC Countryside Access Manager, along with representatives from the NCC Local Access Forum, as part of Active Travel Partnership meetings. These meetings also included representatives from the following:

- Nottinghamshire Area Ramblers
- Newark Sports Association
- British Horse Society
- Cycling UK
- Sustrans

4.10.3 The Applicant has used the comments from the statutory consultation and stakeholder engagement to develop the Scheme design. This has enabled the Scheme to be designed to meet the needs of road users and local communities. Examples of some of the design changes made as a result of the statutory consultation are summarised below:

- Langford Hall access Road – following consultation comments relating to impacted access routes, the Order Limits have been altered near Langford Hall. The access into Langford Hall has been relocated from the A46 to the A1133, approximately 150m from Winthorpe Roundabout. The new access is required as the northbound exit-slip from the new Winthorpe Roundabout requires the existing access road to Langford Hall to be stopped up. A corridor was initially included for a replacement access from the A1133, however through consultation with the landowner it was identified that this would not be an appropriate alignment as it would require a significant loss of vegetation. The alignment was therefore altered to mitigate impacts on the historic tree line and a priority habitat within the grounds of the hall. This has also resulted in a shorter access road to Langford Hall than originally proposed. Refer to the General Arrangement Plans (TR010065/APP/2.5) (PRO.01, LSC.01).
- Winthorpe Roundabout – following consultation comments and ongoing stakeholder engagement, the Winthorpe Roundabout layout has been amended. To improve flows, the A46 traffic would be directed around the roundabout, with the northbound traffic from the Friendly Farmer roundabout passing through the middle. A walking and cycling route would be provided across the junction between the A1133 and Drove Lane (PRO.01).
- Hargon Lane – following consultation comments, the Order Limits have been altered along part of Hargon Lane. This would enable any works and/or rights required to connect the current footpath on Hargon

Lane with a new walking and cycling route across Winthorpe Roundabout between the A1133 and Drove Lane (PRO.01, PEO.01).

- Kelham and Averham FCA - following further design development and engagement with local stakeholders, the Order Limits have been altered to include new land parcels identified for use as FCAs, including land within the Kelham Conservation Area. This reduced the impact on the proposed solar power generation site by minimising the loss of land proposed for panels (PRO.01, LSC.06).
- Farndon bridleway (BW2) temporary diversion - the construction of the new Windmill Viaduct requires Newark Bridleway 2 (BW2) to be temporarily diverted. In the statutory consultation design BW2 was to be diverted along Farndon footpath path 5 (FP5) between the River Trent and Crees Lane. Following consultation feedback, the proposed temporary diversion route will also utilise an existing stone access road located to the north of FP5 as this provides a wider route for active travel users. FP5 is particularly narrow at the proposed diversion (approximately 1.5 metres) and would have created a safety issue for users when horses passed walkers and cyclists. Therefore, the proposed diversion route will now be along the stone access road for horse riders only, and along FP5 for walkers and cyclists. The revised design therefore maintains the accessibility for active travel users by providing a wider temporary bridleway.

4.10.4 Further information on the consultation process and the design changes made as a result can be found in the Consultation Report (TR010065/APP/5.1).

4.11 Good road design is long lasting

4.11.1 The design has considered the use of materials and whole-life operation, management and maintenance requirements to provide a long-lasting solution. These are demonstrated through the below examples:

Maintenance requirements

4.11.2 Maintenance facilities have been designed to allow access from local access tracks making inspection easy and allow minor maintenance needs to be identified early. Adopting this approach will prevent minor issues escalating into major rehabilitation needs and make the infrastructure last longer.

4.11.3 Options for a longer-life pavement surface course are being investigated to reduce maintenance frequencies. These polymer modified materials may increase the maintenance intervals to 30 years where current materials last on average 10 years.

Structures

4.11.4 All structures have been designed with due regard to the long-term maintenance requirements and in accordance with DMRB design

standard CD 350 The design of highway structures. All structures have been designed to a design life of 120 years.

4.11.5 Structures have been designed with durability and maintenance in mind, with the aim to deliver solutions that minimise maintenance requirements over the life of the structure (STR.02, 04).

4.12 Design amendments to reduce carbon

4.12.1 In accordance with the DMRB LA 114 Climate, the Applicant has sought to minimise carbon emissions as far as possible in order to contribute to the UK's net reduction in carbon emissions (PRO.02). This approach also supports the requirements of NPSNN paragraphs 4.38 to 4.46 (climate change adaptation) and 5.17 – 5.19 (carbon emissions). Paragraph 5.17 of the NPSNN requires *road projects* to provide evidence of the carbon impact of the Scheme and assessment against the Government's carbon budgets, with paragraph 5.19 requiring evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) in both design and construction should be presented. Further details of the Scheme's compliance with the NSPNN paragraphs listed above can be found in the NPSNN Accordance Tables (TR010065/APP/7.2).

4.12.2 A hierarchical approach to carbon management has been applied, which applies the principles of build nothing, build less, build clever, build efficiently (as described in PAS 2080: Carbon Management in Infrastructure). PAS 2080 is a global standard for managing carbon in building and infrastructure. It looks at the whole value chain and aims to reduce carbon and cost through intelligent design, construction and operation. The assessment of significance, set out in Chapter 14 (Climate) of the ES (TR010065/APP/6.1), follows DMRB LA 114 Climate which sets out relevant methodology for highways schemes on the strategic road network (SRN).

4.12.3 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 in paragraph 5.17 of the NPSNN paragraph 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'.* The assessment includes a comparison of estimated Green House Gas (GHG) emissions arising from the Scheme with UK carbon budgets and the associated reduction targets in line with DMRB LA 114.

4.12.4 The results of this comparison are presented in Table 14.21 Chapter 14 (Climate) of the ES (TR010065/APP/6.1). Carbon emissions for the Scheme have been calculated for the design using the Mott MacDonald Moata Carbon Portal (a tool to produce carbon assessments using a library of emission factors) which is PAS 2080 certified to undertake the embodied carbon assessment. This has

allowed for the consideration of carbon in the design process, resulting in the development of a carbon baseline from which further reductions may be made. The National Highways' Carbon Tool will be used to monitor and manage carbon throughout the construction period to ensure an ongoing focus on CC mitigation. Further information is set out in Chapter 14 (Climate) of the ES (TR010065/APP/6.1), which also details mitigation measures for both design and construction of the Scheme (PRO.02).

4.12.5 In line with the National Highways' Carbon Management System (the process the Applicant follows as its own internal governance to reduce carbon emissions across projects and operations), the Applicant has undertaken a baseline emissions assessment and a carbon reduction target has been set in line with the National Highways Net Zero Plan. The Scheme target has been set at 35% reduction from the baseline to the completed Scheme. To date the design has achieved a 33% reduction through design optimisation and specification of low carbon products. It is anticipated that the additional measures will be implemented through detailed design and construction to achieve the target (PRO.02).

4.12.6 A Carbon Management Plan will be produced in conjunction with the Second Iteration EMP to act as a live document that will be updated as the Scheme progresses through design. This will ensure the consideration of carbon reduction through all phases of the lifecycle of the Scheme.

5 Consultation & engagement with third parties

5.1 Introduction

5.1.1 The full details of the consultation and engagement undertaken by the Applicant is detailed in the Consultation Report (TR010065/APP/5.1).

5.2 Summary of engagement

5.2.1 As part of the development of the Scheme the Applicant has continued to engage with stakeholders outside of the options consultation and statutory consultation periods. This enabled the Applicant to provide stakeholders with updates and seek comments as the Scheme design progressed.

5.2.2 The options for the route were presented in 2020 between the dates of 9 December 2020 to 2 February 2021 as part of a non-statutory consultation. The consultation received 1,584 responses from individuals which were used to develop the Scheme to provide a design that became the PRA. The PRA was published in February 2022 and a statutory consultation was held between 26 October to 12 December 2022.

5.2.3 Common topics arising from the statutory consultation included:

- Traffic congestion, forecasts and speed limits
- Noise and vibration
- Road drainage and water (including borrow pits, flood risk and floodplain compensation areas)
- Scheme benefits, disbenefits, cost, alternative solutions and timescales
- Landscape and visual effects
- Winthorpe Roundabout and Farndon roundabout
- Biodiversity
- Air quality
- Population and human health (including impacts on community, business and agriculture)

5.2.4 Consultee comments received during the statutory consultation have resulted in changes to the design, to provide a more informed Scheme. Full details on how the Applicant has had regard to the responses received during the statutory consultation are provided in Annex N of the Consultation Report (TR010065/APP/5.1) (PRO.01).

5.2.5 Some examples of changes implemented as a result of comments are summarised in Table 5-1:

Table 5-1: Summary of design changes resulting from engagement

Element of the Scheme and issue raised in consultation	Design change as a result of consultation response
Comments received relating to the Scheme's impact on Newark Lorry Park	The Newark Lorry Park entrance has been relocated and improved within the Scheme design, providing traffic signals to help future traffic flows as well as making it safer for walkers and cyclists to cross. The Newark Lorry Park land required within the Order Limits has also been reduced (PRO.01).
Comments relating to location and need of shared maintenance and walking/cycling access track to the east of Winthorpe village.	A section of this access track has been removed within the Scheme design between Hargon Lane and the A1133. The footpath element has also been relocated in this area. The laybys on the track have also been moved so they are not positioned in the fields (PRO.01).
Comments relating to the loss of land and vegetation on land at the rear of properties on Crees Lane.	The Scheme design and construction strategy has been changed at Windmill Viaduct to include a retaining wall on the west side of the road near the existing Farndon underpass. This has reduced the Order Limits in this location and the impact on land and vegetation (PRO.01, LSC.01).
Comments requesting a more direct route for pedestrians and cyclists at the new Brownhills junction.	The footpath adjacent to the new roundabout at Brownhills junction has been realigned so that it follows a more direct route for pedestrians and cyclists PRO.01, PEO.03).
Request made for Winthorpe Roundabout to be re-aligned to avoid the trees in the middle of the existing roundabout and the rookery.	When the roundabout design was modified for the targeted consultation, the route through the centre was aligned to avoid the trees (PRO.01, LSC.01).

5.2.6 Ongoing engagement regarding the Scheme design was undertaken by the Applicant with prescribed consultees and stakeholders

representing the local community, such as NSDC in the months leading up to the statutory consultation period and since the consultation ended. Engagement activities carried out by the Applicant included public information events, in person meetings, online meetings, telephone and email correspondence with the following:

- Local political authorities and elected representatives
- Statutory environmental bodies
- Persons with land interests potentially affected by the proposals
- Local residents and community groups
- Local businesses and organisations

5.2.7 The Applicant established technical working groups comprising representatives from NCC and NSDC and statutory environment bodies, such as the EA and Natural England. The purpose of these groups was to offer a means for the Applicant to seek the technical and local expertise of these stakeholders on relevant design issues, and to support the development of Statements of Common Ground (SoCG). The SoCGs continue to be developed and will be submitted to the Examining Authority during the examination of the application for DCO.

5.2.8 From March 2022 persons with land interests were contacted directly to obtain permission for the Applicant to carry out a range of surveys on land parcels, to gather information on the existing environment around the planned route of the Scheme.

5.2.9 In addition to direct engagement with stakeholders, updates were posted on the Scheme webpage between the consultation periods to provide information on Scheme development, land referencing and surveys. Updates included two newsletters and plans showing the draft preliminary design of the Scheme ahead of the statutory consultation (PRO.01).

5.3 Targeted non-statutory consultation

5.3.1 Following the closure of the statutory consultation, held between 26 October and 12 December 2022, the Applicant undertook a targeted consultation as a result of six proposed changes to the Scheme. The Applicant carried out the targeted non-statutory consultation between 17 March and 16 April 2023, allowing a total of 30 days to respond.

5.3.2 This targeted consultation was held to seek views and allow an opportunity for prescribed consultees, persons with an interest in land and community stakeholders whom the Applicant considered would be impacted by, and interested in, the Scheme, to comment on the following updates:

- Langford Hall access road
    - Following consultation feedback relating to impacted access routes, the Order Limits were altered near to Langford Hall.

- Winthorpe Roundabout
    - Following consultation feedback and ongoing stakeholder engagement, the Winthorpe Roundabout layout was amended. To improve flows, the A46 traffic would be directed around the roundabout, with the northbound traffic from the Friendly Farmer Link Road passing through the centre of the roundabout. A signalised walking and cycling route would be provided across the junction between the A1133 and Drove Lane (PRO.01, PEO.01, 02, 03).

- Hargon Lane
    - Following consultation feedback, the Order Limits were altered along part of Hargon Lane. This would enable any works and/or rights required to connect the current footpath on Hargon Lane with a new walking and cycling route proposed across Winthorpe Roundabout between the A1133 and Drove Lane (PRO.01, PEO.01).

- Kelham and Averham FCA
    - Following further design development and engagement with local stakeholders, the Order Limits were altered to include new land parcels identified for use as FCAs, including land within the Kelham Conservation Area (PRO.01, LSC.06).

- Farndon bridleway (BW2) temporary diversion
    - Following consultation feedback, the Order Limits were altered to enable an alternative route to be used as a temporary bridleway diversion during construction.

- Farndon temporary construction holding area
    - Following feedback from local stakeholders, the Order Limits were altered to include additional land for temporary use as a vehicle holding area during construction.

6 Scheme design process

6.1 Introduction

6.1.1 The NPSNN, the primary policy framework for NSIPs, states that design must be an integral consideration from the outset of proposals.

6.1.2 This section outlines how the Scheme has ensured regard for good design throughout the design development, by balancing the requirements of specialist disciplines and receiving independent advice surrounding the design of the Scheme, when appropriate.

6.1.3 The development of the Scheme design has been an iterative process, undertaken by the Applicant's integrated design team, bringing together civil infrastructure disciplines alongside broader design disciplines including landscape architects, and influenced by environmental specialists. The design has been developed to meet the key Scheme objectives whilst also minimising environmental impacts wherever practicable.

6.1.4 This adheres to the principles of the design and mitigation hierarchy outlined in DMRB LA 104 (Environmental assessment and monitoring). The first principle being to avoid potential adverse environmental effects where possible, before seeking to minimise or mitigate any unavoidable impacts. Adhering to the principles of design and mitigation, as set out in LA 104, has facilitated a solution which delivers a well-developed design with embedded essential mitigation.

6.2 Integrated design team

6.2.1 The Applicant's integrated design team responsible for developing the design included highways, safety, geotechnical and structural engineers; landscape architects; town planners; and environmental specialists including specialists from ecology, landscape and visual impact, drainage, heritage and noise. These respective disciplines have actively collaborated throughout the design process to ensure good design is embedded across the Scheme. Details of how the Applicant's integrated design team have collaborated through the design process are demonstrated in Section 4.9.3. The design has been supported by the Contractor to consider construction issues and buildability as part of the design process.

6.3 Design panel

6.3.1 Paragraph 4.33 of the NPSNN states *'The use of professional, independent advice on the design aspects of a proposal should be considered, to ensure good design principles are embedded into infrastructure proposals.'*

6.3.2 The Applicant sought independent advice on the design aspects of the Scheme from Design: Midlands, utilising their Design Review Panel service. The Design: Midlands Review Panel is an advisory service

comprises a wide range of experts from the built environment field, e.g. architects, urban designers, landscape architects, surveyors, sustainability experts, heritage experts etc. who provide expert, independent and impartial advice. The Design: Midlands Review Panel was led by the Design Panel Manager and joined by representatives from National Highways and the Principal Contractor.

6.3.3 Engagement with the National Highways' internal Design Panel was first sought at the preliminary design stage. No engagement with the Design Panel was undertaken prior to the preliminary design stage.

6.3.4 The Scheme was presented to the Design: Midlands Review Panel on 24 January 2023. This design presented represented the design for the statutory consultation and included a fixed highway alignment and junctions at that time.

6.3.5 The scope of the design review was to look at the design of the Scheme and for the Design: Midlands Review Panel to provide its views in the context of 'The Road to Good Design' 10 principles of good road design.

6.3.6 The Design: Midlands Review Panel conducted a site visit on 24 January 2023, and provided the Applicant with constructive comments on and opportunities in relation to the Scheme design on 9 February 2023

6.3.7 The Principal Contractor introduced the need for the Scheme and a high-level description was given, prior to the site visit to key locations along the route. Following the site visit, a presentation running through details of the Scheme was given. With the Scheme being an on-line widening scheme in the most part, the focus was not upon route alignment, which had already been established prior to the preliminary design stage. Instead, the presentation referred to new structures and junctions and any new off-line sections of the Scheme such as the Brownhills link and junction. At each location/asset, panel members provided their comments.

6.3.8 The Design: Midlands Review Panel provided comments structured around general themes for the overall Scheme, relating to:

- Design Principles
  - The Panel recommended that the Applicant produce a set of well-defined and robust Design Principles and aspirations on the design intentions of the project. The Design Principles should be utilised to test the scheme proposals. The principles will also be useful to evidence and provide resilience to the design decisions undertaken. These Design Principles are detailed in Annex A.
- Active travel
  - The Panel welcomed the ambition to provide new and improved existing pedestrian and cycle routes and that new cycle and pedestrian infrastructure will need to be designed in accordance with LTN1/20 (Local Transport Note 1/20) and CD 195 Designing

for cycle traffic. All pedestrian and cycling infrastructure is to be designed in accordance with these standards, where possible.

- Landscape framework
  - The Panel welcomed the work undertaken so far and recommended that a number of points be considered as part of the design development.
- Flood risk/water management
  - The Panel welcomed the positive design approach in exploring water management and flood risk at the early design stages. The provision of SuDS was supported. The Applicant was encouraged to produce information on how the proposed SuDS support, contribute and interact with the flood risk measures. Further information is provided in the Drainage Strategy, Appendix 13.4 of the ES Appendices (TR010065/APP/6.3).
- Budget/costs
  - The Panel suggested consideration be given to whether slimming down the span and potentially the height of the proposed bridge structures would enable a cost saving. The Applicant explained that constraints relating to the cross-section and vertical alignment of the highway would not allow for this.

6.3.9 They also provided comments on specific areas, relating to:

- Newark-on-Trent
- Farndon Road/B6166
- Cattle Market Junction/Roundabout
- Nether Lock
- Winthorpe
- Newark Showground

6.3.10 Details of how the Applicant has responded to these comments is summarised in Table 6-1:

Table 6-1 : Summary of recommendations from Design Panel

Design Review Panel key recommendations	Applicant Response
Provision of a set of Design Principles and ambitions which focus on placemaking and design quality.	A set of Design Principles have been produced for the Scheme, focusing on WCH facilities and key Design Principles for key disciplines. These are set out in Annex A – Design Principles. The ten principles of the Good Road Design publication have been followed and information as to how these have been met is provided in Section 4 of this Report. In addition, the environmental design has developed from the broad principle to create a cohesive and consistent blue green

Design Review Panel key recommendations	Applicant Response
	corridor along the length of the route, bringing co-benefits through nature based solutions including above surface drainage, wetlands and a variety of landscape types and habitats. This has been developed whilst being mindful of the receiving landscape, variations in local landscape character, key views and the historic context and existing sense of place of the area, as well as opportunities for positive change.
That the proposals will benefit Newark-on-Trent including connectivity, placemaking etc.	The Scheme is forecast to reduce traffic congestion in the vicinity of Newark-on-Trent and improve connectivity for walkers and cyclists accessing Newark Showground. A new footway/cycle track would be provided through a landscaped area to provide connectivity between the A1 and the village of Winthorpe. Further information is provided below in response to the action on provision of active travel routes (PEO.04).
Provision of 'active travel' routes which are LTN1/20 and CD 195 compliant and connect with the existing cycle and pedestrian network specifically at Cattle Market Roundabout, Winthorpe and Newark Showground.	The link from the proposed Brownhills Roundabout to the existing walking and cycling route has been relocated away from the edge of the carriageway to create a more direct route along the desire line. The Scheme would provide access for walking and cycling from Winthorpe with improved access to the north and south side of the Newark Showground through the provision of dedicated walking and cycling routes. The existing walking and cycling routes from Newark-on-Trent to the north, via Cattle Market junction, have been retained by providing a 3m wide route across the eastern side of the junction. This ties into the existing route across the Smeaton's Arches and replicates the existing crossing arrangement from this route across to Kelham Road. Walking and cycling infrastructure across the Scheme has been designed in accordance with the guidance provided in LTN1/20 (Local Transport Note 1/20) and CD 195 Designing for cycle traffic (PEO.01 -03).

Design Review Panel key recommendations	Applicant Response
Detail the proposals for flood risk including information on how the proposals connects with Sustainable Drainage Systems (SuDS).	The proposed drainage design and FCAs have been developed as an integrated part of the overall Scheme design, with a key driver being to use NbS as part of an effective blue green corridor running the length of the Scheme. Further details on the SuDS design can be found in the Drainage Strategy and plans at Appendix 13.4 of the ES Appendices (TR010065/APP/6.3) and the General Arrangement Plans (TR010065/APP/2.5) (LSC.06, 07).
Ensure the proposals for water management support placemaking and landscape infrastructure.	The drainage and landscape design have been developed as an integrated part of the overall Scheme design, with a key driver being the provision of an effective blue green corridor using nature based solutions along the length of the Scheme, aiding placemaking, landscape integration and habitat creation, wherever practicable (LSC.02, 03). Further details on the SuDS design can be found in the Drainage Strategy and plans at Appendix 13.4 of the ES Appendices (TR010065/APP/6.3) and the General Arrangement Plans (TR010065/APP/2.5).
Develop ideas on how the landscape proposals reference and reinforce the landscape character, contribute and form part of a network of existing spaces etc.	The landscape proposals have been developed with an understanding of the receiving environment and local landscape context, including the rich historical associations of the area. This has been identified through site surveys, discussions with stakeholders, review of the key landscape actions identified in the Newark & Sherwood District Council Landscape Character Assessment Supplementary Planning Document (SPD) (LSC.07, 09, 11). For further detail please see Chapter 7, Landscape and Visual Effects of the ES (TR010065/APP/6.1). Figure 2.3 Environmental Masterplan of the ES Figures (TR010065/APP/6.2) depicts the environmental mitigation included as part of the design, including landscape proposals. Compliance with the principles of the Environmental Masterplan is secured by Requirement 12 of the draft DCO

Design Review Panel key recommendations	Applicant Response
	(TR010065/APP/3.1).
Ensure the benefit of relieving traffic from Farndon Road is realised - improving and enhancing facilities for active travel.	Improvements to relieve traffic and improve WCH facilities along Farndon Road are not required to deliver the Scheme, therefore will not be progressed. Traffic modelling of Farndon Road has been undertaken as part of the Scheme design and no issues have been identified. The modelling forecasts a reduction in annual average daily traffic along Farndon Road with the Scheme in place. In addition to this, the traffic signals on the A46 at Farndon Roundabout will create natural gaps (known as inter green gaps i.e. the gap between one green phase and another) on Farndon Road which will reduce queuing and congestion.
Further dialogue with Winthorpe residents to pursue an under bridge rather than an 'underpass' route, retaining and improving the existing direct alignment.	The majority of residents within Winthorpe, and comments from the active travel group, stated that underpasses were not preferred. The realigned route has been provided through the new Brownhills bridge to link in with the existing route that passes beneath the existing A46 (PEO.01).
Provision of a bespoke design to the bridge at Cattle Market Roundabout which references the local vernacular, sensitive to heritage assets and provides a robust gateway into Newark-on-Trent.	The Applicant held a design workshop between heritage specialists, landscape architects and structural engineers to develop the aesthetics of Cattle Market Junction. The following has been suggested in current design proposals: • Colour pallet selection mindful of local historic assets, with proposed red band to lower section of retaining walls to tie in with Smeaton's Arches (STR.03, 06). • Drainage amended to allow planting to centre of roundabout to aid screening to nearby residents and reinstate existing tree planting on junction.
Explore the placemaking potential of the areas beneath the bridge at Cattle Market Road and Nether Lock to create new spaces/places which benefit the community.	Cattle Market is not considered suitable for public open space. At Nether Lock a place making opportunity would be provided with a relocated attenuation feature next to the river, on the eastern side of the viaduct. This is to be developed further during detailed design

Design Review Panel key recommendations	Applicant Response
	(LSC.12, 17).

7 Junction design

7.1 Overview

7.1.0 There are four new junctions to be provided as part of the Scheme. These are shown on the General Arrangement Plans (TR010065/APP/2.5) and described further below.

7.2 Farndon roundabout

7.2.1 The existing Farndon roundabout is a large five-arm roundabout with two lanes around its circulatory. The existing A46 connects into the north and south of the roundabout with two lanes at the entries and exits on both the north and south sides. Fosse Road ties into the south-western side of the roundabout with two lanes on the entry and one lane on the exit that provides access to/from the village of Farndon. Farndon Road connects into the north-eastern side of the roundabout with two lanes on the entry and one lane on the exit that provides access to/from Newark-on-Trent. A large private road connects into the south-eastern side of the roundabout with two lanes on the entry and one lane on the exit that provides access to/from businesses in that area.

7.2.2 The Scheme would widen the entries of the existing five arms from the A46 from two to three lanes. This would largely be constructed within the footprint of the existing road to minimise the need for additional land. There would also be a requirement to provide some small, localised widening to accommodate the extra lane (PLA.01, 02).

7.2.3 The design evolved utilising good Design Principles as part of the preliminary design development after statutory consultation. As part of this, the design developed so that a third lane would also be provided on the east and west sides of the circulatory of the roundabout, with traffic signals on the A46 arms of the roundabout which would improve flows for both A46 and local traffic. This could largely be constructed by modifying the road markings within the existing roundabout footprint as the existing circulatory is wider than required for two lanes. Some widening would however be required on the inside of the northern quadrant to facilitate the traffic signals to be installed at this location and the spiralised road markings where the lanes reduce from three lanes to two in this location (LST.02).

7.3 Cattle Market junction

7.3.1 The existing Cattle Market Roundabout is a large five-arm roundabout with two lanes around its circulatory. The existing A46 connects into the east and west of the roundabout with two lanes at the entries and exits on both the east and west sides. The A617 ties into the north-western side of the roundabout with two lanes on the entry and exit that provides access to/from the villages of Kelham and Averham. The A616 connects into the north side of the roundabout with two lanes on

the entry and one lane on the exit that provides access to/from Ollerton. The Great North Road connects into the south side of the roundabout with two lanes on the entry and one lane on the exit that provides access to/from Newark-on-Trent. There is also a small private access from the south-western side of the roundabout that provides maintenance access to the flood defense in the location.

7.3.2 As part of the Scheme, the existing Cattle Market Roundabout would be enlarged in size to form a gyratory, with the mainline elevated over the top to separate local traffic and A46 mainline traffic. The enlarged gyratory would provide additional capacity for traffic. Northbound and southbound slip roads would be provided to allow traffic to pass between the roundabout and mainline. The northbound exit slip and southbound exit slip would be two lanes with taper diverges, widening to three lanes at the entry to the new gyratory. The northbound entry slip and southbound entry slip would be single lane slip roads with taper merges and two lanes at the exit from the roundabout (PLA.02, PRO.02, STR.01).

7.3.3 The roundabout itself would be elongated to accommodate these slip roads and the gyratory widened to provide a third lane on the north and south sides of the gyratory, it will be partially signalised to improve traffic flows. The elongation would be predominantly to the south, with slight widening also to the north and east. The mainline would then pass over the centre of the new gyratory. The existing culvert beneath the roundabout would be extended to accommodate the widened earthworks (PLA.02).

7.3.4 The A617 arm of the roundabout would be widened slightly to the north to accommodate a third lane on the entrance to Cattle Market Roundabout. The A616 arm will maintain the two-lane entry and single lane exit, however, the existing structure would need to be widened to the west to accommodate the tie into the enlarged roundabout. This would allow the existing eastern kerb line and footpath to remain in place and avoid the need to widen the Grade II listed Smeaton's Arches on the eastern side (PLA.01, 02, STR.04).

7.3.5 A third lane would be provided on the entry from the Great North Road arm of the roundabout which would require widening of the existing road to the west. A second lane would also be added to the exit from the roundabout. This second lane would continue for around 200 metres down to the junction with Kelham Road, to provide greater capacity for queuing traffic when the level crossing is closed and to prevent traffic from queuing back onto the A46 mainline. To accommodate the second lane, the widening would largely be to the west of the Great North Road, allowing the existing kerb line and footpath on the eastern side to remain in place. There would, however, be some localised widening to the east of Great North Road on the immediate exit from the roundabout.

7.3.6 A walking and cycling route would be provided through the junction, with signalised crossings on the eastern slip roads (PEO.04).

7.3.7 The existing private maintenance access on the south-western side of Cattle Market Roundabout would be closed for safety reasons, with alternative access to the EA's flood defense bund, located to the south of the A46, provided from Kelham Road.

7.4 Brownhills junction

7.4.1 To the west of the A1 a new grade separated Brownhills Junction would be provided to maintain local access from the A46 and to provide a link from the A46 to the A1 and A17. This is required as the Scheme would mean that the dual carriageway would bypass the existing Brownhills and Friendly Farmer Roundabouts which previously provided that access (PLA.02, PRO.02, STR.01, 05).

7.4.2 The Brownhills Junction would consist of a new southbound entry slip from the existing Brownhills Roundabout, and a new northbound exit slip linking to a new roundabout located to the west of the A1 and north of the dual carriageway. The new roundabout would provide local access to the businesses/properties in that location and would be connected to the existing Brownhills Roundabout via a new two-way link road.

7.4.3 The southbound entry slip would be a single lane with a parallel merge and two lanes from the exit of Brownhills Roundabout. As far as possible this slip road would utilise the existing A46 and retain the vegetation along this corridor. A narrow widening would be required where the new entry slip joins the A46 within the grass verge, requiring a small retaining wall to retain the existing vegetation. The new eastbound exit slip would be a single lane with an auxiliary diverge and one lane on the entry to the new roundabout. This slip road would be formed on earthworks with 1:2 side slopes to minimise the impact on the flood zone located directly to the north, to the east of the A1. The new roundabout would be formed in earthworks with 1:2.5 side slopes. The level of the roundabout has been set such that it would match that of the existing A1 to avoid it flooding. The roundabout would be lit with 10.0 m high lighting columns to reduce light pollution to adjacent properties (LSC.01, 11, LST.02, 06, 08).

7.4.4 The link road between the new roundabout and the existing Brownhills Roundabout would be a single lane in each direction, widening to three lanes on the approach to Brownhills Roundabout as per the existing entry. A right turn is provided from part way along the southbound entry slip, which would provide the access from Brownhills Roundabout to the new roundabout.

7.5 Winthorpe Roundabout

7.5.1 The existing Winthorpe Roundabout is a large four-arm roundabout with two lanes around its circulatory. The existing A46 connects into the north-east and south-west of the roundabout with two lanes at the entries and exits on both sides. The A1133 ties into the north-western side of the roundabout with two lanes on the entry and one on the exit

that provides access to/from the villages of Winthorpe and Collingham. Drove Lane connects into the south-eastern side of the roundabout with a single lane on the entry and exit that provides access to/from Newark Showground and onwards to Coddington.

7.5.2 As part of the Scheme, Winthorpe Roundabout would be enlarged and partially signalised, with the Friendly Farmer Link Road traffic passing through the centre of the roundabout in a through-about layout. This layout provides capacity for all arms of the roundabout to operate efficiently and deal with the traffic flows. Eastbound and westbound slip roads would be provided to allow traffic to merge and diverge between the mainline and the roundabout (PLA.01, 02).

7.5.3 To achieve this the A46 would be widened on approach to the roundabout to accommodate the tie-in to the larger roundabout, with the addition of traffic signals, and to provide three lanes on both approaches. Two lanes would be maintained on each of the exits to the A46. The A1133 would also be realigned to the south-west to provide the correct approach angle into the roundabout, with two lanes maintained on the approach and a single lane on the exit. Drove Lane would also be locally widened to accommodate the tie-in to the larger roundabout and to provide two lanes on the entry. A single lane would be maintained on the exit from the roundabout. The enlargement of the roundabout would also require the existing access to Newark Showground off Drove Lane to be realigned to the south as there is not sufficient space for it to be safely retained in its existing location (PLA.01).

7.5.4 A new single carriageway link named the Friendly Farmer Link Road would be constructed to the south of the dual carriageway that provides a link between Winthorpe Roundabout and Friendly Farmer Roundabout. There would be two lanes from the exit of Winthorpe Roundabout to this link, and three lanes at the entry, which would be controlled by traffic signals. The right-hand two lanes would pass through the centre of the roundabout to provide access to the A46 northbound only, whereas the left-hand lane would provide access to the circulatory of the roundabout to allow access to the A1133 and Drove Lane. Some additional signage to ensure users are in the correct lane on approach to the roundabout will be developed as part of detailed design (PLA.03, LST.01, 04).

7.5.5 The circulatory of the roundabout would vary between two and five lanes. This would require clear signage and road markings so that the roundabout is clear for users to understand. This would include the addition of a new signage gantry over the south-eastern portion of the circulatory, where the circulatory splits to four lanes. The height of this gantry would be around 8.0 metres high as it needs to provide a 6.45 metre clearance for high loads (LST.03, 10).

8 Side road design

8.1 Overview

8.1.1 Connections to all local roads in the vicinity of Farndon Roundabout, Cattle Market junction and Winthorpe Roundabout would be retained, with the new junction layouts being designed to accommodate them as discussed in the section above. This includes Fosse Road, Farndon Road, the A617, the A616, the Great North Road, Drove Lane and the A1133.

8.1.2 In addition, a new single carriageway link named the Friendly Farmer Link Road would be provided between the Friendly Farmer Roundabout and the new enlarged roundabout at Winthorpe. This would be constructed on low level earthworks with 1:2.5 side slopes and would be separated from the dual carriageway by a road restraint system with anti-dazzle louvres on the top, to prevent glare from the opposing carriageways.

8.1.3 The existing Brownhills Roundabout would be impacted by the Scheme; however with some minor adjustments to traffic signs, road markings and highway lighting as part of the Scheme it will essentially operate as it does at present. No modifications to the junction layout, such as kerb realignments, would be required (LST.01, 02).

8.1.4 The existing Friendly Farmer Roundabout would also be impacted by the Scheme by minor amendments made but even with the Scheme in place it would essentially operate as it does at present. Works to this roundabout would include a minor realignment to the eastbound approach from Brownhills and to the arm that would become the Friendly Farmer Link Road. In addition, there would be some adjustments to traffic signs, road markings and highway lighting (LST.01, 02).

8.1.5 Further details are shown on the General Arrangement Plans (TR010065/APP/2.5) and described further below.

9 Structures design

9.1 Overview

9.1.1 A range of structures including over bridges retaining walls, culverts, CCTV masts, a variable message sign and a sign gantry would be installed as part of the Scheme.

9.1.2 Localised widening is required to the west of the Smeaton's arches adjacent to Cattle Market junction. The appearance of this widening will match the existing traffic lane as closely as practicable (STR.06).

9.1.3 As stated in Section 4 of this Report, all major structures have been designed with due regard to the long-term maintenance requirements and in accordance with DMRB CD 350 ‘The design of highway structures’.

9.1.4 The primary structures along the new dual carriageway are detailed below and are shown on the General Arrangement Plans (TR010065/APP/2.5).

9.1.5 The finish to new bridges would generally be similar to the existing adjacent structures and where possible wing walls would be formed with split block facing in a stretcher bond layout. A split block face refers to the appearance of the structure which appears to be split or hand-chiseled in a highly textured way using split blocks. A stretcher bond layout is created when bricks are laid overlapping midway with the courses of bricks below and above, as per typical modern bricklaying for dwellings (STR.01, 05).

9.1.6 At Cattle Market junction the split block facing would have a red coloured lower section to link in with the adjacent Smeaton’s red brick parapet walls, with the introduction of local artwork to the walkway/cycleway route abutment wall being considered (STR.06).

9.1.7 **Windmill Viaduct** - a new three span structure would be built alongside the existing, this would be similar in structural form to the existing, however the colour will be different. The existing structure is painted steel, whereas the proposed structure would be weathering steel, with a gap between the structures to allow both the inspection and maintenance to take place safely in the future. The bridge would be supported on bored concrete piles (STR.01, 03).

9.1.8 **Nottingham to Lincoln Railway Bridge West** - a new structure would be built alongside the existing. The beams would consist of weathering steel which differs from the existing which is a prestressed concrete beam. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles (STR.03, 06).

9.1.9 **Cattle Market Junction East Bridge** - the bridge would be a single span structure supported on bored concrete piles (STR.05).

9.1.10 **Cattle Market Junction West Bridge** - this bridge would be identical in structural form to Cattle Market Junction East (STR.05).

9.1.11 **Nottingham to Lincoln Railway Bridge East** - the existing bridge would be widened to the north to accommodate the additional width required for the dual carriageway. The form would match the existing, with a new steel parapet installed to the northern side of the bridge on the widened section. The bridge would be supported on bored concrete piles (STR.03).

9.1.12 **Nether Lock Viaduct** - a new structure would be built alongside the existing, this would be similar in structural form to the existing, however the colour will be different. The existing structure is painted steel, whereas the proposed structure would be weathering steel. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles (STR.02).

9.1.13 **Nether Lock Railway Crossing** - a new structure would be built alongside the existing, this would be a longer span than the existing to avoid the existing Lincoln line railway chord. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles (STR.02, 04).

9.1.14 **Brownhills Junction Bridge** - this bridge would be identical in structural form to the Cattle Market Junction structures with a single span supported on bored concrete piles or a spread concrete foundation. The span is longer than required to provide an open feel for walkers and cyclists using the walking/cycling route below (STR.05).

9.1.15 **A1/A46 Crossing** - a single span structure would be provided to pass over the existing A1 slip roads and the A1 mainline carriageway. The bridge would be supported on bored concrete piles or a spread concrete foundation) (STR.01, 02).

9.1.16 There are a number of secondary structures across the Scheme that are listed below. These are predominantly modifications to existing drainage culverts to lengthen them under the widened A46:

- Pipe culvert no. 5
- Pipe culvert no. 6
- Pipe culvert no. 7
- Flood relief culvert at Cattle Market roundabout
- Pipe culvert no. 12
- Pipe culvert no.16
- Bleach house culvert

9.1.17 The secondary structures listed above are shown on the General Arrangement Plans (TR010065/APP/2.5).

9.1.18 **Temporary bridge crossing of the River Trent** - A new structure would be built over the River Trent to provide construction access to the southern section of the Nether Lock Viaduct. This bridge would be used for the construction period only and would be removed upon completion of the works. The bridge would be single span, crossing the River Trent and Bridleway 6. The bridge deck would be supported on reinforced soil embankments which would also form the approach ramps. The height of the bridge soffit would be set to ensure that the navigational rights along the River Trent are not impeded.

10 Drainage design

10.1 Overview

10.1.1 The drainage design is illustrated on the General Arrangement Plans (TR010065/APP/2.5). The Drainage Strategy, in Appendix 13.4 of the ES Appendices (TR010065/APP/6.3), was undertaken in order to outline the drainage design and mitigation measures to reduce impacts upon the water environment by the Scheme.

10.1.2 The drainage system has been designed, wherever possible, to be kept above-surface. Above-surface drainage features come with multiple benefits which include pollution control, ease of inspection and maintenance, biodiversity net gain (BNG) and flood resilience. The proposals have been designed in close co-ordination with the wider environmental team to maximise the benefits these can provide (LSC.06, 07).

10.1.3 The attenuation and conveyance of surface water run-off prioritises the use of surface-water channels, swales and attenuation basins (LSC.12).

10.1.4 NbS and SuDS have been prioritised as overarching principles in the design of the drainage strategy in line with the SuDS hierarchy. This entails the integration of SuDS with other environmental and landscaping features to bring about additional complimentary benefits such as ease of inspection and maintenance. This is referred to as blue-green infrastructure. These features are present along much of the western/northern extents of the scheme at the toe of embankments (LSC.07, 12).

10.1.5 Surface water run-off from the highway is conveyed by a channel or a pipe down the embankment and is then discharged into conveyance swales located at the toe of the embankment. These conveyance swales are the Scheme's primary pollution capture and treatment device and would therefore be raised above an agreed fluvial flood level to improve their flood resilience. The swale is a planted, baffled swale that would retain and convey surface water run-off.

10.1.6 Swales convey runoff into a wetland system consisting of forebays and attenuation basins, which have been provided along the base of embankments throughout the Scheme (LSC.07).

10.1.7 The attenuation basins will be bunded to around 500mm above existing ground levels for the highest basin within each attenuation feature, although this level may vary as flood levels can vary along the length of the Scheme. The aspiration is to be able to protect against the 1 in 2 year fluvial flood event (including climate change), however the modelled level may be higher than the bunding. In that case, the basin will then provide fluvial flood protection to events lower than the 1 in 2, such as the 1 in 1 year storm event or lower, more regular fluvial events. Attenuation basins are designed to discharge to the

nearest watercourse at greenfield run-off rate. Further information on this assessment is detailed within Appendix 13.2 (Flood Risk Assessment) of the ES Appendices (TR010065/APP/6.3) (LSC.07, 12).

10.1.8 The above-surface drainage features have been designed in accordance with the Construction Industry and Research Information Association (CIRIA) SuDS Manual and the DMRB. The CIRIA SuDS Manual provides the framework for designing SuDS to maximise benefits. Its contents are relevant for a wide range of professions and roles, and it highlights that through engagement and collaboration SuDS can be integrated into the design of urban areas, to create high quality places for future generations.

10.1.9 For a full list of all design standards used please refer to Appendix C in the Drainage Strategy at Appendix 13.4 of the ES Appendices (TR010065/APP/6.3).

10.1.10 Where above-surface drainage is not suitable for the Scheme, piped runs would be utilised to convey runoff to the closest conveyance swale where runoff would be conveyed to the attenuation feature, and separators would be used to intercept oil where there is an insufficient area for softer devices. A Scheme specific example of this is catchment C4, which cannot flow via swale to its attenuation basin so would be piped under the embankment, across the underpass, and into basin B3. The use of oil interceptors requires a DfS from DMRB standard GG 501 Design of highway drainage systems and has therefore been avoided where possible.

10.2 Climate change adaption

10.2.1 Attenuation basins have been designed to hold the 1 in 30 years (plus 40% climate change) pluvial storm event volumes. The deviation from the standard to hold the 1 in 100 year (plus 40% climate change allowance) is subject to a DfS and has been preliminarily approved by NCC (the Lead local Flood Authority (LLFA)) and the EA. This approval in principle has now been confirmed through the completion of the volume impact assessments, detailed in 10.2.2 to 10.2.8 below, which have demonstrated that there would be no adverse impact on landowners and stakeholders through the incorporation of the 1 in 30 years (plus 40% climate change allowance) attenuation ponds within the Scheme. Further information is provided in the Drainage Strategy, Appendix 13.4 of the ES Appendices (TR010065/APP/6.3) which incorporates the volume impact assessment technical note at Appendix B, investigating and assessing the impacts of attenuating to a lower storm event (LSC.12).

10.2.2 The 40% climate change allowance is used to calculate the total volume of water to be stored within attenuation areas. It is also used to assess the risk of flooding on the carriageway during a 1:100 rainfall event. The 25% climate change allowance is normally applied at 20% but the LLFA (NCC) require 25% within the Newark area. This is used

to confirm that the carriageway does not flood during a 1:100 rainfall event.

10.2.3 Two volume impact assessments were carried out to measure the impact of not attenuating storm events larger than the 1 in 30 years plus a 25% climate change allowance. The first assessment looked at the impact of the exceedance that will not be formally stored within the detention basins during a storm event. The second assessment looked at the exceedance volume if the storm event occurs at the same time as a fluvial flood event.

Exceedance Management – Assessment 1

10.2.4 Where a storm exceeds 1 in 30 year pluvial storm event, run-off would overtop via a designed spillway and flow to the receiving watercourse via the natural topography of the land.

10.2.5 To demonstrate what happens to run-off that overtop the basins, an exceedance management plan was produced using the topographical survey levels to determine overland flow paths from the designated basin spillway to the receiving watercourse. The plan was required to ensure there is no risk of flooding to site users or landowners/property owners nearby when a basin overtops into the surrounding landscape.

10.2.6 Exceedance flow paths for all storm events above the 1 in 30 years (+25% climate change) for all basins within the floodplain can be seen in Appendix 13.4 of the ES Appendices (TR010065/APP/6.3).

10.2.7 The freeboard will store some additional run-off before overtopping and spilling via a designated spillway towards the receiving watercourse.

Mitigation

10.2.8 When the River Trent is not in flood two approaches will be implemented to manage the discharge:

1. The Farndon East and Farndon West FCAs would be utilised as attenuation to offset, by displacement, the exceedance volume for events above the 1 in 30-year storm (+25% climate change) up to the 1 in 100 years (+25% climate change) where detention basins 1, 2 and 3 would discharge via spillways into these.
2. The existing Old Trent Dyke would discharge flows in excess of 200mm within it into the Farndon East and Farndon West FCAs. This provides capacity within the dyke for basins 4 to 8 inclusive to spill over and utilise the additional capacity and convey the discharge to the River Trent at Nether Lock without flooding adjacent land.

Exceedance Management – Assessment 2

10.2.9 The Flood Risk Assessment, which forms Appendix 13.2 of the Environmental Statement Appendices (TR010065/APP/6.3), provides details upon the Scheme's impact for flood risk. The assessment

provided ‘modelled fluvial flood levels’ which the volume impact assessment used, then measured the impact exceedance flows would have on fluvial flood events.

10.2.10 Due to the enormity of the flood plain the pluvial rainfall event had a negligible impact on the level of the water within the flood plain and the volume impact assessment included within Appendix B of the Drainage Strategy, Appendix 13.4 of the ES Appendices (TR010065/APP/6.3) concluded that the exceedance volume run-off raises the flood water levels by less than 1mm.

10.2.11 Further information is provided in the Drainage Strategy, Appendix 13.4 of the ES Appendices (TR010065/APP/6.3).

10.3 Specific features

Debris Screens

10.3.1 On some existing culverts, debris screens have been implemented at various times. It would appear on visual inspection that these are likely to be non-compliant with the C786 CIRIA Culvert, screen and outfall manual. This design guide sets parameters for the design of screens and also sets out rules for where screens should or should not be implemented (DRA.01).

10.3.2 All existing and new culverts, inlets and outlets are to be reviewed at detailed design stage to determine whether or not screening will be required to intercept debris. Refer to the Design Principles in Annex A (DRA.01).

10.3.3 The methodology of the screening assessment is to follow that set out in 'Culvert, screen and outfall manual (C786)'.

11 Environmental design

11.1 Context

11.1.1 This section presents an overview of the environmental considerations that have influenced the design of the Scheme. The section also demonstrates compliance with the NPSNN design requirements such as those identified within paragraphs' 5.38 (biodiversity and ecological conservation), 5.124 – 5.138 (cultural heritage), 5.144 to 5.161 (landscape and visual) and 5.186 – 5. 200 (noise and vibration) of the NPSNN.

11.1.2 The development of the Scheme design has been an iterative process, undertaken as part of the Applicant's integrated design team. The design adheres to the principles of the design and mitigation hierarchy outlined in DMRB LA 104 Environmental assessment and monitoring. The first principle being to avoid potential adverse effects where possible, before seeking to minimise or mitigate any unavoidable impacts. This has formed a well-developed essential mitigation strategy.

11.1.3 The landscape design strategy for the Scheme seeks to respond to the local landscape character and physical topography of the area, aiding the settlement of the Scheme within the receiving environment. It also seeks to limit 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 is outlined in Chapter 2, (The Scheme), of the ES (TR010065/APP/6.1) and the Figure 2.3, First Iteration Environmental Masterplan (TR010065/APP/6.5) of the ES Figures (TR010065/APP/6.2) (PRO.03, LST.03).

11.2 Embedded environmental mitigation

11.2.1 The Applicant's integrated design team has followed a joined-up approach, across the various disciplines, throughout the assessment process. This method ensured that the majority of environmental mitigation measures were raised at an early stage as constraints and opportunities were identified and have been incorporated into the design. This resulted in various environmental mitigation measures being embedded into the Scheme design.

11.2.2 The careful integration of earthworks into the landscape as part of the design would shape the proposed new landform sympathetically, in order to integrate the Scheme into the receiving landscape (LSC.07, 13). This is achieved by:

- The use of earth landscape bunds to further aid landscape integration and reduce the prominence of the Scheme as appropriate (LSC.01).
- Designing the earthworks to minimise conflicts with existing vegetation as well as PRoWs (LSC.07).

- Rounding off the crests and toes of all embankments and the FCAs design to achieve a more natural appearance for slope profiles, allowing greater integration with the surrounding landform.
- Sloping profiles being graded out and returned to agricultural use to retain the open character of the area (LSC.07, 13).
- Limiting the increase of vertical alignment of the new road, junctions, structures and associated infrastructure as far as practicable to minimise landscape and visual impacts. Measures would include seeking to avoid placement of fence lines at the top of any embankment slopes where they could dominate the skyline (LSC.07, 13).
- Lighting columns would be kept to the minimal height necessary and be directional to minimise impact on nearby properties and the wider night sky. This would need to be considered in conjunction with operational safety requirements (LST.09).
- New structures would 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 (STR.06).
- Retention of the existing A46 for the new southbound entry slip from Brownhills junction, allowing existing bunds and the majority of established vegetation to be retained.
- Where the alignment severs an existing public right of way, connectivity will be maintained wherever possible. This will be achieved with the reconnection of severed PRoWs with permanent diverted routes, for example, the provision of a 3.0m wide walking cycling route around Cattle Market junction and a route to Newark Showground entrance from Winthorpe and Newark-on-Trent where there is currently no provision from Winthorpe and a sub-standard route from Newark-on-Trent (PEO.01).

11.2.3 The noise assessment has been completed and noise mitigation measures will be provided from the eastern side of the Brownhills northbound exit slip road through to Winthorpe Roundabout. This will vary in form from fencing, a bund or a combination of both, due to physical constraints along the route, as well as low noise road surfacing. Two acoustic barriers would be located between the western slip road at Brownhills and the southern approach of Cattle Market roundabout going around the southbound entry slip. A 2 metre fence will be provided from the Farndon roundabout underpass up to Windmill Viaduct on the western side. Noise mitigation measures, including noise fencing and noise bunds, are shown on Figure 2.3 (Environmental Masterplan) of the ES Figures (TR010065/APP/6.2)

11.2.4 Further details are available in Chapter 11 (Noise and Vibration) of the ES (TR010065/APP/6.1).

11.3 Floodplain compensation areas

Kelham and Averham

11.3.1 A FCA would be provided between Kelham and Averham. This is to provide a combination of direct and indirect compensation to floodplain lost between 11.4-13.0 metres Above Ordnance Datum (AOD) due to the Scheme being instated in the floodplain (LSC.06, 08,).

11.3.2 There are eight features of note as shown on Sheet 7 of the General Arrangement Plan (TR010065/APP/2.5):

- The existing Kelham Hall Field Ditch between the River Trent and the A617, adjacent to the Kelham Hall boundary wall. Sections of this ditch are constrained by other local features including an access road from the field into Kelham Hall land. The ditch channel itself will need to be cleared of vegetation obstructions to improve flow conveyance, where this does not interfere with the boundary wall. Due to risks relating to use of the existing Kelham Hall Field Ditch as a drain-down feature, land has been retained within the Order Limits for this ditch to be maintained.
- A series of culverts beneath the A617 to enable flood water conveyance to the FCA. Due to the surrounding topography, this arrangement will consist of five concrete/reinforced plastic pipes laid in parallel, each with a 600mm internal diameter. To enable this, the existing six-inch gas main will need to be diverted. The culverts would be wetted for the 5% annual exceedance probability (AEP) and larger flood events, as shown by hydraulic modelling, and therefore will often be dry.
- Access to the FCA site, which will be from the western side of the A617. The existing access point to the land will be retained and is to allow vehicular access to the adjacent land.
- A connecting channel, which is to act as floodplain compensation in its own right. To enable the connecting channel, culvert, and adjacent FCAs to be accessed, an access track would be provided with a width of 3 metres, allowing access to the adjacent field. To ensure that this access track is usable in all but the most extreme flood events, and to limit new flood pathways on the western side of the A617, the access track would be situated on a variable height bund that follows the existing elevation of the adjacent A617. This ditch is to act as a FCA in its own right.
- The northern area. This currently has ground levels at approximately 12 metres AOD. The works would involve lowering ground levels in this field to approximately 11.4 metres AOD, providing an average change in elevation of 0.6 metres. To enable drainage as flood water recedes, the ground will be profiled towards the ditch, with a minimum 1:1000 gradient. This field is currently, and shall remain, as arable land and therefore cannot be planted (LSC.12).
- The southern area. This is closest to the village of Averham. An existing pond, storage and access track will need to be relocated

within the Order Limits. This site will be formed with a similar approach to the northern FCA; however the minimum elevation of this site would become 11.8 metres AOD, from the existing ground level of approximately 12.6 metres AOD. Therefore, an average change in depth of 0.8 metres is expected. This is to remain as arable land.

- The FCA, which will be constructed such that it remains as agricultural land. The area is susceptible to groundwater flooding, however monitoring shows that in an event of a flood, groundwater will be conveyed to the nearest watercourse, hence flooding in the FCA area will not increase due to groundwater level.
- An additional area adjacent to the northern area. This is to be partially utilised. This would be an extension of the FCA, with similar ground levels.

Farndon West (LSC.06, 08, BPR.01-05)

11.3.3 An FCA would be provided between the A46 and the River Trent immediately north of Windmill Viaduct, shown on Sheet 2 of the General Arrangement Plan (TR010065/APP/2.5). This is to provide a combination of direct and indirect compensation to floodplain lost between 10.0-11.6 metres AOD due to the new A46 road embankment being instated in the floodplain. The minimum elevation of the site will be 10.6 metres AOD. Therefore, there will be an average change in depth of approximately 1.5 metres.

11.3.4 This site is to partially remain as arable land with a part of the site to become a floodplain grazing marsh. The FCA will be connected to the Old Trent Dyke overland to the left bank of the dyke which enables the FCA to drain down following a flood event. The connection point to the Old Trent Dyke was chosen so that the proposed area can make maximum use of the land, whilst also not generating a new overland flow path in flood conditions bypassing the existing River Trent.

Farndon East (LSC.06, 08, BPR.01-05).

11.3.5 A FCA would be provided between the A46 and the River Trent immediately north of Windmill Viaduct, shown on Sheet 2 the General Arrangement Plan (TR010065/APP/2.5). This is to provide a combination of direct and indirect compensation to floodplain lost between 9.6-11.0 metres AOD due to the new A46 road embankment being instated in the floodplain.

11.3.6 The connection to the Old Trent Dyke to enable flood water conveyance will be facilitated through a connection to the bank of the watercourse. This approach was chosen so that the proposed area can make maximum use of the land, whilst also not generating a new flood flow path from the River Trent through breaking the high left bank.

11.3.7 Further details about the FCAs can be found in the Flood Risk Assessment, Appendix 13.2 of the ES Appendices (TR010065/APP/6.3).

11.4 Watercourse Realignment

11.4.1 As a part of the Scheme, watercourse realignment is required where new/existing culverts are created/extended that alter the flow path of an existing watercourse (LSC.07).

11.4.2 The exact alignment of some culverts (upstream and downstream extents) may be adjusted as part of detailed design. Several of these culverts carry Trent Valley Drainage Board (TVDB) controlled watercourses, and further engagement with TVDB will be required following confirmation of the extent of realignment required to discuss a design approach.

11.4.3 Further details can be found in Chapter 13, (Road Drainage and the Water Environment) of the ES (TR010065/APP/6.1).

11.5 Landscape masterplan design considerations

11.5.1 The landscape design has sought to integrate the Scheme with surrounding landscape character. The design objectives included retaining notable extents of existing planting and providing new planting to replicate existing features and establish visual screening (LSC.03, 04). The environmental mitigation strategy also seeks to reinstate landscape features lost as a result of the Scheme, as well as a general enhancement of the landscape context, wherever possible. Details of the landscape proposals for the Scheme are provided in Chapter 7 (Landscape and Visual Effects) of the ES (TR010065/APP/6.1) and Figure 2.3 Environmental Masterplan of the ES Figures (TR010065/APP/6.2).

11.5.2 The design seeks to integrate the Scheme with the existing landscape by:

- Making it environmentally sustainable (as set out above in paragraph 4.7) and retaining the sense of openness where this is consistent with a balanced preference for visual screening.
- Integrating Scheme infrastructure (notably overbridges) through appropriate use of planting to contribute to visual screening (LSC.05).
- Selecting plant and grass species appropriate to the locality to maintain consistency with the appearance of the area.

11.5.3 The various planting types are consistent with DMRB LD 117 Landscape design defined elements and compatible with standard highway practices for long term operational maintenance and management. The ultimate outcome of using locally occurring native species, which replicate existing features and are maintained in a manner consistent with that of the wider highway network, would contribute to consistency and integration of the Scheme to the surroundings (LSC.03, 16).

11.5.4 In summary, the Scheme's planting design seeks to:

- Provide appropriate visual, landscape, ecological and environmental mitigation whilst minimising land take and impact upon adjoining agricultural land.
- Establish new planting to screen and integrate the Scheme into the landscape, whilst retaining visual cohesion with existing landscape features (LSC.04, 14)
- Use new planting to integrate the scale, layout, form and massing of the Scheme, to reduce the scale of earthworks and structures and filter views, as well as reinforce existing planting (LSC.03, 04, 07, 10, 14).

12 Interrelationship with other developments

12.1 Overview

12.1.1 This section summarises how the Applicant has engaged with and will manage the interaction with the following developments directly interacting with the Scheme. This in turn influenced the design and construction strategy for the Scheme and assumptions in Chapter 15 (Combined and Cumulative Effects) of the ES (TR010065/APP/6.1). The other developments are:

- Southern Link Road
- North Hykeham bypass

12.2 Newark Southern Link Road

12.2.1 The Southern Link Road is a scheme being brought forwards by NSDC, in partnership with NCC and a developer, Urban & Civic. The scheme has full planning permission and will be completed in phases, work has commenced and the final section joining to the existing A46, south of Farndon roundabout, is expected to be completed in Spring 2025.

12.2.2 Plans involve the creation of a new roundabout on the A46 near to Hawton Lane which will then further connect the A46 at Farndon to the A1 at Balderton. The Southern Link Road has been included within the traffic model for the A46 Scheme and the new Southern Link Road roundabout on the A46 has been designed to account for the Scheme.

12.2.3 The development of the Southern Link Road is a part of a much larger, long-term scheme, encompassing over 3,000 new homes and creating up to 5,000 new jobs, whilst also playing an important role in the wider ambitions set out by Newark and Sherwood District Council and Newark Town's Fund Board.

12.2.4 Details of the engagement held with NSDC and NCC is outlined in the Chapter 3 of the Consultation Report (TR010065/APP/5.1).

12.2.5 The Southern Link Road should be completed prior to the A46 Scheme commencing. Should the Southern Link Road be delayed, no impacts to the A46 Scheme are expected as the new roundabout on the A46, proposed as part of the Southern Link Road scheme, and located approximately 1km to the south of Farndon roundabout, is outside of the Order Limits for the Scheme. The construction programme for the Southern Link Road will continue to be reviewed through 2024 and 2025 (through regular liaison with the developer) to identify any changes and how they impact the Scheme.

12.3 North Hykeham Relief Road

12.3.1 This is a scheme proposed by Lincolnshire County Council.

12.3.2 The North Hykeham Relief Road is a new 70mph dual carriageway that will complete the orbital ring road around Lincoln. Located towards the south of the city, it will tie into the existing roundabout where Newark Road meets the A46 and then link to the Lincoln Eastern Bypass.

12.3.3 Construction of the final section of the North Hykeham Relief Road is expected to commence in March 2028 and be completed in late 2028, therefore in parallel with the Scheme's delivery programme. The North Hykeham Relief Road is predominately offline, however there would need to be coordination with regards to closures on the A46 when the contractor is undertaking works to the Hykeham roundabout. This would be coordinated through traffic management workshops.

12.3.4 The proposed scheme has been included within the traffic model as it has planning permission. As the scheme does not have committed funding, and has not started, the Applicant will liaise further with Lincolnshire County Council (LCC) throughout the DCO process of the Scheme to enable any impacts of the scheme being implemented to be assessed.

12.3.5 Further details can be found in the Outline Traffic Management Plan (TR010065/APP/7.7).

12.3.6 Details of the engagement held with LCC is outlined in Chapter 3 of the Consultation Report (TR010065/APP/5.1).

13 Statutory undertakers (utilities) considerations

13.1 Overview

13.1.1 Overhead and buried utilities are impacted by the Scheme, and therefore diversion or protection works are required to a number of existing infrastructure assets and services during the advanced and enabling works phases and, where necessary, in the early stages of the main construction works. The full scope of these works would be developed and agreed with each affected asset operator.

13.1.2 The extent of the utility diversions are shown on the Utilities Work Plans (TR010065/APP/2.14).

13.1.3 The following classification of works are to be undertaken on the existing utility assets within the Order Limits:

- Protection Works. The existing asset is retained in its current state but with either an exclusion zone or bridging slab installed to protect the asset during construction and from the loading from the elements of the Scheme. Several of the existing service corridors pass under the existing A46 embankment and will have pre-existing protection measures in place. In this instance the Scheme's solution is to design and construct new protection slabs over the assets to protect them from the temporary loadings associated with the construction traffic and the permanent loadings from the embankment widening (UT.01).
- Single diversion. The asset is diverted onto a new permanent alignment prior to construction activities commencing (UT.02-05).
- Multiple phased diversion. Where there are land or logistic constraints it may be necessary to divert the service into a temporary alignment, to allow construction to take place, and upon completion of the works the service is diverted into a new, permanent, alignment. This may be required where the proposed permanent alignment for the asset is within the construction area and a single phased diversion would result in either excessively deep alignment or would create a hazard during the construction operation (UT.02-05).

13.1.4 Works relating to the installation of protection slabs would involve the removal of topsoil and subsoil to a specified depth, followed by the formation of a reinforced concrete slab positioned on top of compacted fill material.

13.1.5 Works relating to the diversion of assets will involve combinations of the following activities:

- Excavating trial holes to determine the exact alignment and depth of existing utilities and the desired connection points.
- Installation of new assets and connections to existing service.
- Installation of poles for overhead equipment.
- Survey of the completed asset for recording purposes.
- Testing and commissioning of the new assets.

- Decommissioning and removal of redundant equipment.

13.1.6 Trenchless techniques such as horizontal directional drilling and micro tunnelling are also likely to be employed for installing certain buried utilities such as underneath the existing carriageway or areas where open trenching is not suitable. This usually constitutes excavating separate launch and reception pits, which vary in size depending on the method chosen, where the burrowing machinery would work from and to. These techniques are described within the construction strategy set out in Chapter 2 of the ES (TR010065/APP/6.1) and have been assessed as part of the EIA.

13.1.7 All service shut downs would be communicated to those affected via the statutory undertaker conducting the works. If access to properties would be affected during diversionary works, this would be communicated to the relevant landowners.

13.1.8 The diversion and protection works identified in Table 13-1 below would need to be undertaken during the advanced and enabling works phase to facilitate the delivery of the enabling and main construction works. It is assumed that in the case of diversions required prior to the consent of the DCO that these would be delivered under the statutory undertaker's permitted development rights. All advanced works have been included in the DCO application and assessed in the ES technical chapters (Chapters 5 to 15) (TR010065/APP/6.1) to assess whole-life impacts of the Scheme.

Table 13-1: Utility protection and diversion works (UT.01-05)

Location	Work No	Asset owner	Asset type	Protect or divert	Details
Section 1 Farndon Roundabout	2 and 10	National Grid	132kv Overhead cables	Protect	The pylon and overhead cables at Farndon Roundabout would not be impacted by the Scheme. An exclusion zone would be established around the base of the pylon and appropriate height restriction barriers installed under the overhead lines in line with the Health and Safety Executive's guidance document, GS6, avoiding danger from overhead power lines.
Section 1 Farndon Roundabout	U1	Local Authority (Nottinghamshire County Council)	Low voltage street lighting cables and	Single phase	Temporary diversion of the existing street lighting cable with protection measures to facilitate the construction of the haul road access to the south abutment of the Windmill Viaduct (Work No 7).

			feeder pillars		
Section 1 Farndon Roundabout	2	Openreach	Buried ducted communications cable	Protect or single phase	On confirmation of the depth of the asset and the interface with the widening works to the Farndon Roundabout, the Scheme will be able to confirm if the asset can be protected with a cover slab or will require a local diversion, likely to involve the lowering of the asset, under the interface with the proposed permanent works.
Section 1 Farndon Roundabout	2	National Grid	Buried 11kv cable	Protect or single phase	
Section 1 Farndon Roundabout	2	Virgin Media	Buried ducted communications cable	Protect or single phase	
Section 1 Farndon Roundabout	2	Severn Trent	Buried clean water pipe	Protect	Protection slab over the asset to protect it from temporary construction traffic loading.
Section 1 A46 southbound	16	Virgin Media	Buried ducted communications cable	Protect	Protection slab over the asset to protect it from construction works in the construction of the new access road on the southbound A46 (Work No 16)
Section 1 Nottingham to Lincoln railway west crossing	U2	National Grid	Buried and overhead 33kv cable.	Single phase and protect	Diversion of the existing 33kv overhead cables and construction of protection slab to allow the widening of the existing highway embankment to form the new A46 northbound carriageway (Work No 4).
Section 1 Nottingham to Lincoln railway west crossing	U3	National Grid	Buried and overhead 11kv cable	Single phase and protect	Divert and lower the duct to avoid the excavations for the new bridge pier and abutment (work No 26). Protection measures implemented to protect assets from the temporary construction traffic loading.
Section 1 Nottingham to Lincoln railway west crossing	U4	Openreach	Buried ducted communications cable	Single phase and protect	
Section 2 Alignment of the old Kelham Road, now	U5	Cadent Gas	Buried medium pressure gas main.	Single phase and protect	Diversion and protection of section of a medium pressure gas main to allow construction of the new northbound carriageway of the A46 (Work

a private road.					No 33) and the new slip road (Work No 34).
Section 2 Cattle Market	U6	Severn Trent Water	Buried water main	Single phase and protect	Diversion and protection of section of a buried water main and values to allow construction of the new northbound carriageway of the A46 (Work No 33) new slip roads (Work No 34 and 36) and new retaining wall (Work No 35).
Section 2 Cattle Market junction	U9	Openreach	Buried ducted communications cable	Single phase	Divert into new verge along the Great North Road (Work No 49) and around new roundabout (Work no 40). Divert short section into new verge along the Kelham Road (Work No 42) and Great North Road (Work No 45).
Section 2 Cattle Market junction	U10	National Grid	Buried 11kv cable and transformer pole	Single phase and protect	Relocate Transformer pole on Great North Road to allow construction of new roundabout (Work no 40). Provide new ducted route under the A46 (Work No 33) and slip roads (Work No 51 and 52).
Section 2 Cattle Market junction	U7	Virgin Media	Buried ducted communications cable	Single phase	Diverted into new ducted network to allow construction of the new slip road (Work No 36) and roundabout (Work No 40). Diverted along Great North Road and around new roundabout and in the verge of the new slip road.
Section 2 Nether Lock Viaduct	U12	National Grid	Buried 11kv cable	Single phase and protect	Cable within tow path. Divert (if necessary) and protect where the access track for the satellite compound on the north side of the River Trent (Work No 65) crosses the cable route between factory building and the ECML.
Section 2 Nether Lock Viaduct	U13	National Grid	Buried 11kv cable	Single phase and protect	Cable within land adjacent to old factory building. Divert (if necessary) and protect where the cables interface with the new bridge pier for the Nether Lock viaduct (Work No 64) on

					the north side of the River Trent.
Section 2 Nether Lock Viaduct	U11	Openreach	Buried ducted communications cable and overhead cable	Single phase	Divert overhead cable alongside the tow path into duct to protect cable during construction of the new Nether Lock Viaduct (Work No 64).
Section 3 Quibell's Lane	U14	Openreach	Buried ducted communications cable	Single phase and protect	Diversion required for the extension of the sewage treatment works underpass (Work No 70) and construction of the new northbound carriageway of the A46 (Work No 56). Divert into new alignment, parallel to the new embankment construction. Construct protection slabs at designated construction traffic crossing points and under new embankment.
Section 3 Crankley Point	56	Severn Trent Water	Buried foul sewer	Protect	Protection slab over the main at designated construction traffic crossing points and under the embankment for the new northbound carriageway of the A46 (Work No 56).
Section 3 Crankley Point	U15	National Grid	Buried 11kv cables	Single phase and protect	Diversion and protection slab over cables at designated construction traffic crossing points and under the new embankment for the new northbound carriageway of the A46 (Work No 56).
Section 3 Crankley Point	56	Severn Trent Water	Buried water main	Protect	Protection slab over 3 inch water main at designated construction traffic crossing points and under the new embankment for the new northbound carriageway of the A46 (Works No 56).
Section 3 Brownhills borrow pit	U16	Severn Trent Water	Buried foul water main	Single phase and Protect	Protection slab over 150mm dia. water main at designated construction traffic crossing points for the proposed borrow pit area to the north side of Brownhills junction roundabout

					(Work No 83). Diversion of pipe around the attenuation basins (Work No 74).
Section 3 Winthorpe Road	U18	Cadent Gas	Buried medium pressure gas main	Single phase	Divert gas main into new corridor in the verge of the new footway/cycleway (Work No 81) and the verge of the new link road (Work No 87) to allow construction of the new embankment for the A46 carriageway (Work No 76) and slip road (Work No 79).
Section 3 Winthorpe Road	U17	Severn Trent Water	Buried water main	Single phase and protect	Divert water main into new corridor under the new embankment for the A46 carriageway (Work No 76) and slip road (Work No 79).
Section 3 Winthorpe Road	U19	National Grid	Buried 11kv cable	Single phase	Divert electrical cables into the verge of the new footway/cycleway (Work No 81) and the verge of the new link road (Work No 87) to allow construction of the new embankment for the A46 carriageway (Work No 76) and slip road (Work No 79).
Section 3 Winthorpe Road	U20	Openreach	Buried ducted communication cables	Single phase	Divert cables into the verge of the new footway/cycleway (Work No 81) and the verge of the new link road (Work No 87) to allow construction of the new embankment for the A46 carriageway (Work No 76) and slip road (Work No 79).
Section 4 A46 northbound	U23	Openreach	Buried ducted communication cables	Single phase	Diversion between Friendly Farmer Roundabout and north of Winthorpe Roundabout into a new alignment along the north side of the northbound carriageway of the A46 (Work No 100).
Section 4 A46 northbound	U21	Virgin Media	Buried ducted communication cables	Single phase	Diversion between Friendly Farmer Roundabout and north of Winthorpe Roundabout into a new alignment along the north side of the northbound carriageway of the A46 (Work No 100). Includes diversion of

					ducts and cables within the verge of the southbound carriageway at Friendly Farmer roundabout into the verge of the new Friendly Farmer Link road (Work No 104).
Section 4 Friendly Farmer roundabout	U22	Severn Trent Water	Buried water main	Single phase and protect	Divert main, re-position values and install protection measures to allow construction of the new A46 dual carriageway to the east of the A1 (Work No 100) and the Friendly Farmer Link road (Work No 104).
Section 4 A46 southbound	U24	National Grid	Overhead 11kv cable and substation	Single phase	Divert overhead cables into buried alignment within the verge of the new Friendly Farmer Link road (Work No 104). Relocation of existing substation to the east of the Shell service area access to allow for the construction of the new access provision (also included in Work No 104).
Section 4 Winthorpe Roundabout	U27	Virgin Media	Buried ducted communication cables	Single phase	Divert duct and cable into new alignment within the verge of the new A46 northbound carriageway (Work No 100) and under a new crossing to the north of side of the Winthorpe Roundabout (Work No 108).
Section 4 A1133, Winthorpe Roundabout and Drove Lane	U26	TATA (EUNE Networks)	Buried ducted communication cables	Single phase	Divert duct and cable into new alignment within the verge of the new A1133 (Work No 109) under the A46 dual carriageway (Work No 100) and the Friendly Farmer Link (Work No 104) and then within the new verge of Drove Lane (Work No 115).
Section 4 Winthorpe Roundabout and Drove Lane	U25	Openreach	Buried ducted communication cables	Single phase	Divert duct and cable into new alignment around the new Winthorpe Roundabout (Work No 108) with crossing under the A46 dual carriageway to the west of the roundabout (Work No 100) and east of the roundabout (Work No

					119). Section of duct and cable diverted into new verge of Drove Lane (Work No 115).
Section 4 A1133, Winthorpe Roundabout and Drove Lane	U28	National Grid	Buried and overhead 11kv cables	Single phase	Divert the existing overhead and buried cables (including existing transformer poles) at Winthorpe Roundabout, A1133 and Drove Lane into new buried alignments within the verge of the A1133 (Work No 109), the Friendly Farmer Link Road (Work No 104) and Drove Lane (Work No 115).
Section 6 A617 Main Road	U30	National Grid	Buried and overhead power cable.	Single Phase	Remove and provide new connection to pump house located within the floodplain compensation area to the north side of the A617 (Work No. 125).
Section 6 A617 Main Road	U29	National Grid	Overhead power cable.	Protect	Install protection measures to the overhead cables on the south side of the A617 during the construction of the new culvert crossing under the A617 (Work No 124).
Section 6 A617 Main Road	U31	Open Reach	Buried ducts and cables	Divert and Protect	Diversion and protection measures to the buried ducted cable in the north verge of the A617 during the construction of the new access road (Work No 122) and the new culvert crossing (Work No 124).
Section 6 A617 Main Road	U32	Cadent Gas	Buried medium pressure gas main	Single phase	Diversion of the gas main required within the south verge of the A617 during the construction of the new culvert crossing (Work No 124).
Section 6 A617 Main Road	U33	Severn Trent Water	Buried water main	Protect	Diversion and protection measures installed to protect the main during the construction of the new culvert crossing (Work No 124).

14 Construction considerations

14.1 Introductions

14.1.1 This section explores the key issues and decision-making that determined the location and extent of the following construction features, which in turn influenced the Order Limits and assumptions in the ES (TR010065/APP/6.1).

- Site compounds
- Material storage and handling areas
- Work areas to build the Scheme
- Construction traffic management
- Construction work area requirements

14.2 Site compounds

14.2.1 The size and potential locations of compounds required to deliver the Scheme have been developed to account for the requirements of the construction works, and in particular the location of the new structures, junctions and major utility diversions. The presence of local community receptors and environmental constraints have also been accounted for in the planning of the compound areas. The Applicant has also taken into consideration discussions with affected land interests which have been factored into the selection and extent of the compound locations.

14.2.2 The main site compound would be located at the site of the old NCC Highway Depot and would function as the head office for the Scheme and would accommodate the site management and delivery teams responsible for works.

14.2.3 The total area of this compound would be approximately 14,500m^2 .

14.2.4 Vehicle access to the compound would be via the Great North Road with the existing access amended as part of the compound establishment works.

14.2.5 In summary, the compound would include the following features:

- Modular office of approximately 2,000m^2 together with canteen and welfare facilities.
- Training building for site safety briefings and inductions
- Site stores compound, including subcontractor material storage yards and plant yards and laydown areas.
- Materials testing laboratory facilities.
- Cement bound material batching plant, installed during the pavement construction operations.
- CCTV traffic control facility.
- Vehicle free recovery unit and storage, with customer care centre.
- Waste management and segregation areas.

14.2.6 The compound would accommodate parking provision for:

- Up to 60 vehicles for staff, subcontractors, labour and visitors traveling to the site daily.
- 20 vehicle spaces for site-based vehicles including pickups, vans, minibuses, crew cabs etc. and suitable parking for LGVs, HGVs and plant.

14.2.7 In addition to the main construction compounds, a number of satellite construction compounds would be formed to facilitate the construction of the Scheme.

14.2.8 These smaller compounds would generally be located adjacent to bridge structures and be in operation for a limited duration whilst undertaking these works. Works within the compounds would normally only be undertaken during core hours; however, during periods of overnight works such as bridge beam installation, road tie-ins and other critical works, these compounds would need to operate outside of these hours. These working hours have been assessed as part of the ES and the working hour restrictions are also detailed within commitment G1 of Table 3-2 of the REAC within the First Iteration EMP (TR010065/APP/6.5).

14.2.9 The perimeter to these compounds would be fenced to prevent unauthorised access. The fence type and construction would be appropriate to the level of security required, but this is likely to be 'Heras' type fencing.

14.2.10 The compounds would typically include the following features:

- Parking Spaces for a small number of site vehicles such as pickups, vans and minibuses.
- An office of 72m2 required for up to 10 staff, together with mess room and welfare facilities.
- A diesel generator to provide a source of power to the facilities (where practicable solar panels and batteries would be used in place of, or in combination with, a generator).
- Site storage areas including subcontractor material storage yards and plant parking.

14.2.11 The locations of the proposed main and satellite construction compounds are illustrated on Figure 2.4 Locations of Temporary Works Areas Required During Construction of the ES Figures (TR010065/APP/6.2), the details and access arrangements of which are described in Table 2.8 Chapter 2 (The Scheme) of the ES (TR010065/APP/6.1). All temporary works during construction have been assessed within the ES.

14.3 Material storage and processing areas

14.3.1 The areas allocated within the Order Limits for materials management as shown in Figure 2.4 Locations of Temporary Works

Areas Required During Construction of the ES Figures (TR010065/APP/6.2) have been selected to meet one or more of the following criteria, which are based on best practice:

- To minimise as far as possible adverse environmental impact, and in this regard be located in areas where any impact can be reduced as necessary
- To require dedicated space, as far as possible, outside the immediate footprint of the permanent works and working areas. This is so stockpiling, management and processing of the earthworks materials do not frustrate, restrict or prevent the efficient construction of the Scheme as programmed.
- The size and shape of any area used for materials storage, management and processing is to be suitable for the safe execution of the various activities required. This includes access and egress linked closely to the main construction works, space for safe plant operation and movement, space for appropriate segregation of plant and personnel.
- The areas for materials storage, management and processing are to provide sufficient space for stockpiling and processing commensurate with the nature of the materials concerned. This is to enable the properties and characteristics of the materials to not be impaired and rendered unsuitable.
- The materials storage, management and processing areas are to be located optimally to support the earthworks. In this regard the areas need as far as possible to be proximal to the main works to avoid excessive and inefficient haulage. Inevitably, as a consequence of the linear nature of the Scheme, this will necessitate a number of areas established at suitable locations but working simultaneously to support the construction efficiently.

14.4 Construction site management

14.4.1 A First Iteration EMP (TR010065/APP/6.5) has been prepared to include construction, operational and maintenance good practice and mitigation measures. These have been identified in part by the assessments presented in the ES (TR010065/APP/6.1). The First Iteration Environmental Management Plan includes the REAC.

14.4.2 The First Iteration EMP (TR010065/APP/6.5) will be developed into a Second Iteration EMP, relating to the construction phase of the Scheme, prior to commencement of construction, which is secured by Requirement 3 of the draft DCO (TR010065/APP/3.1). A Third Iteration Environmental Management Plan, relating to the operational and maintenance phases of the Scheme, will be developed prior to operation of the Scheme and is secured by Requirement 4 of the draft DCO.

14.4.3 The DCO application also contains an Outline Traffic Management Plan (TR010065/APP/7.7) that sets out the measures that would be used to reduce the impacts from construction traffic, such as reducing

worker vehicle and HGV movements, particularly at peak periods. The Outline Traffic Management Plan will be developed into the Traffic Management Plan which is secured via Requirement 11 of the draft DCO (TR010065/APP/3.1). This Plan will set out how construction traffic will be managed during this phase of the Scheme.

14.4.4 The construction traffic will be managed to limit noise and dust (as well as mud and the cleanliness of the local roads), in line with industry best practice. This will include the use of wheel washing and similar controls as set out in the First Iteration EMP (TR010065/APP/6.5).

15 Operation of the Scheme

15.1 Maintenance and management

15.1.1 The Scheme has been designed in a way that minimises the frequency of future interventions through the incorporation of low maintenance equipment and features that reduce the number of repairs required. Examples include the use of cast-in road studs over other stick-on alternatives, and the co-location of equipment to facilitate access for routine inspections. Accordingly, no substantial maintenance activities are likely to be required within the first five years of the Scheme being operational.

15.1.2 The Scheme has been designed with maintenance and safe operation in mind and any ongoing commitments and mitigation measures required during operation of the Scheme would be set out in the Third Iteration EMP, to be developed prior to road opening and secured by requirement 4 of the draft DCO (TR010065/APP/3.1) (STR.02, 04).

15.1.3 Maintenance is defined as actions needed to inspect, repair, adjust, alter, improve, landscape, preserve, remove, decommission, reconstruct refurbish or replace all aspects that relate to the Scheme (provided that such works do not give rise to any materially new or materially different environmental effects than those in the Environmental Statement).

15.1.4 Long-term maintenance and repairs to the highways and associated assets (including drainage) would be undertaken as required to maintain the appropriate standards for the relevant highway authority e.g. National Highways or NCC for local authority network assets.

15.1.5 Maintenance access has generally been provided from the local road network where possible, however there are two locations where access is taken directly from the dual carriageway. In these locations, this has been done to avoid significant lengths of access tracks and reduce the Order Limits.

15.1.6 Facilities for maintenance include the following:

- Vehicular access tracks for the maintenance of drainage assets and outfall works.
- Maintenance strips for access alongside highways drainage ditches.
- Hardstanding and layby access with dedicated walkways for maintaining equipment along the Scheme.
- Hardstanding areas for feeder pillars for power to lighting installations.
- Hardstanding areas and access footways or steps for structures.
- Level strips for the provision of acoustic barriers, enabling a level surface side of the barriers to be used for inspection and maintenance.

15.1.7 The maintenance responsibilities for the new carriageway and associated slip roads, as shown on the Classification of Roads Plans (TR010065/APP/2.9) and detailed in Schedule 3 of the draft DCO (TR010065/APP/3.1), would rest with the Applicant.

15.1.8 The maintenance responsibility for the new local road network and any other unclassified roads, as shown on the Classification of Roads Plans (TR010065/APP/2.9) and detailed in Schedule 3 of the Draft DCO (TR010065/APP/3.1), would rest with the applicable and relevant local highway authority.

15.1.9 Traffic Management deployed during maintenance operations would comprise a combination of temporary speed restrictions, land closures and reduced running land widths to enable continued access for traffic.

15.2 Boundary treatments

15.2.1 During the design, attention has been paid to the space required between the earthwork footprint and the Order Limits. As well as providing a highway boundary for safety and security, the permanent land take requirements have considered the need for an earthworks, drainage and maintenance access strip between new structures and the Scheme's operational land boundary.

15.2.2 Unless alternatives have been agreed with neighboring landowners, or special fencing is specified for environmental mitigation, post and rail fence will be provided in accordance with the Requirement 7 of the draft DCO (TR010065/APP/3.1) and Manual of Contract Documents for Highway Works standard details.

15.3 Decommissioning

15.3.1 It is highly unlikely that the Scheme would be demolished after its design life, as the improvements would have become an integral part of the strategic and local road networks.

15.3.2 In the unlikely event of the Scheme needed to be demolished, this would conform to the statutory process in place at that time, including any requirements for EIA as appropriate.

15.3.3 Demolition of the Scheme has therefore not been considered further in the ES (TR010065/APP/6.1); however, appropriate consideration has been given, where relevant, to its future maintenance in relation to activities such as periodic inspections and the renewal of components once they reach the end of their design life, where significant effects are likely to occur.

Annex A – Design Principles

Overview

The Design Principles referred to in the table below are cross-referenced within the report where they are applicable to a particular design intervention.

Reference no.	Theme	Design Principle
PEO.01	WCH	WCH crossings and the paths surrounding the route have a design that is safe, considers the convenience of users, and the local traffic network, and the context of the surrounding landscape character.
PEO.02	WCH	In order to enable users to stay aware of their location and use crossings safely, WCH crossings across and adjacent to the Scheme would include clear and informative signage to provide wayfinding for users.
PEO.03	WCH	The design of the new WCH routes maximise access for users (including those with limited mobility) through good design whilst considering and mitigating the potential impacts from misuse.
PEO.04	WCH	WCH routes are separated where possible from the mainline A46 in order to maximise safety of users and their experience.
PEO.05	WCH	The surfacing, signage, boundary treatments and access controls would be designed with consideration of the surrounding context. Surfacing, signage, boundary treatments and access controls are adapted where appropriate to better fit with their surrounding context as WCH routes travel between rural and urban environments.
PLA.01	Design	The design has been developed according to a common design language whilst remaining sensitive to place. As the Scheme travels through both rural and urban contexts, the

Reference no.	Theme	Design Principle
		design language is adapted to be appropriate to its surroundings.
PLA.02	Design	Structures, landscape, and engineering design are efficient in their use of resources and multifunctional where practicable.
PLA.03	Design	The amount of roadside furniture and signage is reduced or combined as far as practical, whilst remaining within safety standards.
PRO.01	Design Process	The design process has been guided by engagement with stakeholders from the start of the design process. The range of views of stakeholders affected would be taken into account and where practicable, reflected in the detailed design of the Scheme.
PRO.02	Design Process	All design proposals have been developed with the goal of reducing carbon emissions in mind. Beyond reducing emissions through journey times, low-carbon materials and construction processes shall be specified in the design where practicable and economically viable.
PRO.03	Design Process	The detailed design of structures, buildings and landscape shall be developed with the goal of maximising biodiversity where practical and within the scope of the Scheme.
STR.01	Structures	The detailed design of structures would ensure that they fulfil their function and are able to withstand the required abnormal heavy vehicle loads without restriction. Bridges where required integrate with the wider WCH and road network.
STR.02	Structures	The detailed design of structures should consider their future maintenance from the outset. Whilst materials and designs would be chosen to minimise the need for maintenance, structures should be positioned and designed in such a way that would enable safe maintenance works to be

Reference no.	Theme	Design Principle
		carried out with minimal disruption to A46 users.
STR.03	Structures	The selection of materials used for structures has been considered for their durability qualities, minimising future maintenance requirements.
STR.04	Structures	The Scheme should deliver value for money by achieving its objectives. The detailed design of the Scheme should deliver these aims and objectives in a cost efficient manner, considering the cost of construction and materials throughout the design process. Cost-effectiveness will be weighed against quality of existing local landscape character, aesthetic value, safety, and other Design Principles discussed in this document.
STR.05	Structures	The detailed design of bridges shall share a consistent design approach that uses similar details with appropriate diversification for their local context. i.e. new bridges would generally be similar to the existing, adjacent structures, using similar structural components. Bridges should be incorporated within their context through their material palette and associated landscaping for aesthetic purposes.
STR.06	Structures	The detailed design for structures should seek to minimise their impact on the local environment. This should be achieved through use of a muted material palette and incorporating the structure into the local character context through earthworks and planting.
STR.07	Structures	Structures are designed in accordance with National Highways Suicide Prevention Strategy (National Highways, 2022).
LST.01	Lighting, signage and technology	Lighting, signage and technology used across the Scheme would adhere to and support the most modern and effective safety measures. Signage

Reference no.	Theme	Design Principle
		would clearly communicate risk and danger to drivers, cyclists, pedestrians and horse riders.
LST.02	Lighting, signage and technology	The detailed design of lighting, signage and technology should consider aesthetic value and its surrounding context of landscape, balanced against safety, cost and durability considerations.
LST.03	Lighting, signage and technology	The detailed design of lighting, signage and technology features should be responsive to their local landscape character. Consideration should be given to the rural or urban location of their placement, and the proximity of heritage assets. Appropriate material palettes and forms should be selected accordingly. Lighting, signage and technology should contribute to a sense of place, contribute towards a place's amenity, help prevent crime and fear of crime.
LST.04	Lighting, signage and technology	For both motor and WCH users across the Scheme, clear and intuitive signage, positioned in the most suitable locations to aid journeys, would aid wayfinding.
LST.05	Lighting, signage and technology	The detailed design of the Scheme should avoid unnecessary traffic signage to minimise clutter, especially where it would act as a roadside distraction or detract from local amenity.
LST.06	Lighting, signage and technology	Wayfinding signs do not always need to be illuminated by internal or external lighting, or use reflective materials, particularly for signage in the WCH network. The use of lighting with signage should be evaluated against safety, effectiveness and potential light pollution.
LST.07	Lighting, signage and technology	Lighting designs should enhance night-time use, enjoyment and provide safe passage for users of the A46 and surrounding WCH network where provided.

Reference no.	Theme	Design Principle
LST.08	Lighting, signage and technology	The need for lighting to promote user safety and enjoyment should be balanced where practicable with the need to promote biodiversity and avoidance of light pollution.
LST.09	Lighting, signage and technology	Lighting, signage and technology should balance the need for safety and effectiveness with the need for discretion in order to maintain the rural context of the route and surrounding WCH network. Lighting should be discreet whilst still being visible and should minimise light pollution.
LST.10	Lighting, signage and technology	Minimise the height of lighting columns, particularly where on elevated parts of the Scheme.
LSC.01	Landscape	Retain as much existing vegetation as possible where it provides an important visual screening function and/or forms part of the landscape structure. Where vegetation loss is unavoidable, replace and extend areas of proposed planting into the landscape to provide screening and to contribute towards the surrounding framework of vegetation.
LSC.02	Landscape	BNG of habitat throughout the Scheme extent and improve wildlife connectivity by incorporating linear habitats, such as hedgerows and lines of trees, linking with retained woodland and hedgerows where possible.
LSC.03	Landscape	Reinforce the landscape character and biodiversity by planting native species typically found within the surrounding landscape.
LSC.04	Landscape	Provide visual interest for local residents, users of public rights of way and public open space; including incorporating intermittent planting to allow views out from the road for drivers using the A46.
LSC.05	Landscape	Filter, screen and contain views of major junctions and integrate into the surrounding landscape framework of native planting.

Reference no.	Theme	Design Principle
LSC.06	Landscape	Aim to limit the overall extent of the Scheme as much as possible when considering the design and location of drainage ponds and FCAs.
LSC.07	Landscape	Integrate drainage and earthworks sensitively into the surrounding landscape in terms of earth modelling and planting, and carefully consider structure design over watercourses, aiming to minimise visual intrusiveness, connectivity for wildlife and maintain the character of the landscape and views along valley floors.
LSC.08	Landscape	Within areas of floodplain keep land take and vegetation loss to an absolute minimum to retain the locally distinctive willow plantations. Ensure proposed planting contributes to the pattern and character of existing vegetation.
LSC.09	Landscape	Alignment of the Scheme and location of junctions and borrow pits would be designed to reduce landscape and visual effects.
LSC.10	Landscape	Careful design of major structures, signage and gantries to limit visual intrusion and to help integrate these into the wider landscape.
LSC.11	Landscape	Refinement of the design of earthworks to create natural gradients and slopes that achieve better integration with the surrounding landform, where space and material are available.
LSC.12	Landscape	Sensitive design of borrow pits and attenuation ponds, to integrate these features into the landscape and reduce visual intrusion.
LSC.13	Landscape	Planting of native hedgerows, shrubs and trees would reduce adverse landscape and visual effects. Consideration of the species, pattern and distribution of proposed hedgerows, shrubs and trees along the Scheme would reflect the distinctive local character of vegetation within the

Reference no.	Theme	Design Principle
		adjacent landscape and provide screening for visual receptors.
LSC.14	Landscape	Dense native tree and shrub planting on and adjacent to highway earthworks would create woodlands, copses and shelterbelts in order to break up the scale of the road, screen structures, traffic and lighting, and help integrate the Scheme into the existing landscape pattern.
LSC.15	Landscape	Support green infrastructure objectives through use of planting to link into existing field boundary vegetation to provide screening and integration into the local pattern and character, as well as connection of existing wildlife corridors.
LSC.16	Landscape	Use of locally indigenous native and non-native plants as appropriate to reflect the distinctive local character, such as the replication of willow plantation on valley floors.
LSC.17	Landscape	Consideration of balance between screening the Scheme, and retention of views out from the highway through breaks in the planting to help create a sense of place and stimulating visual experience for vehicle travellers where practicable.
DRA.01	Drainage	All existing and new culverts, inlets and outlets are to be reviewed at detailed design stage to determine whether or not screening will be required to intercept debris.
BPR.01	Borrow Pit Restoration	Borrow pits would be shaped to form natural gradients with rounded contours to integrate into the surrounding landscape.
BPR.02	Borrow Pit Restoration	Where waterbodies remain after excavation these would include scalloped edges and shallow slopes or berms for safety, and to improve access and egress for animals.
BPR.03	Borrow Pit Restoration	Planting within the restored borrow pits would include woodland planting where

Reference no.	Theme	Design Principle
		screening is required along with intermittent tree and scrub planting and individual trees in species-rich grassland.
BPR.04	Borrow Pit Restoration	Boundaries with new or gapped up hedgerows with trees would tie into existing features to help restore the landscape pattern and maintain ecological connectivity.
BPR.05	Borrow Pit Restoration	Aquatic and wetland planting would be introduced at the margins of waterbodies along with areas of wet woodland planting
UT.01	Utilities	Directly impacted elements of the existing statutory undertakers' network will be identified, avoided, or protected where feasible.
UT.02	Utilities	If scheme design and construction interfaces cannot be resolved via engineered protection measures, utilities will be diverted by fabrication, testing and commissioning of new sections of distribution mains (i.e. diversions).
UT.03	Utilities	Diversions will be situated within easements, negotiated with local landowners, local authorities, and National Highways. Easement extents depend upon the size and pressure of the diversion.
UT.04	Utilities	Diversions will have minimum nominal cover to the crown of pipes and cables.
UT.05	Utilities	Diversions will be designed and constructed at suitable depths to avoid direct interface with the proposed highways scheme, associated infrastructure and mitigation measures e.g. replacement habitat areas