HS2

October 2018

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)

Working Draft Environmental Statement

Volume 2: Community Area report

LA06: Stapleford to Nuthall

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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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A report prepared for High Speed Two (HS2) Limited:

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Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES deposited in November 2013, followed by ESs deposited with Additional Provisions to that Bill in 2014 and 2015. The Phase One hybrid Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in July 2017.

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2.

Structure of the HS2 Phase 2b working draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown in Figure 1.

This working draft ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

The working draft ES comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of the following, identified at a stage in the ongoing design and environmental assessment:

- the Proposed Scheme and the reasonable alternatives studied;
- the likely significant beneficial and adverse effects of the Proposed Scheme;
- the means to avoid or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

This contains terms and abbreviations, including units of measurement, used throughout the working draft ES.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques, based on a stage in the ongoing design;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase, based on a stage in the ongoing design; and

- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied post July 2017 are reported in the relevant Volume 2: Community area reports.

Volume 2: Community area reports and map books

These cover the following community areas:

- western leg: MA01 Hough to Walley's Green; MA02 Wimboldsley to Lostock Gralam; MA03 Pickmere to Agden and Hulseheath; MA04 Broomedge to Glazebrook; MA05 Risley to Bamfurlong; MA06 Hulseheath to Manchester Airport; MA07 Davenport Green to Ardwick; MA08 Manchester Piccadilly Station; and
- eastern leg: LA01 Lea Marston to Tamworth; LA02 Birchmoor to Austrey; LA03 Appleby Parva to Ashby-de-la-Zouch; LA04 Coleorton to Kegworth; LA05 Ratcliffe-on-Soar to Long Eaton; LA06 Stapleford to Nuthall; LA07 Hucknall to Selston; LA08 Pinxton to Newton and Huthwaite; LA09 Stonebroom to Clay Cross; LA10 Tibshelf to Shuttlewood; LA11 Staveley to Aston; LA12 Ulley to Bramley; LA13 Ravenfield to Clayton; LA14 South Kirkby to Sharlston Common; LA15 Warmfield to Swillington and Woodlesford; LA16 Garforth and Church Fenton; LA17 Stourton to Hunslet; and LA18 Leeds Station.

The reports provide the following information for each area, as identified at a stage in the ongoing design and environmental assessment:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a summary of the local alternatives considered since the Government's announcement of the preferred route in July 2017;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- where possible, the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in a separate Volume 2: Community area map book. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-00, LV-02, LV-03, and LV-04, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: Community area reports), operational sound contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: Community area reports) and maps showing key surface water and groundwater features (Map Series WR-01 and WR-02, to be read in conjunction with Section 15, Water resources and flood risk of the Volume 2: Community area reports).

In addition to the community areas detailed above, reports are provided for community areas within which electrification of a section of the MML is proposed: MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station. These reports are provided at an earlier stage of the design and environmental assessment process, following the amendment of the route of the Proposed Scheme to include the electrification of a section of the MML between Clay Cross and Sheffield Midland Station. This would enable high speed trains to connect to Chesterfield and Sheffield as part of the Proposed Scheme. They include for each area:

- an overview of the area;
- a description of the proposed works within the area, based on a stage in the ongoing design;
- an outline of potential effects; and
- an overview of stakeholder engagement and consultation to be carried out as part of the EIA process.

Mitigation measures have not been identified at this stage of the design and environmental assessment process in relation to the likely effects arising from construction and operation of the Proposed Scheme for the MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station areas. Any required mitigation measures will be reported in the formal ES. In addition, any required environmental monitoring during operation of the Proposed Scheme will be reported in the formal ES.

Volume 3: Route-wide effects

This describes the effects that are likely to occur at a geographical scale greater than the community areas described in the Volume 2: Community area reports, based on a stage in the ongoing design and environmental assessment.

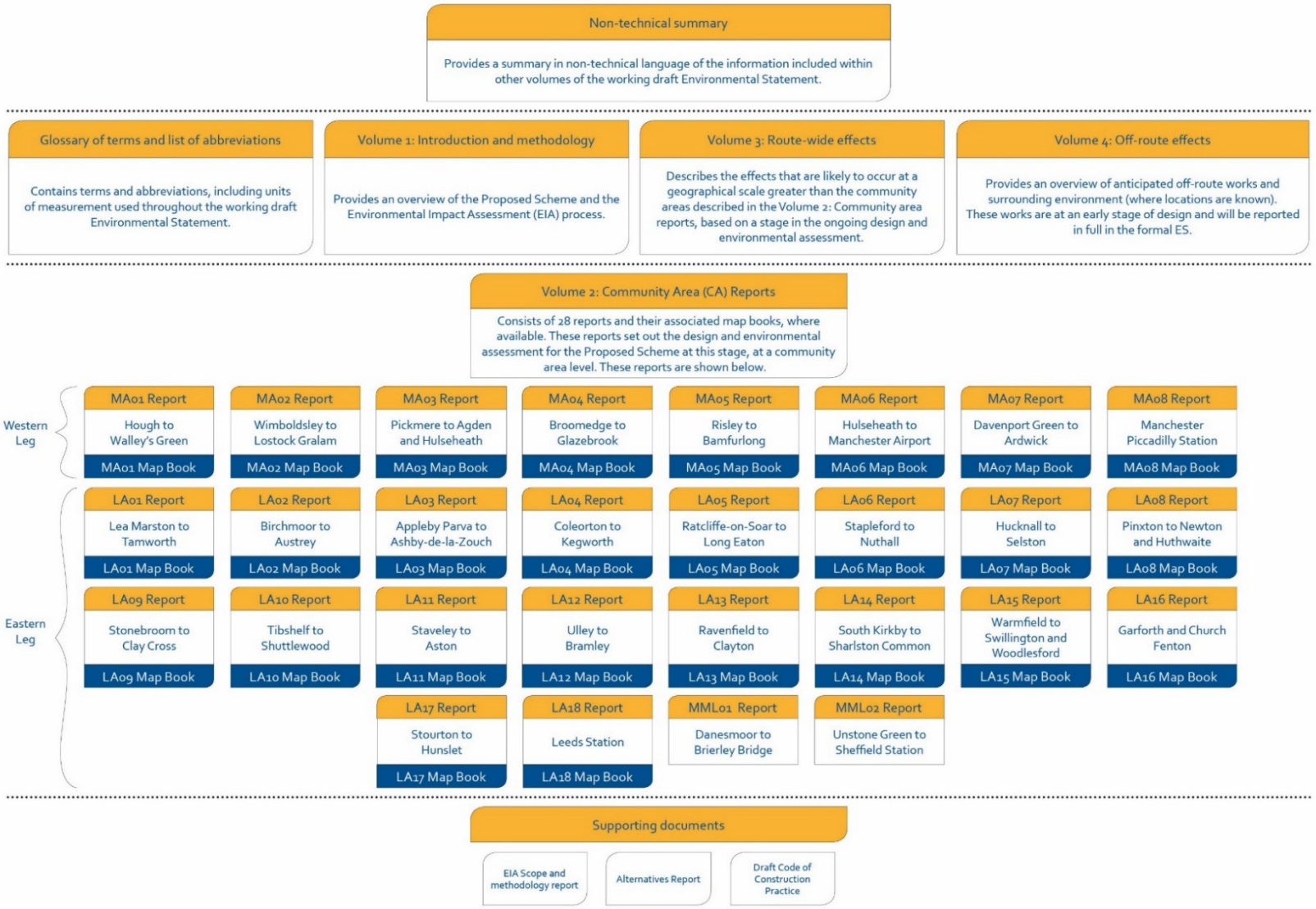
Volume 4: Off-route effects

This provides an overview of anticipated off-route works and surrounding environment (where locations are known). These works are at an early stage of design and will be reported in full in the formal ES.

Supporting documents

- EIA Scope and Methodology Report: this outlines the scope and methodology adopted for the EIA. HS2 Ltd consulted on a draft of the EIA Scope and Methodology Report (SMR) between July and September 2017. This updated version takes into consideration comments received, where appropriate, in addition to changes required as a result of updates to legislation or industry best practice guidance.
- Alternatives report: this describes the evolution of the Proposed Scheme and the reasonable alternatives considered at this stage of the design, at the strategic, route-wide, route corridor and local levels.
- Draft Code of Construction Practice (CoCP): this sets out measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Figure 1: Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, East Midlands and South Yorkshire will be served by high speed trains running at speeds of up to 360 kilometres per hour (kph) (225 miles per hour (mph)).

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London - West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.

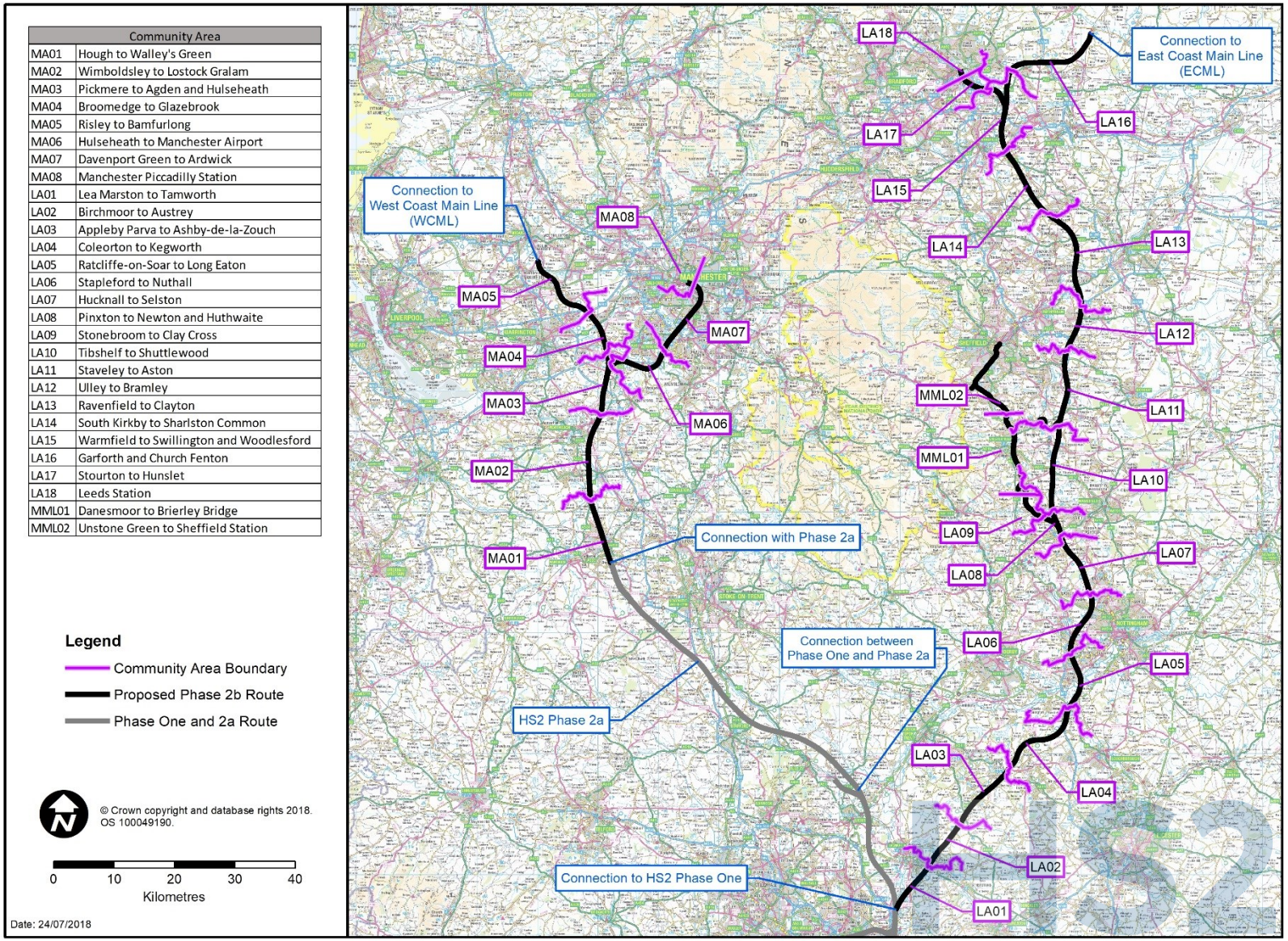
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the 'Y network'.

1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands - Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.

1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the 'western leg'), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as 'the eastern leg'). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Stapleford to Nuthall area (CA number LA06) which is located on the eastern leg of the Proposed Scheme.

Figure 2: The HS2 Phase 2b route and community areas



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point-in-time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Stapleford to Nuthall area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.

1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.

1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)[1,2]. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.

1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;

[1] *Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment)*, House of Commons
[2] House of Lords, 2005, Standing Orders of the House of Lords - Private Business, The Stationery Office

- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

1.3.2 Each environmental topic section (Sections 4 to 15) comprises:

- an introduction to the topic;
- a description of the existing environmental baseline within the community area;
- a description of the impacts or likely significant environmental effects identified to date arising during construction and operation of the Proposed Scheme; and
- a description of any proposed mitigation and monitoring measures that have been identified to date to address any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Stapleford to Nuthall area are provided in a separate corresponding document entitled Volume 2: LA06 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: LA06 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope

[3] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Stapleford to Nuthall area covers an approximately 10.7km section of the Proposed Scheme passing through the parishes of Sandiacre, Stanton-by-Dale, Trowell, Strelley and Nuthall. It falls within the local authority areas of Broxtowe Borough Council (BBC), Erewash Borough Council (EBC), Nottinghamshire County Council (NCC), Derbyshire County Council (DCC) and Nottingham City Council (NoCC).

2.1.2 The B5010 Derby Road through Sandiacre and Stapleford forms the southern boundary of this section. The northern boundary of the area is located in Nuthall parish, and follows the route of the existing Greasley Footpath 18.

2.1.3 As shown in Figure 3, the Ratcliffe-on-Soar to Long Eaton area (LA05) lies to the south and the Hucknall to Selston area (LA07) lies to the north.

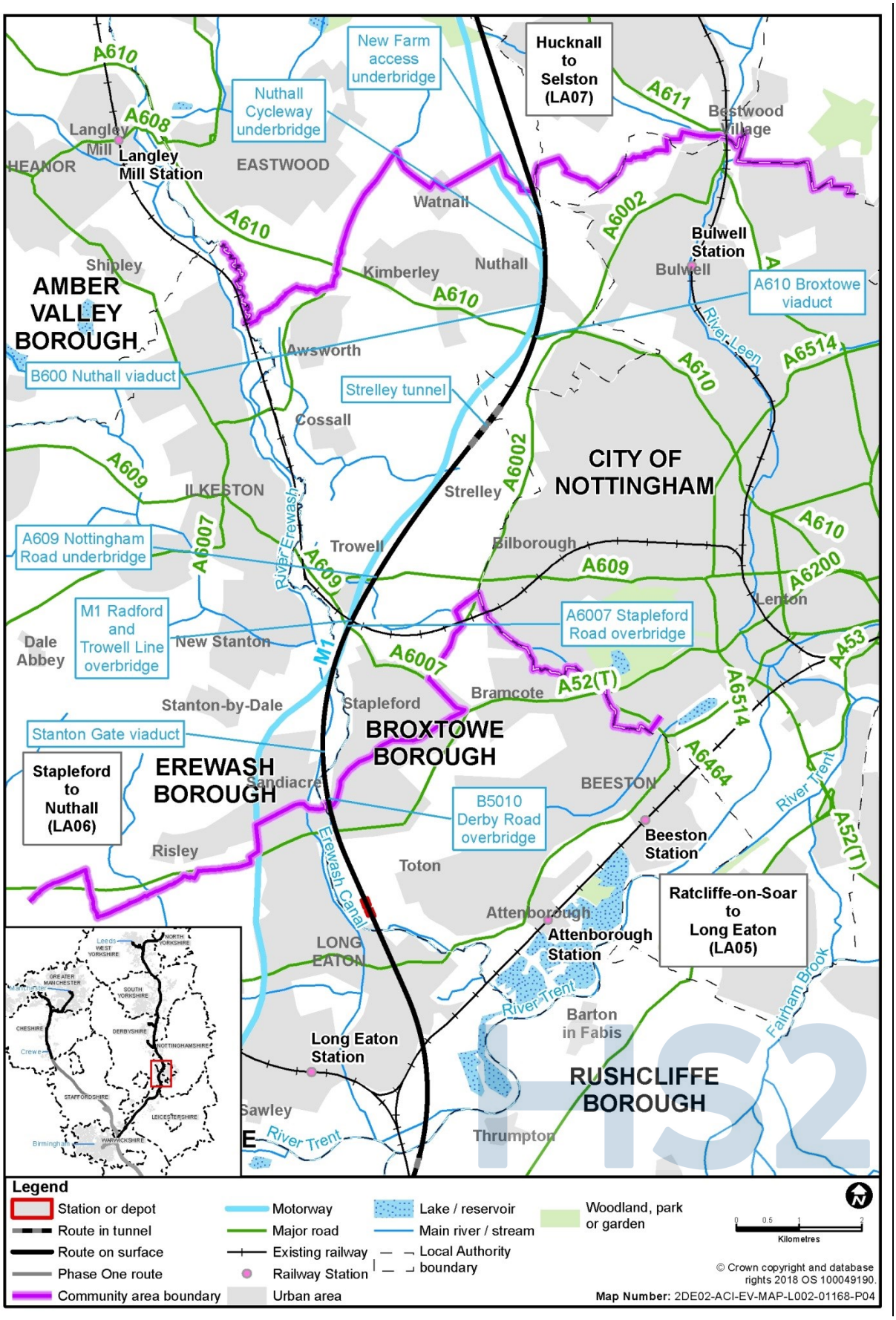
Settlement, land use and topography

2.1.4 The southern part of the Stapleford to Nuthall area comprises built-up areas and includes the settlements of Long Eaton, Stapleford, Sandiacre and Trowell. To the north, the area becomes more rural, with villages including Strelley and Nuthall and a scattering of isolated dwellings and farmsteads, predominantly following the alignment of the M1 past Stanton Gate. Much of the area is characterised by gently undulating lowland and river valley landscapes, with occasional floodplain pasture at lower levels along the River Erewash.

2.1.5 In the south of the Stapleford to Nuthall area, land use consists of residential properties, light industrial and manufacturing uses and recreational open space associated with the River Erewash and Erewash Canal. Land use around Stanton Gate and Stanton-by-Dale is predominantly agricultural. Further north of Stanton Gate, land use consists mainly of residential, light industrial and commercial land uses and the Trowell Motorway Services. At the northern end of the Stapleford to Nuthall area, the landscape is predominantly rural in character, with agriculture being the main land use between Trowell and Nuthall.

2.1.6 The River Erewash floodplain, situated at approximately 35m above Ordnance Datum (AOD), is a dominant topographic feature on the visual landscape that defines the land use in this area. Residential areas to the west and east of the Proposed Scheme are located on higher ground as the topography rises towards Trowell in the north, approximately 80m AOD at the A609 Nottingham Road. The highest point of the Stapleford to Nuthall area is near Strelley, at approximately 120m AOD.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The M1 runs through the Stapleford to Nuthall area, connecting Long Eaton in the south with Hucknall in the north, and provides connections to London and Leeds. The M1 is accessed from junction 25 and junction 26. The Proposed Scheme would generally run parallel to the east of the M1 between Stanton Gate and Nuthall.

2.1.8 The A610 Nuthall Road and A609 Nottingham Road are the principal east-west routes through the area connecting Derby and Nottingham. The A6007 Stapleford Road also provides an east-west connection between Stapleford to Trowell and Nottingham.

2.1.9 Other local roads in the Stapleford to Nuthall area include the B5010 Derby Road, Station Road, Stanton Gate, and Waterloo Lane in the south. Main Street and Lawrence Drive in Strelley to the north are minor local roads that connect the M1 via the A6002 Woodhouse Way and the A610 to the east of the route of the Proposed Scheme.

2.1.10 The Erewash Valley Line passes through the southern section of the Stapleford to Nuthall area, providing connections between Derby and Chesterfield. At Trowell, the route of the Proposed Scheme would pass over a branch of the Radford and Trowell Line that connects Nottingham to Ilkeston.

2.1.11 The route of the Proposed Scheme would cross several public rights of way (PRoW) including bridleways and public footpaths, which provide important links between scattered dwellings and surrounding villages. The Erewash Valley Trail and Nutbrook Trail, both multi-user promoted routes[4], pass through Long Eaton, Toton and Sandiacre. The Nutbrook Trail forms part of the longer National Cycle Network Route 67.

Socio-economic profile

2.1.12 Within the BBC area, there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of business (14%), with construction (13%) followed by retail (10%) and manufacturing (8%).

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the BBC area was 88% (61,800 people), and unemployment was 4.8%.

2.1.14 The survey also reported that 37% of BBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 7% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentrations of community facilities are in the larger settlements of Sandiacre and Stapleford. Stanton-by-Dale, Trowell, Strelley and Nuthall are villages

[4] Promoted ProW refers to those PRoW which are 'promoted' destinations in their own right as a recreational resource
[5] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[6] The proportion of working age (16-64 year olds) residents that are in employment

and hamlets that are located closer to the Proposed Scheme, and have fewer local services.

2.1.16 Sandiacre is a town located towards the south of the Stapleford to Nuthall area. The town includes community facilities such as Sandiacre library, Ladycross Infant School, Cloudside Junior School, sports and leisure facilities, St. Giles' Church and a number of public houses.

2.1.17 Community facilities in Stapleford include places of worship, educational facilities including George Spencer Academy and Fairfield Primary Academy, social clubs, community centres, healthcare facilities shops and public houses. Other facilities include the Peatfield allotment located to the east of Stapleford and allotments along the B5010 Nottingham Road.

2.1.18 Notable community facilities in Stanton-by-Dale include public houses, churches and the Erewash Golf Club.

2.1.19 Community facilities in Trowell include St. Helen's Church, Trowell Parish Hall, Trowell Church of England Primary School, Pit Lane Recreation Area and a public house.

2.1.20 Notable community facilities in Strelley include the All Saints' Church and Broad Oak public house and a cafe at Strelley Hall.

2.1.21 Community facilities in Nuthall include places of worship, Nuthall Parish Council Temple Centre which provides sports and community facilities, healthcare facilities, primary schools and Oldmoor Lodge public house.

Recreation, leisure and open space

2.1.22 There are a number of recreational facilities in the Stapleford to Nuthall area, including recreational grounds to the west of Stapleford, known locally as Cow's Fields that provide public access to the Stapleford Footpath 13 and recreational routes along the River Erewash. The Hickings Lane Recreation Ground, Pasture Road Recreation Ground and the Queen Elizabeth Park are located within Stapleford. The Hayworth Road Recreation Ground, Sandiacre Park, St. Giles Park and Stony Clouds Local Nature Reserve (LNR) are located within Sandiacre.

2.1.23 The Erewash Valley Trail is a 48km promoted[7] recreational route for walkers and cyclists, which follows the former Nottingham Canal in Trowell.

2.1.24 Basil Russell Playing Fields caters for a range of sport and leisure activities in Nuthall. The Nuthall Railway Multi-User Access Route, a promoted PRoW, is mainly used by pedestrians, cyclists and horse riders and runs from A6002 Low Wood Road in Bulwell to Buckingham Way in Nuthall.

[7] Promoted route refers to those PRoW which are 'promoted' destinations in their own right as a recreational resource

Policy and planning context

Planning framework

2.1.25 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

2.1.26 The following local policies have been considered and referred to where appropriate to the assessment:

- the adopted (saved) policies of the Broxtowe Local Plan (2004)[8] and the Greater Nottingham (Broxtowe Borough, Gedling Borough and Nottingham City) Aligned Core Strategy Part One Local Plan (2014)[9];
- the adopted (saved) policies of the Nottingham (City) Local Plan (2005)[10] and the Greater Nottingham (Broxtowe Borough, Gedling Borough and Nottingham City) Aligned Core Strategy Part One Local Plan (2014)[11];
- the adopted (saved) policies of the Erewash Borough Local Plan (2005)[12] and the Erewash Core Strategy (2014)[13];
- the Nottinghamshire Minerals Local Plan (2005)[14] and the Derby and Derbyshire Minerals Local Plan (2000)[15];
- the Nottinghamshire and Nottingham Waste Core Strategy (2013)[16] and the saved policies of the Nottinghamshire and Nottingham Waste Local Plan (2007)[17] and the Derby and Derbyshire Waste Local Plan (2005)[18]; and
- the Nottinghamshire Local Transport Plan 2011-2026 (2011)[19], the Nottingham Local Transport Plan Strategy 2011-2026 (2011)[20] and the Derbyshire Local Transport Plan 2011 -2026 (2011)[21].

[8] Broxtowe Borough Council (2004) *Broxtowe Local Plan*. Available online at: https://www.broxtowe.gov.uk/for-you/planning/planning-policy/2004-broxtowe-local-plan/
[9] Broxtowe Borough Council (2014). *Greater Nottingham (Broxtowe) Aligned Core Strategy (Part One)*. Available online at: https://www.broxtowe.gov.uk/for-you/planning/planning-policy/part-1-local-plan-core-strategy/
[10] Nottingham City Council (2005). *Nottingham City Local Plan*. Available online at: https://www.nottinghamcity.gov.uk/localplan#adopted
[11] Nottingham City Council (2014). *Greater Nottingham (Nottingham) Aligned Core Strategy (Part one)*. Available online at: https://www.nottinghamcity.gov.uk/planning-and-building-control/planning-policy/the-local-plan-and-planning-policy/
[12] Erewash Borough Council (2005). *Erewash Borough Local Plan*. Available online at: https://www.erewash.gov.uk/media/files/Erewash_Local_Plan_Saved_Policies_2005_amended_2014_v2.pdf
[13] Erewash Borough Council (2014). Erewash Core Strategy. Available online at: https://www.erewash.gov.uk/media/files/Final_Core_Strategy_-_Version_for_Website.pdf
[14] Nottinghamshire County Council (2005). *Nottinghamshire Minerals Local Plan*. Available online at: http://www.nottinghamshire.gov.uk/media/110638/mineral-local-plan.pdf
[15] Derbyshire County Council and Derby City Council (2000). *Derby and Derbyshire Minerals Local Plan*. Available online at: https://www.derbyshire.gov.uk/images/DD%20MLP%20Part%201_tcm44-189489.pdf
[16] Nottinghamshire County Council, (2013). *Replacement Waste Local Plan, Part 1: Waste Core Strategy*. Available online at: http://www.nottinghamshire.gov.uk/planning-and-environment/waste-development-plan/part-1-waste-core-strategy
[17] Nottinghamshire County Council and Nottingham City Council (2007). *Nottinghamshire and Nottingham Waste Local Plan*. Available online at: http://www.nottinghamshire.gov.uk/media/109140/wastelocalplan.pdf
[18] Derbyshire County Council and Derby City Council (2005). *Derby and Derbyshire Waste Local Plan*. Available online at: https://www.derbyshire.gov.uk/images/D%26D%20WLP_tcm44-189473.pdf
[19] Nottinghamshire County Council (2011). *Nottinghamshire Local Transport Plan 2011-2026*. Available online at: http://www.nottinghamshire.gov.uk/media/123040/local-transport-plan-strategy.pdf
[20] Nottinghamshire City Council (2011). *Nottingham Local Transport Plan 2011-2026*. Available online at: https://www.nottinghamcity.gov.uk/transport-parking-and-streets/transport-strategies-funding-bids-and-current-consultations/
[21] Derbyshire County Council (2011). *Derbyshire Local Transport Plan 2011-2026*. Available online at: https://www.derbyshire.gov.uk/images/LTP3%202011_tcm44-161132.pdf

2.1.27 Emerging policies are not considered as part of this assessment unless a development plan has been submitted to the Secretary of State for examination.

Committed development

2.1.28 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme.

2.1.29 Where it is likely that committed developments will have been completed by 2023, these will be identified as 'future baseline' schemes and taken into account in the formal ES.

2.1.30 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.31 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

Ongoing design development

2.1.32 Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting from this will be reported in the formal ES. The main areas of design development being considered include:

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route for private means of access;
- auto-transformer station locations; and
- refinement of construction compound locations and site haul routes.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Stapleford to Nuthall area, including the proposed environmental mitigation measures that have been identified to date. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9.

2.2.2 Land required for operation of the Proposed Scheme is described in this section and is shown on Volume 2: LA06 Map book, Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: LA06 Map book, Map Series CT-05.

Overview

2.2.3 The Proposed Scheme through the Stapleford to Nuthall area would be approximately 10.7km long and lie within the BBC, EBC, NCC, DCC and NoCC areas.

2.2.4 The route through the Stapleford to Nuthall area would extend from the B5010 Derby Road in the south and to Hucknall in the north.

2.2.5 This section of route is illustrated on maps CT-06-434b to CT-06-441a in the Volume 2: LA06 Map Book.

2.2.6 All dimensions in the sections below are approximate.

2.2.7 In the Stapleford to Nuthall area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 2.8km (Stanton Gate, A610 Broxtowe and B600 Nuthall viaducts);
- cuttings for a total length of approximately 2.2km (Trowell, Trowell Moor No.1, Trowell Moor No.2, Mellors Way and New Farm Wood cuttings);
- embankments for a total length of approximately 4.5km (Erewash, Trowell, Trowell Moor (No. 1 and No. 2), Broxtowe (No. 1 and No.2), Nuthall and Westville embankment); and
- tunnels for a total length of approximately 1.2km (Strelley tunnel including portals).

2.2.8 The Proposed Scheme is described in four separate sections below.

2.2.9 In general, features are described along the route of the Proposed Scheme from south to north along the route and from west to east for features that cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA06 Map Book.

B5010 Derby Road to Stanton Gate viaduct

2.2.10 The route of the Proposed Scheme would continue from the Ratcliffe-on-Soar to Long Eaton area (LA05), north-east towards Stapleford. It would pass underneath the realigned B5010 Derby Road before continuing on a viaduct over the River Erewash, Erewash Valley Line and Erewash Canal to Stanton Gate.

2.2.11 This section of route is illustrated on maps CT-06-434b to CT-06-435b in the Volume 2: LA06 Map Book.

2.2.12 Key features of this 1.8km section would include:

- a section of Toton trough, 200m in length and continuing from the Ratcliffe-on-Soar to Long Eaton area (LA05). The Toton trough[22] would be an open cut concrete channel that would be up to 3m below ground level through which the route of the Proposed Scheme would pass. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 4m in height, running along the top of the cutting, to provide acoustic screening for residents of Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, 2m in height, running along the top of the cutting, to provide acoustic screening for residents in Sandiacre (see Volume 2: Map CT-06-434b, C5 to G5);
- Erewash embankment, 280m in length and up to 6m in height. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 4m in height, running along the top of the embankment, to provide acoustic screening for residents of Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, 3m in height, running along the top of the embankment, to provide acoustic screening for residents in Sandiacre (see Volume 2: Map CT-06-434b, G5 to I5);
- an area of landscape mitigation planting to the east of the Erewash embankment to provide visual screening of the Proposed Scheme to residents in Stapleford (see Volume 2: Map CT-06-434b, H5 to I5);
- realignment of Stapleford Footpath 13, to the east and west of the route of the Proposed Scheme, which would increase in length by 125m. The footpath would be realigned to run under the Proposed Scheme (see Volume 2: Map CT-06-434b, H4 to I6);
- a section of Stanton Gate viaduct, 1.3km in length and up to 18m in height in this section. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of the viaduct, to provide acoustic screening for residents in Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, 2m in height, running along the top of the viaduct, to provide acoustic screening for residents in Sandiacre (see Volume 2: Map CT-06-434b, I5 to Volume 2: Map CT-06-435a, E5);
- an area of landscape mitigation planting and woodland habitat creation to the east and west of the Proposed Scheme to provide visual screening of the Proposed Scheme to residents in Sandiacre and Stapleford, and provide replacement habitat (see Volume 2: Map CT-06-434b, G5 to J6);

[22] Toton trough is a u-shaped cutting where the route of the Proposed Scheme passes below ground level

- two areas of grassland habitat creation to the east and west of the Proposed Scheme, to provide replacement habitat (see Volume 2: Map CT-06-434b, H4 to J7);
- a balancing pond and pumping station for railway drainage would be located to the east the Erewash Valley Line (see Volume 2: Map CT-06-435b, C7 to D7);
- a balancing pond for railway drainage would be located to the east the route of the Proposed Scheme and Stanton Gate auto-transformer station (see Volume 2: Map CT-06-435b, E6); and
- Stanton Gate auto-transformer station, on the western side of the route of the Proposed Scheme, 250m south of Stanton Gate. Access would be provided via an access track off Stanton Gate (see Volume 2: Map CT-06-435b, E5).

2.2.13 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.14 Construction of this section would be managed from the East Midland Hub station main compound located in the Ratcliffe-on-Soar to Long Eaton area (see Volume 2: LA05, Ratcliffe-on-Soar to Long Eaton), the B5010 Derby Road satellite compound located in the Ratcliffe-on-Soar to Long Eaton area (see Volume 2: LA05, Ratcliffe-on-Soar to Long Eaton) and the Stanton Gate main compound which are described in Section 2.3, and shown on map CT-05-435b in the Volume 2: LA06 Map Book.

Stanton Gate viaduct to A6007 Stapleford Road

2.2.15 The route would continue north on the Stanton Gate viaduct passing over Stanton Gate, the Erewash Canal, the Erewash Valley Line and the River Erewash and to the east of a section of the existing M1 to the west of Trowell. The route continues on the Stanton Gate viaduct to cross the A6007 Stapleford Road.

2.2.16 This section of route is illustrated on maps CT-06-435b to CT-06-436 in the Volume 2: LA06 Map Book.

2.2.17 Key features of this 1.1km section would include:

- continuation of the Stanton Gate viaduct, 1.1km in length (in this section) and up to 18m in height. On the east side of the route of the Proposed Scheme, up to 2m in height, running along the top of the viaduct, to provide acoustic screening to residents in Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, 2m in height, running along the top of the viaduct, to provide acoustic screening for residents in Stanton Gate (see Volume 2: Map CT-06-435a, F5 to Volume 2: Map CT-06-436 D5);
- areas of woodland habitat creation, to the south of Stanton Gate and to the east and west of the Proposed Scheme, to provide replacement habitat (see Volume 2: Map CT-06-435b, C5 to G7);

- realignment of the M1, 90m to the west of its existing alignment at ground level and on an embankment, approximately 2.1km in length and up to 6m in height. The embankment would include associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape and incorporate an area of woodland habitat creation. The following features are associated with the realignment of the M1 (see Volume 2: Map CT-06-435b, E1 to Volume 2: Map CT-06-436, F4):
  - widening of the M1 Ilkeston Road underbridge on its current alignment by 20m with a height clearance of 6m to accommodate the realigned M1 (see Volume 2: Map CT-06-435b, F3 to G3);
  - construction of a new M1 Erewash Canal underbridge 70m north-west of its current location underneath the realigned M1 (see Volume 2: Map CT-06-435b, H5);
  - construction of a new M1 Stanton Works Railway Branch underbridge 60m north-west of its current location for under the realigned M1 (see Volume 2: Map CT-06-435b, H5);
  - construction of a new M1 Erewash Valley Line underbridge 100m north-west of its current location under the realigned M1 (see Volume 2: Map CT-06-435b, I5);
  - construction of a new M1 River Erewash underbridge, 100m north-west of its current location under the realigned M1. The realigned Trowell Footpath 5 would pass under the new underbridge (see Volume 2: Map CT-06-435b, I6 to J5);
  - realignment of Trowell Footpath 5, 70m north-west of its current alignment for 410m, crossing the route of the Proposed Scheme on the M1 River Erewash underbridge (see Volume 2: Map CT-06-435b, H6 to J5); and
  - reconstruction of the M1 A6007 Stapleford Road overbridge, 25m west of its current location that passes over the existing M1 approximately 100m to the south of the Radford and Trowell Line (see Volume 2: Map CT-06-436, D5).
- an area of grassland habitat creation, to the east and west of the Proposed Scheme to the south of the M1, to provide replacement habitat (see Volume 2: Map CT-06-435b, G6 to H5);
- an area of landscape mitigation planting and woodland habitat creation to the east and west of the Proposed Scheme and to the east of the Erewash Valley Line, to provide visual screening of the realigned M1 and the Proposed Scheme for residents in Stanton Gate, Stapleford and Trowell (see Volume 2: Map CT-06-435b, F1 to J7);
- replacement floodplain storage area on the eastern side of the Proposed Scheme, adjacent to the Stanton Gate viaduct (see Volume 2: Map CT-06-435b, H6 to J7);
- a balancing pond for railway drainage would be located to the east of the route of the Proposed Scheme and to the south of Stapleford. Access would be provided off Dawn View in Stapleford (see Volume 2: Map CT-06-436, B6); and

- Stanton-by-Dale Footpath 21 would cross underneath the Proposed Scheme along its existing alignment to the east of the Erewash Canal and underneath the M1 through the M1 Erewash Canal underbridge (see Volume 2: Map CT-06-435b, G5 to J4).

2.2.18 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.19 Construction of these sections would be managed from the Stanton Gate main compound and A6007 Stapleford Road satellite compound, which are described in Section 2.3, and shown on map CT-05-435b and CT-05-436 in Volume 2: LA06 Map Book.

A6007 Stapleford Road to Strelley tunnel

2.2.20 The route would continue north on the Stanton Gate viaduct over the Radford and Trowell Line before passing onto the Trowell embankment over the realigned A609 Nottingham Road to the east of Trowell. The route would continue north on the Trowell embankment and in cutting before entering Strelley tunnel to the east of the M1.

2.2.21 This section of route is illustrated on maps CT-06-436 to CT-06-438 in the Volume 2: LA06 Map Book.

2.2.22 Key features of this 3.2km section of the Proposed Scheme would include:

- continuation of the Stanton Gate viaduct, 200m in length in this section (2.6km in total) and up to 18m in height, crossing over the Radford and Trowell Line. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along a the top of the viaduct, to provide acoustic screening to residents in Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of the viaduct, to provide acoustic screening to residents in Trowell (see Volume 2: Map CT-06-436, D5 to E5);
- an area of landscape mitigation planting and woodland habitat creation to the east and west of the Proposed Scheme and to the east of the Erewash Valley Line, to provide visual screening of the realigned M1 and the Proposed Scheme for residents in Stanton Gate, Stapleford and Trowell (see Volume 2: Map CT-06-436, B6 to E4);
- M1 Radford and Trowell Line overbridge, 10m west of its existing alignment. The Radford and Trowell Line would pass underneath the Proposed Scheme to the east (see Volume 2: Map CT-06-436, D5);
- Trowell retained earthworks, 140m in length and up to 10m in height, which would be located along the western side of the Proposed Scheme to avoid encroaching on the realigned M1 (see Volume 2: Map CT-06-436, E5);

- Trowell embankment, 820m in length and up to 20m in height with associated landscaping earthworks and landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape and incorporating wetland and woodland habitat creation at the toe of the embankment. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of a section of the embankment, to provide acoustic screening to residents in Stapleford. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of a section of the embankment, to provide acoustic screening to residents in Trowell (see Volume 2: Map CT-06-436, E5 to H6);
- a balancing pond for railway drainage would be located to the east the route of the Proposed Scheme. Access would be provided via an access track from Derbyshire Avenue on the west side of the M1 in Trowell. The access track would pass through an existing M1 underpass and through the Trowell Footpath 6 accommodation underbridge (see Volume 2: Map CT-06-436, F6);
- realignment of Trowell Footpath 6, 30m south of its current alignment for 100m, crossing the route of the Proposed Scheme through Trowell Footpath 6 accommodation underbridge. This underbridge would also provide agricultural accommodation access for Rectory Farm (see Volume 2: Map CT-06-436, F4 to F7);
- Trowell Footpath 6 accommodation underbridge, 60m in length and up to 10m below track level (see Volume 2: Map CT-06-436, F5 to F6);
- Trowell Moor south culvert, which would be located 250m south of the A609 Nottingham Road and would be used to provide surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-436, G5 to G6);
- closure of Trowell Footpath 23 and Trowell Footpath 24 where it would cross the route of the Proposed Scheme along the former Nottingham Canal. Users would be diverted along the A609 Nottingham Road and along Trowell Footpath 10 and Trowell Footpath 11(see Volume 2: Map CT-06-436, F7 to I7);
- closure of part of Trowell Footpath 10 along the former Nottingham Canal where it would cross the route of the Proposed Scheme. Users would be diverted along footways adjacent to the A609 Nottingham Road for 40m and along Trowell Footpath 11 before re-joining the existing Trowell Footpath 10 (see Volume 2: Map CT-06-436, G6 to I7);
- A609 Nottingham Road underbridge, 30m in length and up to 8m below track level (see Volume 2: Map CT-06-436, H5);
- an area of landscape mitigation planting and woodland habitat creation to the east of the Proposed Scheme, adjacent to the A609 Nottingham Road, would provide visual screening to residents and recreational users along the A609 Nottingham Road (see Volume 2: Map CT-06-436, I6 to J6);
- a balancing pond for highway drainage would be located to the west of the route of the Proposed Scheme and to the north of the A609 Nottingham Road. Access would be provided off the A609 Nottingham Road. There would also be landscape

mitigation planting to the west to provide visual screening to residents and recreational users along the A609 Nottingham Road (see Volume 2: Map CT-06-436, H5);

- Trowell Moor north culvert, 75m north of the A609 Nottingham Road, which would provide surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-436, H5 to H6);
- a balancing pond for railway drainage to the west of the Proposed Scheme. Access would be provided via an access track from the A609 Nottingham Road (see Volume 2: Map CT-06-436, J5);
- Trowell cutting, 220m in length, up to 35m in width and up to 3m in depth (see Volume 2: Map CT-06-436, I6 to Volume 2: Map CT-06-437, B5);
- Trowell Moor embankment No.1, 430m in length and up to 10m in height, with associated landscaping earthworks and landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape and incorporating an area of woodland habitat creation (see Volume 2: Map CT-06-437, B5 to D5);
- Trowell drain culvert, which would pass under Trowell embankment No. 1, for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-437, C5 to C6);
- accommodation access for Uplands Farm, located to the west of the route of the Proposed Scheme will be provided at the Trowell drain culvert (see Volume 2: Map CT-06-437, C5 to C6);
- realignment of Waterloo Lane, on an embankment 700m in length and up to 11m in height. There would also be landscape mitigation planting to the east and west to aid landscape integration and provide visual screening of the Proposed Scheme to users of the Trowell Service Area. The realigned Waterloo Lane would cross the route of the Proposed Scheme on the Waterloo Lane overbridge up to 12m above track level. The realignment of Waterloo Lane would include one new culvert, Waterloo Lane culvert south, to allow an existing unnamed watercourse to flow through the realigned Waterloo Lane on its existing alignment (see Volume 2: Map CT-06-437, C7 to E4);
- permanent realignment of Trowell Bridleway 13 from its existing alignment along Waterloo Lane to tie into the realigned Waterloo Lane. (see Volume 2: Map CT-06-437, C7 to E4);
- a balancing pond for highway drainage to the east of the route of the Proposed Scheme and to the west of the realigned Waterloo Lane Access would be provided via an existing access track off the disused section of Waterloo Lane (see Volume 2: Map CT-06-437, D7);
- Trowell Moor cutting No.1, 1.1km in length, 70m in width and up to 8m in depth. There would also be landscape mitigation planting and hedgerow habitat creation to the east and west of the Proposed Scheme, adjacent to the cutting, to provide

visual screening and habitat connectivity around Trowell (see Volume 2: Map CT-06-437, E5 to J5);

- realignment of Trowell Bridleway 14, crossing the route of the Proposed Scheme on the Trowell Bridleway 14 overbridge, which would be 55m in length and up to 9m above track level. The realigned section of bridleway would re-join its existing alignment between the M1 and the route of the Proposed Scheme, before crossing underneath the M1 (see Volume 2: Map CT-06-437,F10 to G1);
- Trowell Moor embankment No.2, 270m in length and up to 5m in height. There would also be landscaping earthworks and landscape mitigation planting to the east and west of the Proposed Scheme to aid landscape integration in and around Strelley (see Volume 2: Map CT-06-438, B5 to C6);
- Catstone Hill culvert, which would be located 450m south of the existing Main Street in Strelley and would provide surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-438, B5 to B6);
- Strelley auto-transformer station located at Strelley, on the eastern side of the route of the Proposed Scheme. Access would be provided from Main Street in Strelley (see Volume 2: Map CT-06-438, C6);
- an area of grassland habitat creation to the west of the Proposed Scheme to the south of Strelley to provide replacement habitat (see Volume 2: Map CT-06-438, B5 to C5);
- two ecological mitigation ponds to the west of the route of the Proposed Scheme to provide replacement habitat for great created newt, with surrounding terrestrial habitat (see Volume 2: Map CT-06-438, C4 to C5); and
- Trowell Moor cutting No. 2, 140m in length, up to 85m in width and up to 8m in depth (see Volume 2: Map CT-06-438, C5 to C6).

2.2.23 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.24 Construction of this section would be managed from the Stanton Gate main construction compound, the Radford and Trowell Line satellite compound, the Trowell and A609 Nottingham Road satellite compound, the Trowell and Waterloo Lane satellite compound and Strelley tunnel south main compound which is described in Section 2.3, and shown on map CT-05-435a, map CT-05-436, map CT-05-437 and map CT-05-438 in the Volume 2: LA06 Map Book.

Strelley tunnel to Westville embankment

2.2.25 The Proposed Scheme would continue north into Strelley tunnel, passing under Main Street and the Strelley Conservation Area. North of the tunnel, the route would emerge at the Nottingham Business Park and then passes over the A610 Nuthall Road and the B600 Nottingham Road. The route would then enter Mellors Way cutting near

New Farm Wood Ancient Woodland before passing onto the Westville embankment and continuing to the end of the Stapleford to Nuthall area.

2.2.26 This section of route is illustrated on maps CT-06-438 to CT-06-440 in the Volume 2: LA06 Map Book.

2.2.27 Key features of this 4.6km section would include:

- a porous portal 150m in length at the southern end of Strelley tunnel, with a headwall of 30m in length and up to 15m in height at the northern end of the portal cutting (see Volume 2: Map CT-06-438, D5 to D6);
- an emergency refuge area, located adjacent to the southern portal of the Strelley tunnel. Access would be provided from Main Street in Strelley (see Volume 2: Map CT-06-438, C6);
- an area of woodland habitat creation and hedgerow habitat creation to the east and west of the Proposed Scheme to the south of Strelley, to provide replacement habitat (see Volume 2: Map CT-06-438, D5 to D6);
- Strelley tunnel (a mined tunnel), 900m in length and up to 33m in depth, passing under Strelley Conservation Area. The top of the tunnel would be up to 20m below existing ground level and track level would be up to 31m below ground level (see Volume 2: Map CT-06-438, D6 to I5);
- a porous portal 150m in length at the northern end of Strelley tunnel, with a headwall 30m in length and up to 15m in height at the southern end of the portal cutting. There would be woodland habitat creation to the east to provide visual screening for the residents of Strelley and the Nottingham Business Park and replacement habitat (see Volume 2: Map CT-06-438, I5 to I6);
- a tunnel services building for mechanical and electrical equipment located adjacent to the northern portal of the Strelley tunnel (see Volume 2: Map CT-06-438, I5);
- access road from Nottingham Business Park to an emergency refuge area adjacent to the northern portal of Strelley tunnel (see Volume 2: Map CT-06-438, J5);
- realignment of Lawrence Drive, 50m south of its existing alignment for 440m. The realigned road would cross over the porous portal at the northern end of Strelley tunnel on the Lawrence Drive overbridge at existing ground level(see Volume 2: Map CT-06-438, I7 to J4);
- Mellors Way cutting, 310m in length, 9m in depth and 90m in width. There would also be some landscape earthworks and landscape mitigation planting to improve landscape integration (see Volume 2: Map CT-06-438, J5 to Volume 2: Map CT-06-439, A5 to C6);
- realignment of Nuthall Footpath 8, 80m in length and up to 8m above track level. The realigned footpath would cross the route of the Proposed Scheme on the Nuthall Footpath 8 footbridge, 80m in length at ground level and up to 8m above track level) (see Volume 2: Map CT-06-439, A2 to B6);

- Broxtowe embankment No.1, 690m in length and up to 10m in height with associated landscape earthworks to help integrate the Proposed Scheme into the surrounding landscape and incorporating landscape mitigation planting and woodland habitat creation. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of the embankment, to provide acoustic screening to residents in New Nuthall. There would also be landscape mitigation planting to the east of the Proposed Scheme to provide visual screening for residents in Broxtowe (see Volume 2: Map CT-06-439, C6 to F6);
- an area of woodland habitat creation to the west of the Proposed Scheme to the south of the A610 to provide replacement habitat (see Volume 2: Map CT-06-439, C5 to F5);
- A610 Broxtowe viaduct, 100m in length and up to 11m in height. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 2m in height, running along the top of the viaduct, to provide acoustic screening to residents in New Nuthall (see Volume 2: Map CT-06-439, F6);
- Broxtowe embankment No.2, 510m in length and up to 9m in height, with associated landscaping planting to help integrate the Proposed Scheme into the surrounding landscape. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along the top of the embankment, to provide acoustic screening to residents in New Nuthall. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along the top of the embankment, to provide acoustic screening to residents in Nuthall. There would also be landscape mitigation planting to the east of the Proposed Scheme, adjacent to the Broxtowe embankment No. 2 to provide visual screening for residents in Broxtowe (see Volume 2: Map CT-06-439, G6 to I6);
- an area of public realm to the east of the Proposed Scheme to the south of the B600 Nottingham Road, to provide replacement playing fields and public open space (see Volume 2: Map CT-06-439, H6 to I7);
- a balancing pond for railway drainage to the east of the route of the Proposed Scheme and 50m to the south of the B600 Nottingham Road. Access would be provided from the B600 Nottingham Road (see Volume 2: Map CT-06-439, H7 to I8);
- B600 Nuthall viaduct, 120m in length and up to 14m in height, crossing the B600 Nottingham Road. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along the top of the viaduct, to provide acoustic screening to residents in New Nuthall. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along the top of the viaduct, to provide acoustic screening to residents in Nuthall (see Volume 2: Map CT-06-439, I6);
- Nuthall embankment, 490m in length and up to 8m in height with associated landscaping earthworks to help integrate the Proposed Scheme into the

surrounding landscaping and incorporating landscape mitigation planting on the eastern side of the Proposed Scheme. On the east side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along a section at the top of the embankment, to provide acoustic screening to residents in New Nuthall. On the western side of the route of the Proposed Scheme there would be a noise fence barrier, up to 3m in height, running along a section at the top of the embankment, to provide acoustic screening to residents in Nuthall. There would also be an area of landscape mitigation planting and woodland habitat creation to the east of the Proposed Scheme, to provide visual screening and replacement habitat (see Volume 2: Map CT-06-440a, A5 to C6);

- a balancing pond for railway drainage to the east of the route of the Proposed Scheme. Access would be provided from a construction traffic route (see Volume 2: Map CT-06-440a, B6 to C7);
- Nuthall Cycleway underbridge, 30m in length, which would cross under the route of the Proposed Scheme at existing ground level, with a height clearance of up to 2.8m below the route of the Proposed Scheme (see Volume 2: Map CT-06-440a, C6);
- New Farm Wood cutting, 320m in length and up to 3m in depth and 30m in width, through New Farm Wood Ancient Woodland. There would also be landscape earthworks, an area of landscape mitigation planting and woodland habitat creation to the east of the Proposed Scheme to the south of New Farm Wood Ancient Woodland, to provide visual screening and replacement habitat (see Volume 2: Map CT-06-440a, C6 to E6);
- an area of woodland habitat creation to the west of the Proposed Scheme and to the south of New Farm Wood Ancient Woodland to provide replacement habitat (see Volume 2: Map CT-06-440a, C7);
- realignment of New Farm access road, 300m to the south-west of its existing alignment and passing under the Proposed Scheme at the New Farm access underbridge. The realigned access road would be 740m in length (see Volume 2: Map CT-06-440a, F9 to H6);
- New Farm access underbridge, 25m in length, which would cross under the route of the Proposed Scheme with a height clearance of up to 5.8m below the route of the Proposed Scheme (see Volume 2: Map CT-06-440a, F6);
- a balancing pond for highway drainage to the east of the route of the Proposed Scheme and 250m to the east of the New Farm access road. Access to the pond would be provided via an access track from the New Farm access road (see Volume 2: Map CT-06-440a, F9);
- New Farm Wood auto-transformer station, on the western side of the route of the Proposed Scheme, 95m east of the M1. Access would be provided via an access track from Blenheim Park Road in the Blenheim Industrial Area and the realigned New Farm access road underbridge. There would also be an area of landscape mitigation planting and woodland habitat creation to the east of the Proposed

Scheme to provide visual screening and replacement habitat creation around the auto-transformer station (see Volume 2: Map CT-06-440, F6);

- an area of landscape mitigation planting and woodland habitat creation to the east of the Proposed Scheme to provide visual screening and replacement habitat (see Volume 2: Map CT-06-440a, D7 to G7);
- a balancing pond for railway drainage to the east of the route of the Proposed Scheme and 50m to the east of the New Farm access road (see Volume 2: Map CT-06-439, G7);
- Westville embankment, 880m in length and up to 6m in height in this section (total length of the Westville embankment that extends into the subsequent section is 4km). There would be an area of landscape earthworks, an area of landscape mitigation planting and woodland habitat creation to the east and west of the Proposed Scheme to aid landscape integration and provide replacement habitat (see Volume 2: Map CT-06-440a, F6 to J5); and
- realignment of Greasley Footpath 18, 45m east of its current alignment for 90m, crossing the route of the Proposed Scheme at the Greasley Footpath 18 underbridge (see Volume 2: Map CT-06-440a, J5 to J6).

2.2.28 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.29 Construction of this section would be managed from the Strelley tunnel south main compound, the Strelley tunnel north main compound, the Nuthall satellite compound and the Westville embankment satellite compound, which are described in Section 2.3, and shown on map CT-05-438, map CT-05-439 and map CT-05-440 in the Volume 2: LA06 Map Book.

Demolitions

2.2.30 As set out in Volume 1, as the design develops, it is likely that not all the properties reported within the assessment would need to be demolished, for example where not all of the land is required for permanent works.

2.2.31 At this stage of the design development, it is anticipated that demolition of 34 existing residential properties, 38 commercial/business properties (including outbuildings) and 12 other structures would be required to construct the Proposed Scheme in the Stapleford to Nuthall area. These could be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Stapleford to Nuthall area. The construction arrangements

described in this section provide the basis for the assessment presented in this working draft ES.

2.3.2 Land used only for construction purposes would be restored as agreed with the owner of the land and the relevant planning authority once the construction works in that area are complete.

2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2.

2.3.4 During the construction phase, public roads and PRoW routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRoW wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRoW may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.

2.3.5 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

2.3.6 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[23] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

[23] HS2 Ltd (2017). Community Engagement Framework. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625971/hs2_community_engagement_framework.pdf

- to set out how HS2 Ltd and its contractors would undertake community engagement during the construction of the project;
- to provide clarity and reassurance to HS2 Ltd's stakeholders about how community engagement activity would be managed; and
- to help HS2 Ltd be a good neighbour to local communities, including by providing accurate and timely information about construction works and offering opportunities to influence them, where appropriate.

2.3.9 A draft CoCP has been prepared and is published alongside this document, in Supporting document: Draft Code of Construction Practice. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

2.3.10 Building and preparing the Proposed Scheme for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul route, site preparation and enabling works; main earthworks and structure works; tunnelling; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

2.3.11 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP including:

- the approach to environmental management during construction and the role of the CoCP (Section 2);
- working hours (Section 5);
- management of construction traffic (Section 14); and
- handling of construction materials (Section 15).

Advance works

2.3.12 General information about advance works can be found in Volume 1, Section 6. Advance works will be required before the main construction works commence and typically include:

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

2.3.13 Construction of the Proposed Scheme would require the following broad types of engineering works along the entire length of the route, and within land adjacent to the route:

- civil engineering works, including earthworks such as embankments and cuttings and erection of bridges and viaducts; and
- works to install, test and commission railway systems, including track, overhead line equipment, communications and signalling equipment and traction power supply.

2.3.14 The construction of track and railway systems works in open areas would include the installation of track form, rails, infill material, minor drainage works, and installation of electrification, signalling and communication equipment.

2.3.15 The construction of the Proposed Scheme would be divided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main compounds or satellite compounds. Satellite compounds are generally smaller than main compounds. Compounds would either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

- space for the storage of bulk materials;
- space for the receipt, storage and loading and unloading of excavated material;

- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.

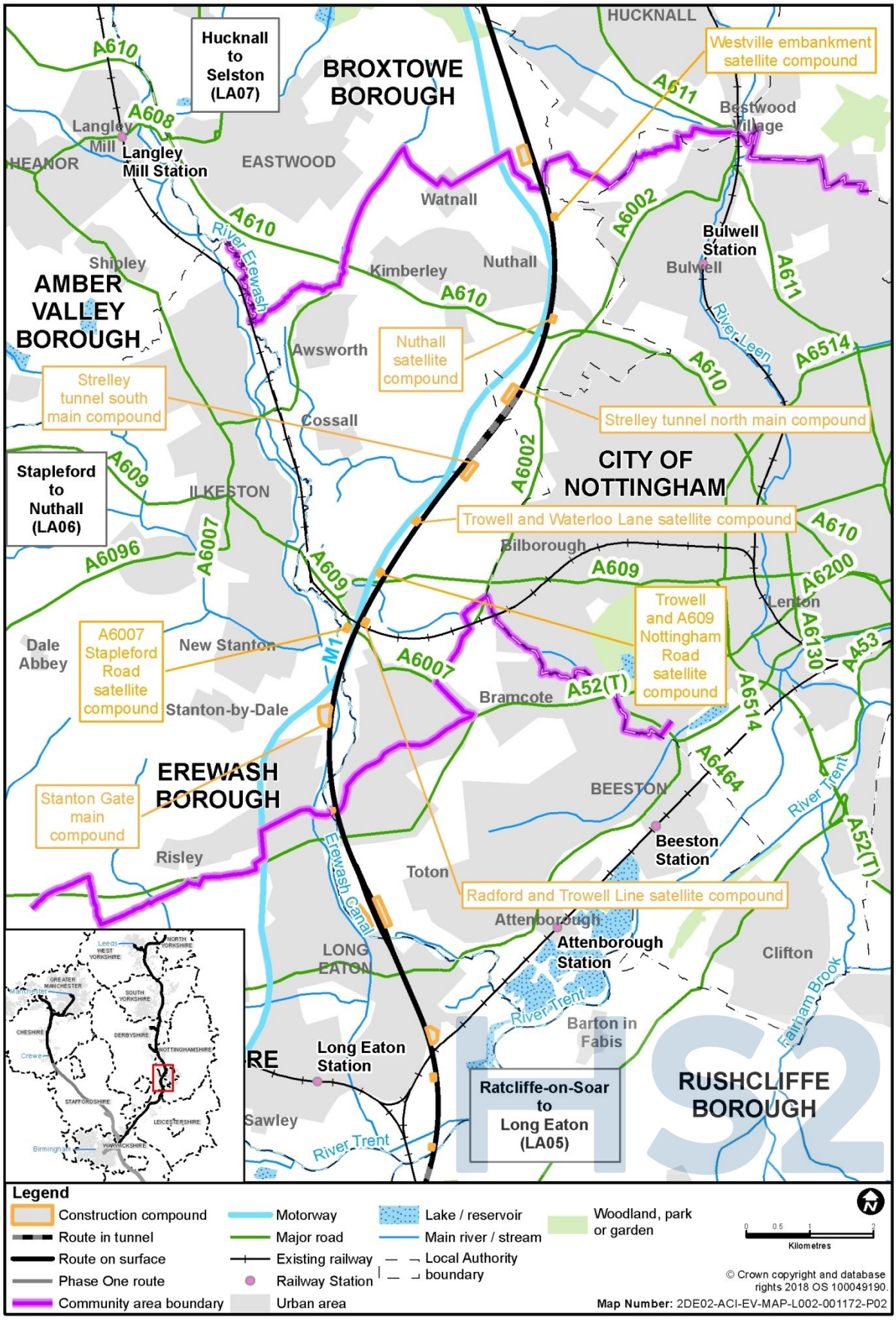
2.3.18 Three main civil engineering compounds, the Stanton Gate main compound, the Strelley tunnel south main compound and Strelley tunnel north main compound would be located in the Stapleford to Nuthall area. Strelley tunnel south main compound would manage four satellite compounds and Strelley tunnel north main compound would manage two satellite compounds.

2.3.19 Six civil engineering satellite compounds would be located in the Stapleford to Nuthall area, three of which would continue to be used as railway installation satellite compounds following the completion of civil engineering works at those compounds.

2.3.20 The railways systems satellite compounds in the Stapleford to Nuthall area would be managed from main compounds located in the Appleby Parva to Ashby-de-la-Zouch area (LA03) (see Volume 2: Community area report LA03, Appleby Parva to Ashby-de-la-Zouch) and the Coleorton to Kegworth area (LA04) compound (see Volume 2: Community area report LA04, Coleorton to Kegworth).

2.3.21 The location of construction compounds in the Stapleford to Nuthall area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA06 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Stapleford to Nuthall area



2.3.22 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles.

2.3.24 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

2.3.25 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Where reasonably practicable, movements between the construction compounds and the working areas would be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.26 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Stapleford to Nuthall area are described in the subsequent sections of this report.

2.3.27 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.

2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes.

Construction compounds

2.3.29 This section provides a summary of the works to be managed from the construction compounds in the Stapleford to Nuthall area, as illustrated in Figure 5 and Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

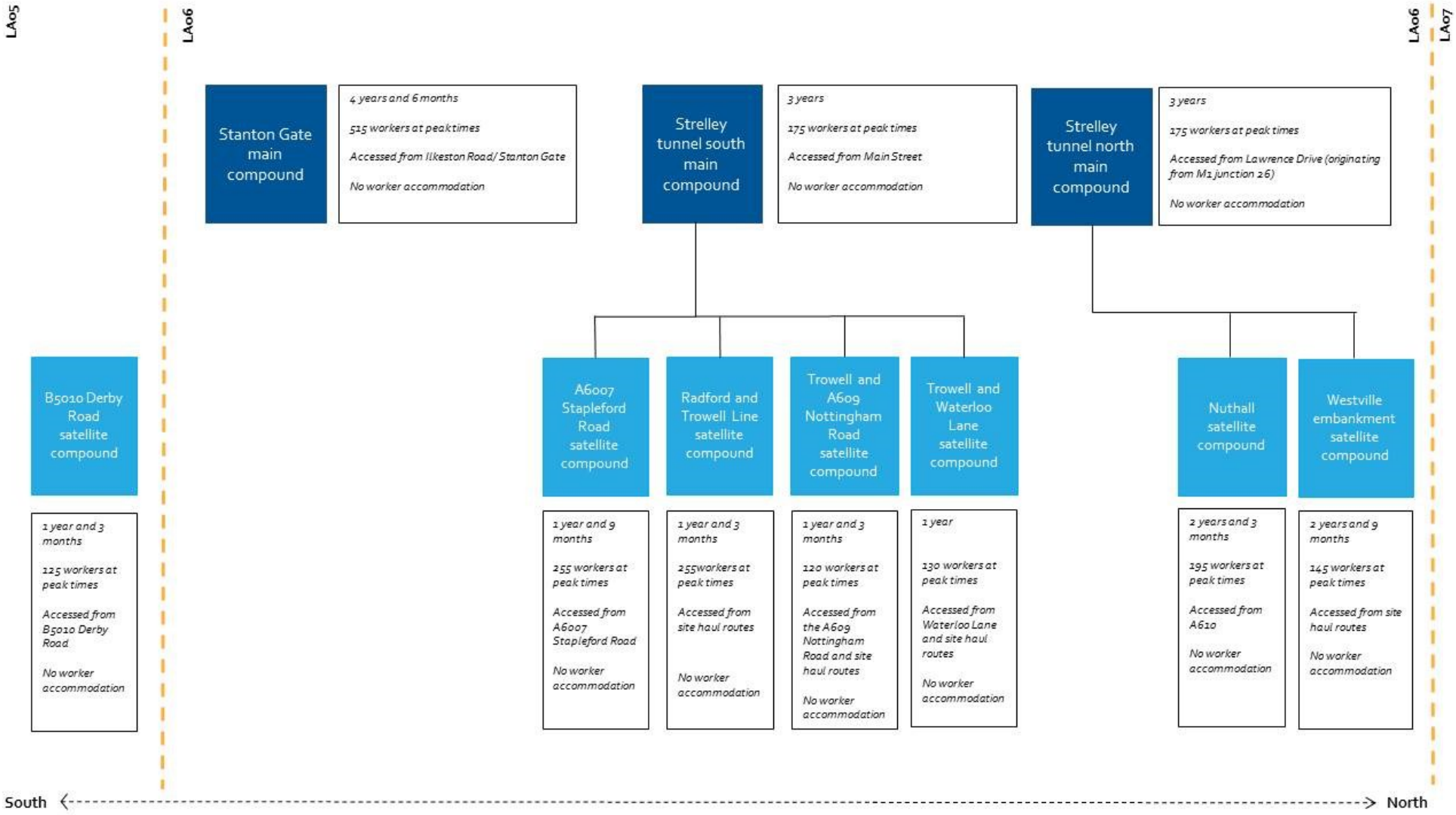
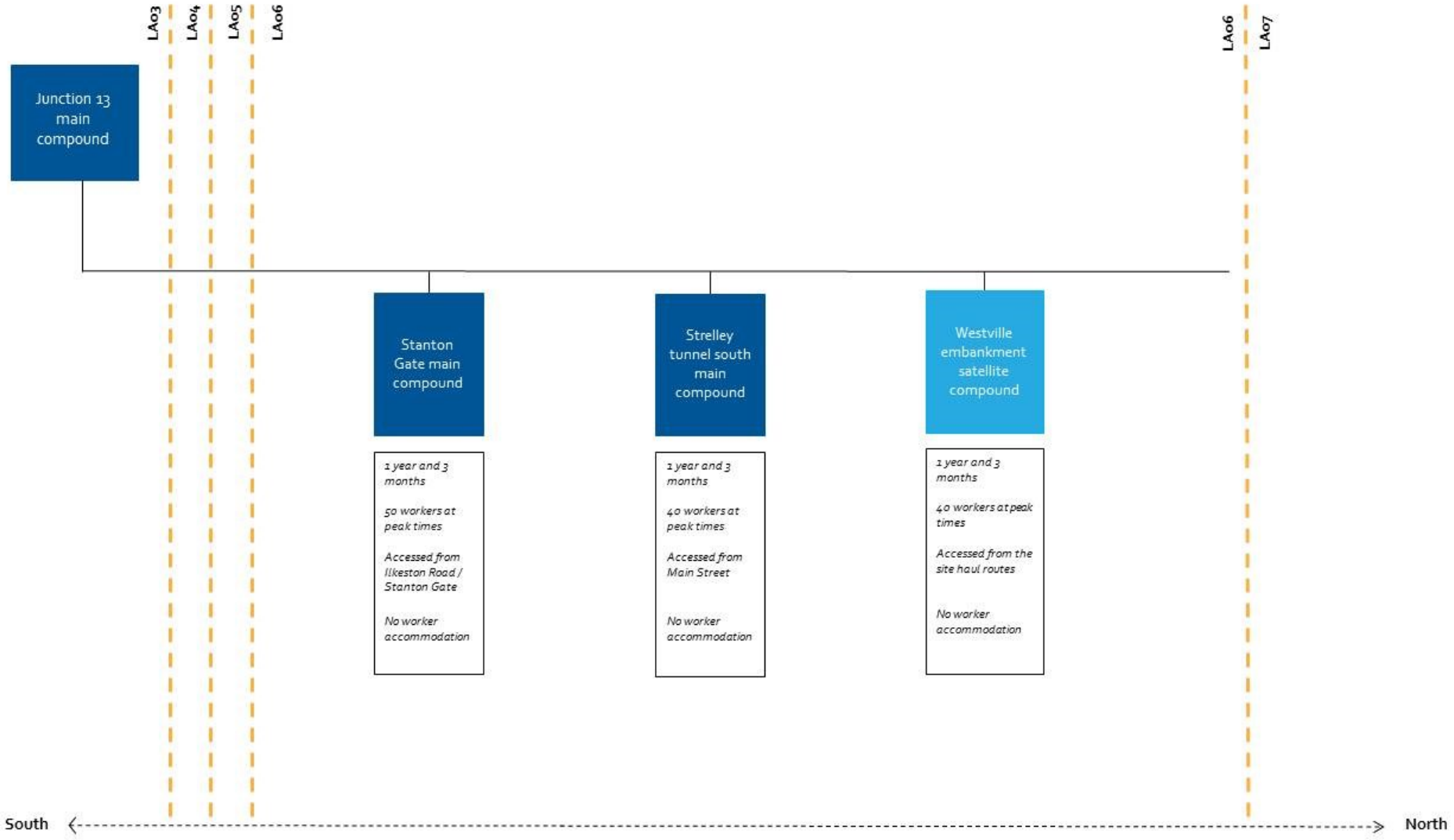


Figure 6: Construction compounds for railway systems works



B5010 Derby Road satellite compound

2.3.30 The B5010 Derby Road satellite compound would be located within the Ratcliffe-on-Soar to Long Eaton area (LA05). It is described in Volume 2: LA05, Ratcliffe-on-Soar to Long Eaton.

2.3.31 The works to be managed from this compound would require demolition of the following buildings within the Stapleford to Nuthall area, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the B5010 Derby Road satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Five residential properties on Station Road	Station Road, Sandiacre	B5010 Derby Road overbridge
Two residential properties on Rutland Grove	Rutland Grove, Sandiacre	B5010 Derby Road overbridge
11 residential properties on Derby Road	B5010 Derby Road, Stapleford	B5010 Derby Road overbridge
Commercial		
Seven commercial properties on Station Road	Station Road, Sandiacre	B5010 Derby Road overbridge
Seven commercial properties on Derby Road	B5010 Derby Road, Stapleford	B5010 Derby Road overbridge
Other		
Signal hut	Toton Yard, Long Eaton	B5010 Derby Road overbridge

Stanton Gate main compound

2.3.32 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5 and Figure 6, for a period of four years and six months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works for a period of one year and three months.

2.3.33 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions required as a result of the works to be managed from the Stanton Gate main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	The Moorings, Stanton Gate, Stanton-by-Dale	Stanton Gate viaduct
Residential property	Ilkeston Road, Sandiacre	Stanton Gate viaduct
Commercial		
Three units at Canalside Industrial Estate	Ilkeston Road, Sandiacre	Stanton Gate viaduct
Commercial garage	Cloudside Garage, Ilkeston Road, Sandiacre	Stanton Gate viaduct
Other		
Tank	Golf Club Road, Stanton-by-Dale	Stanton Gate viaduct
Shed	Cloudside Farm, Ilkeston Road, Sandiacre	Stanton Gate viaduct

Two telecommunications masts	Stanton Gate, Stanton-by-Dale	Stanton Gate viaduct
Signal hut	Stanton Gate, Stanton-by-Dale	Stanton Gate viaduct

2.3.34 The Stanton Gate main compound would be used to manage the construction of the Stanton Gate viaduct, which would take four years and six months to complete.

2.3.35 The compound would be used to manage the construction of the following earthworks:

- Erewash embankment, which would take six months to complete;
- Trowell retained earthworks, which would take three years to complete; and
- Trowell embankment, which would take three years to complete.

2.3.36 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Stanton Gate viaduct would be located at this compound. (Volume 2: Map CT-05-435b, E4).

2.3.37 The compound would be used to manage the M1 realignment, which would take three years and six months to complete. The compound would also be used to manage construction of the following structures associated with the M1 realignment:

- widening of the M1 Ilkeston Road underbridge, which would take one year to complete;
- construction of a new M1 Erewash Canal underbridge, which would take one year to complete;
- construction of a new M1 Stanton Works Railway Branch underbridge, which would take one year to complete;
- construction of a new M1 Erewash Valley Line underbridge, which would take one year to complete; and
- construction of a new M1 River Erewash underbridge, which would take one year to complete.

2.3.38 The works to be managed from this compound would require the following works to PRoW:

- permanent realignment of Stapleford Footpath 13, to the east and west of the route of the Proposed Scheme. During construction, alternative routes would be provided for up to four years and six months to cover the duration of the construction works; and
- temporary diversion of the Sandiacre Footpath 19, Sandiacre Footpath 7, Sandiacre Footpath 16, Sandiacre Footpath 5, Sandiacre Footpath 24 and Sandiacre Footpath 6 to allow the construction of the Proposed Scheme. On completion of construction these footpaths would be reinstated to their original alignment and would pass underneath the Proposed Scheme. During construction, alternative

routes would be provided for up to four years and six months to cover the duration of the construction works.

2.3.39 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.40 Key railway systems works to be managed from this compound would include track and an auto-transformer station installation proposed within the main compound footprint. The track installation from the railway systems compound would take two years and six months to complete. The construction of the Stanton Gate auto-transformer station would take one year and three months to complete.

A6007 Stapleford Road satellite compound

2.3.41 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5.

2.3.42 No demolitions would be required as a result of the works to be managed from this compound.

2.3.43 The compound would be used to manage the construction of the M1 A6007 Stapleford Road overbridge, which would take one year and nine months to complete.

2.3.44 The works to be managed from this compound would require the permanent realignment of M1 A6007 Stapleford Road, which would take one year and nine months to complete.

2.3.45 The works to be managed from this compound would require the following works to PRoW:

- temporary diversion of the Trowell Footpath 5. On completion of construction, Trowell Footpath 5 would be permanently realigned to the east River Erewash and would then pass underneath the realigned M1 and the route of the Proposed Scheme along the M1 River Erewash underbridge. During construction alternative routes would be provided for up to three years and six months to cover the duration of the construction works; and

- temporary diversion of the Stanton-by-Dale Footpath 21, which would cross underneath the Proposed Scheme along its existing alignment to the east of the Erewash Canal and underneath the M1 through the M1 Erewash Canal underbridge. During construction alternative routes would be provided for up to three years and six months to cover the duration of the construction works.

2.3.46 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Radford and Trowell Line satellite compound

2.3.47 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5.

2.3.48 No demolitions would be required as a result of the works to be managed from this compound.

2.3.49 The compound would be used to manage the construction of the following bridges:

- M1 Radford and Trowell Line overbridge, which would take one year to complete; and
- Trowell Footpath 6 accommodation underbridge, which would take nine months to complete.

2.3.50 The works to be managed from this compound would require the temporary diversion of the Trowell Footpath 6 to the south of the area required for the construction of the Proposed Scheme. On completion of construction, Trowell Footpath 6 would be permanently reinstated to pass through the Trowell Footpath 6 accommodation underbridge. During construction, alternative routes would be provided for up to nine months to cover the duration of construction works.

2.3.51 The works to be managed from this compound would require the following works to watercourses and drainage:

- Trowell Moor south culvert to convey surface water under the route of the Proposed Scheme; and
- Trowell Moor north culvert to convey water under the Proposed Scheme.

2.3.52 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Trowell and A609 Nottingham Road satellite compound

2.3.53 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5.

2.3.54 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 3.

Table 3: Demolitions required as a result of the works to be managed from the Trowell and A609 Nottingham Road satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Four residential properties on A609 Nottingham Road	A609 Nottingham Road, Trowell	A609 Nottingham Road underbridge

2.3.55 The compound would be used to manage the construction of the A609 Nottingham Road underbridge and online realignment, which would take one year and three months to complete.

2.3.56 The works to be managed from this compound would require the following works to PRoW:

- permanent diversion of the Trowell Footpath 10 to the west of the area required for the construction of the Proposed Schemes. During construction, alternative routes would be provided for up to one year and three months to cover the duration of construction works of the A609 Nottingham Road underbridge and online realignment; and

- permanent closure of Trowell Footpath 23 and Trowell Footpath 24 to the east of area required for construction of the Proposed Scheme along the former Nottingham Canal. Users would be diverted along the A609 Nottingham Road and along Trowell Footpath 10 and Trowell Footpath 11.

2.3.57 The works to be managed from this compound would require the following works to watercourses and drainage:

- Trowell Moor north culvert to convey water under the Proposed Scheme; and
- Trowell drain culvert to convey water under the Proposed Scheme to the west of the area required for the construction of the Proposed Scheme.

2.3.58 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Trowell and Waterloo Lane satellite compound

2.3.59 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5.

2.3.60 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 4.

Table 4: Demolitions required as a result of the works to be managed from the Trowell and Waterloo Lane satellite compound

Description	Location	Feature resulting in the demolition
Other		
Police building	Trowell Motorway Services , M1, Trowell	Waterloo Lane overbridge

2.3.61 The compound would be used to manage the construction of the Waterloo Lane overbridge, which would take one year to complete.

2.3.62 The works to be managed from this compound would require the permanent realignment of Waterloo Lane, north of its existing alignment, which would take one year to complete.

2.3.63 The works to be managed from this compound would require the realignment of Trowell Bridleway 13 from its existing alignment along Waterloo Lane to tie into the realigned Waterloo Lane.

2.3.64 The Waterloo Lane culvert south would convey water through the realigned realignment of Waterloo Lane.

2.3.65 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Strelley tunnel south main compound

2.3.66 This compound would be used to manage civil engineering works, railway systems works and provide main compound support to four satellite compounds in the Stapleford to Nuthall area, as illustrated in Figure 5 for the civil engineering works.

2.3.67 No demolitions would be required as a result of the works to be managed from this compound.

2.3.68 The compound would be used to manage the construction of the Trowell Bridleway 14 overbridge, which would take nine months to complete.

2.3.69 The compound would be used to manage the construction of the following earthworks:

- Trowell cutting, which would take one year and three months to complete;
- Trowell Moor embankment No. 1, which would take one year and three months to complete;
- Trowell Moor cutting No. 1, which would take one year and six months to complete;
- Trowell Moor embankment No. 2, which would take one year and six months to complete; and
- Trowell Moor cutting No. 2, which would take one year and six months to complete.

2.3.70 The compound would be used to manage the construction of the Strelley tunnel and the Strelley tunnel south portal, which would take three years to complete.

2.3.71 The works to be managed from this compound are not anticipated to require works to public roads.

2.3.72 The works to be managed from this compound would require temporary diversion of the Trowell Bridleway 14 to the south of the area required for the construction of the Proposed Scheme. During construction, alternative routes would be provided for up to nine months to cover the duration of the constructions works for the Trowell Bridleway 14 overbridge.

2.3.73 The works to be managed from this compound would require works to Catstone Hill culvert to convey water under the Proposed Scheme.

2.3.74 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.75 Key railway systems works to be managed from this compound would include track and auto-transformer installation proposed within the main compound footprint. The track installation from the railway systems satellite compound would take one year to complete. The construction of the Waterloo Lane auto-transformer station would take one year and three months to complete.

Strelley tunnel north main compound

2.3.76 This compound would be used to manage civil engineering works and provide main compound support to two satellite compounds in the Stapleford to Nuthall area, as illustrated in Figure 5 for the civil engineering works.

2.3.77 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 5.

Table 5: Demolitions required as a result of the works to be managed from the Strelley tunnel north main compound

Description	Location	Feature resulting in the demolition
Commercial		
20 units at Nottingham Business Park	Nottingham Business Park, Nottingham	Strelley tunnel
Other		
Medical facility	Nottingham Business Park, Nottingham	Strelley tunnel
Four electricity sub-stations	Nottingham Business Park, Nottingham	Strelley tunnel

2.3.78 The compound would be used to manage the construction of the following bridges and viaducts:

- Lawrence Drive overbridge, which would take nine months to complete; and
- Nuthall Footpath 8 footbridge (the construction duration of which will be reported in the formal ES).

2.3.79 The compound would be used to manage the construction of the following earthworks:

- Mellors Way cutting, which would take two years and six months to complete;
- Broxtowe embankment No.1, which would take one year and nine months to complete;
- Broxtowe embankment No.2, which would take two years to complete;
- Nuthall embankment, which would take two years and nine months to complete; and
- New Farm Wood cutting, this would take one year to complete.

2.3.80 The compound would be used to manage the construction of the Strelley tunnel and the Strelley tunnel north portal, which would take three years to complete.

2.3.81 The works to be managed from this compound would require the permanent realignment of Lawrence Drive, south of its existing alignment, which would take nine months to complete.

2.3.82 The works to be managed from this compound would require temporary diversion of the Nuthall Footpath 8.

2.3.83 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Strelley tunnel north tunnelling facility and logistics area

2.3.84 A tunnelling facility and logistics area would occupy land within the Strelley north main compound and would be operational for three years (see Volume 2: Map CT-05-438, I4).

2.3.85 This would provide an area for the storage of bulk materials (aggregates, structural steel, and steel reinforcement) and for transfer of materials associated with the tunnelling works. This area would be managed from within the Strelley tunnel north main compound and accessed from the east from Lawrence Drive.

Nuthall satellite compound

2.3.86 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5.

2.3.87 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 6.

Table 6: Demolitions required as a result of the works to be managed from the Nuthall satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Nine residential properties on B600 Nottingham Road	B600 Nottingham Road, Nottingham	A610 Broxtowe viaduct/B600 Nuthall viaduct

2.3.88 The compound would be used to manage the construction of the following viaducts:

- A610 Broxtowe viaduct, which would take one year and nine months to complete; and
- B600 Nuthall viaduct, which would take two years and six months to complete.

2.3.89 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the A610 Broxtowe viaduct and B600 Nuthall viaduct would be located at this compound for a period of two years and six months, accessed from the A610 Nuthall Road (see Volume 2: Map CT-05-439, G7).

2.3.90 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Westville embankment satellite compound

2.3.91 This compound would be used to manage civil engineering works in the Stapleford to Nuthall area, as illustrated in Figure 5 for a period of two years and nine months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works for a period of one year and three months.

2.3.92 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 7.

Table 7: Demolitions required as a result of the works to be managed from the Westville embankment satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	New Farm Cottage, New Farm Lane, Nuthall	Westville embankment

2.3.93 The compound would be used to manage the construction of the following bridges and viaducts:

- Nuthall Cycleway underbridge, which would take nine months to complete;
- New Farm access underbridge, which would take nine months to complete; and
- Greasley Footpath 18 underbridge, which would take nine months to complete.

2.3.94 The compound would be used to manage the construction of the Westville embankment, which would take three years and six months to complete. Due to the length of this element it will likely be served by A6009 Long Lane satellite compound in the Hucknall to Selston area (LA07).

2.3.95 Transfer nodes are areas where bulk deliveries or excavated materials leave or enter the construction work sites from public roads.

2.3.96 There would be one transfer node within the Stapleford to Nuthall area occupying land adjacent to M1 junction 26 between A610 and B600 Nottingham Road. The transfer node would be located between the A610 and B600 Nottingham Road to the east of the Proposed Scheme (see Volume 2: LA06 Map Book, Map CT-05-439, H8 to H10).

2.3.97 The works to be managed from this compound would require the permanent realignment of New Farm existing farm accommodation access road, to the south-west of its existing alignment, and passing under the route of the Proposed Scheme at the New Farm access underbridge, which would take nine months to complete.

2.3.98 The works to be managed from this compound would require temporary diversion of Greasley Footpath 18. On completion of construction, Greasley Footpath 18 would be permanently realigned to pass underneath the Proposed Scheme through the Westville embankment.

2.3.99 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

2.3.100 Key railway systems works to be managed from this compound would include track and auto-transformer installation proposed within the main compound footprint. The track installation from the railway systems satellite compound would take one year to complete. The construction of the New Farm Wood auto-transformer station would take one year and three months to complete.

Construction waste and material resources

2.3.101 Excavated material generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.

2.3.102 Forecasts of the amount of construction, demolition and excavation waste (CDEW) that would be produced during construction of the Proposed Scheme are reported in Volume 3: Route-wide effects.

2.3.103 Local excess or shortfall of excavated material within the Stapleford to Nuthall area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

2.3.104 Forecasts of the amount of waste generated at temporary worker accommodation sites will be reported in the formal ES.

Commissioning of the railway

2.3.105 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It would be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

Construction programme

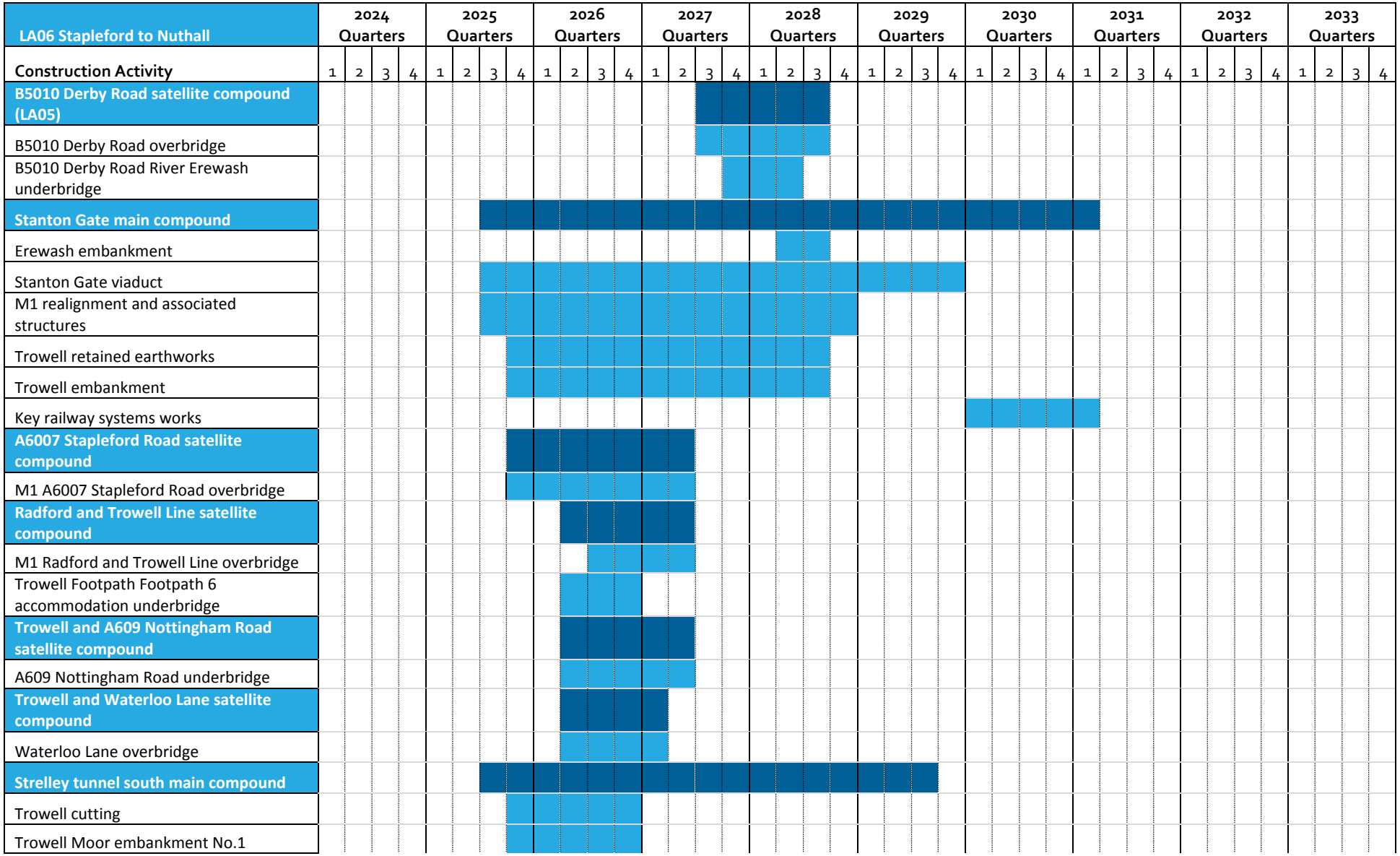
2.3.106 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

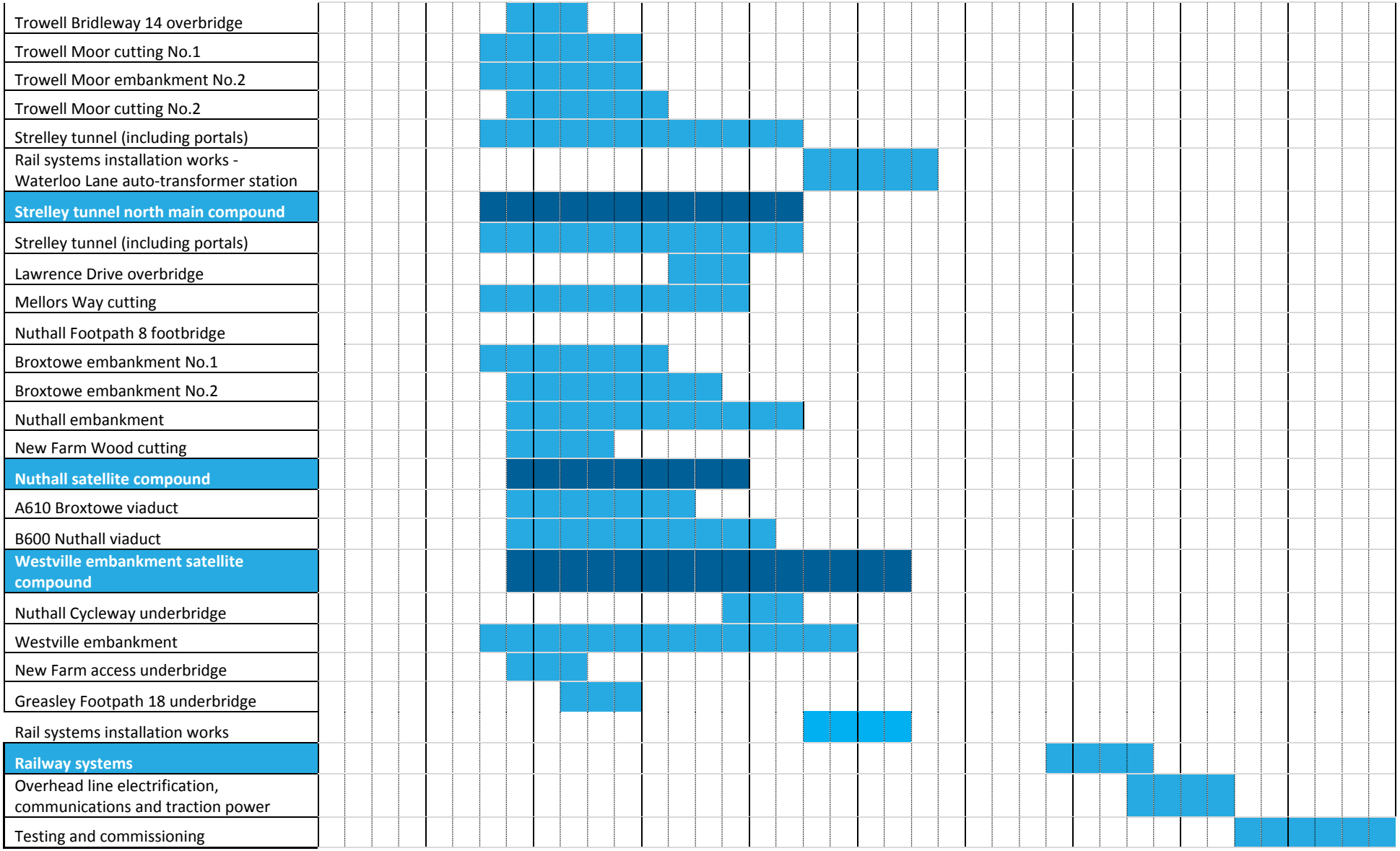
Monitoring during construction

2.3.107 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated undertaker and remedial action identified.

2.3.108 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on the monitoring procedures to be implemented prior to construction commencement.

Figure 7: Indicative construction programme between 2023 and 2033




Trowell Bridleway 14 overbridge
Trowell Moor cutting No.1
Trowell Moor embankment No.2
Trowell Moor cutting No.2
Strelley tunnel (including portals)
Rail systems installation works - Waterloo Lane auto-transformer station
Strelley tunnel north main compound
Strelley tunnel (including portals)
Lawrence Drive overbridge
Mellors Way cutting
Nuthall Footpath 8 footbridge
Broxtowe embankment No.1
Broxtowe embankment No.2
Nuthall embankment
New Farm Wood cutting
Nuthall satellite compound
A610 Broxtowe viaduct
B600 Nuthall viaduct
Westville embankment satellite compound
Nuthall Cycleway underbridge
Westville embankment
New Farm access underbridge
Greasley Footpath 18 underbridge
Rail systems installation works
Railway systems
Overhead line electrification, communications and traction power
Testing and commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Stapleford to Nuthall area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to 11 trains per hour each way passing through the Stapleford to Nuthall area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.

2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.

2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley depot in the Staveley to Aston area. Further information on the Staveley depot can be found in Volume 2: Community area report, Staveley to Aston (LA11).

Operational waste and material resources

2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste will be undertaken for the Proposed Scheme as a whole and reported in Volume 3: Route-wide effects of the formal ES.

2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects will also be reported in the formal ES.

Monitoring during operation

2.4.9 The nominated undertaker would be responsible for monitoring during operation of the Proposed Scheme. Proposed indicative area-specific monitoring measures for each environmental topic area are presented in Sections 4 to 15 of this report based on the current level of assessment.

2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

Strelley tunnel

2.5.1 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the route of the Proposed Scheme where it would pass Strelley. The route of the Proposed Scheme would pass under Strelley Hall in tunnel, before passing through Nottingham Business Park in deep cutting. Ongoing design development has allowed refinement of the design and construction methods for the Strelley tunnel.

2.5.2 The following three options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 0: the route would pass under Strelley Main Street in cut and cover tunnel that would be 810m in length, emerging in the Nottingham Business Park. The cut and cover tunnel would be up to 30m in depth through the Strelley Conservation Area;
- Option A: the route would pass under the Strelley Conservation Area in twin bored tunnels for a distance of 900m between Strelley Main Street and Nottingham Business Park. The structure would consist of two parallel circular tunnels with an internal diameter of 9m at a depth of up to 23m; and
- Option B: the route would pass under the Strelley Conservation Area following a similar alignment to the bored tunnels (Option A) between Strelley Main Street and Nottingham Business Park. This option would adopt mined tunnelling methods to construct two parallel tunnels, similar to Option A, to a depth of up to 23m over a distance of 900m.

2.5.3 Table 8 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 8: Consideration of local alternatives for route of the Proposed Scheme through Strelley

Option	Outcome of analysis	Further action/considerations
Option 0	Greater visual impacts on Strelley Conservation Area and associated listed buildings compared to the Proposed Scheme as a result of the large structures associated with the southern portal. Similar ecological impacts to Strelley Hall Park Local Wildlife Site and Nottingham City Local Wildlife Site compared to the Proposed Scheme. Confirmation required from survey and desk based information to confirm disturbance to protected species. Greater risk of encountering potentially contaminated material compared to Proposed Scheme due to requirement to excavate large volumes of material. Greater quantity of material requiring handling and removal compared to the Proposed Scheme arising from construction of deep cutting and other excavation works.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Greater traffic impacts during construction compared to the Proposed Scheme resulting from a higher volume of material handling associated with the cut and cover tunnel. Would require more commercial demolitions in Strelley around the southern and northern tunnel portals compared to the Proposed Scheme. Greater community impacts when compared to the Proposed Scheme as a result of the realignment of Main Street during construction, affecting access to businesses and local residents and impacting on local traffic. Construction duration would be longer compared to the Proposed Scheme due to the requirement to realign Main Street. Larger construction area required when compared to the Proposed Scheme as Option 0 requires significant cut depth and excavation during construction.	
Option A	Similar visual impacts to Strelley Conservation Area and associated listed buildings compared to the Proposed Scheme. Similar impact on Strelley Hall Park Local Wildlife Site and Nottingham City Local Wildlife Site compared to the Proposed Scheme, with potential loss of deciduous woodland and grassland habitat. Similar impacts on land quality compared to Proposed Scheme, due to less likelihood of encountering contamination resulting from less surface material exposure. Bored tunnel would require less material handling and removal than the Proposed Scheme. Traffic impacts during construction similar to the Proposed Scheme resulting from material handling associated with the bored tunnel. Would require a number of demolitions at the northern end of the tunnel, similar to the Proposed Scheme. Fewer community impacts associated with the realignment of Main Street, which would remain on its current alignment, similar to the Proposed Scheme. Construction duration would be longer compared to the Proposed Scheme due to the timescales required for bored tunnelling techniques. Larger construction area required when compared to the Proposed Scheme as Option A would require the use of tunnel boring machines.	This option will not be subject to further consideration.
Option B (the Proposed Scheme)	Less visual impacts on Strelley Conservation Area and associated listed buildings in comparison to Option A, and fewer in comparison to Option 0. Similar impact on Strelley Hall Park Local Wildlife Site and Nottingham City Local Wildlife Site compared to Option 0 and Option A, with potential loss of deciduous woodland and grassland habitat.	This is the selected option taken forward into the Proposed Scheme

Option	Outcome of analysis	Further action/considerations
	Less impact on land quality compared to Option 0 due to reduced likelihood of encountering contamination resulting from less surface material exposure, and similar impact compared to Option A. Lower volume of material requiring handling and removal when compared to Option 0, and similar to Option A. Fewer traffic impacts during construction compared to Option 0, and similar to Option A. Would avoid commercial demolitions in Strelley around the southern and northern tunnel portals associated with Option 0, however, similar to those required for Option A. Would avoid community impacts associated with the realignment of Main Street required for Option 0, similar to Option A. Shorter construction programme (by using four excavation faces) compared to Option 0 and Option A. Smaller construction area required compared to Option 0 and Option A as the Proposed Scheme would use conventional excavation plant and equipment.	

2.5.4 Option B was taken forward into the Proposed Scheme. The environmental considerations compared to Option A are similar, however, the methodology to construct Option B would require less land during construction and also during operation. This would cause less disruption to the Strelley Conservation Area, Strelley Hall Park Local Wildlife Site and Nottingham City Local Wildlife Site. Whilst the cost of Option B would be greater than Option 0 and Option A, the option would require fewer demolitions and would avoid the need to realign Main Street in Strelley. Further, Option B would have a shorter construction programme and therefore shorter duration of construction related environmental impacts compared to Option 0 and Option A.

3 Stakeholder engagement and consultation

3.1 Introduction

3.1.1 HS2 Ltd's approach to stakeholder engagement and consultation on the Proposed Scheme is set out in Volume 1, Section 3.

3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.

3.1.3 A variety of mechanisms have been used to enable an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders.

3.1.4 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft ES and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016, is provided in Table 9.

Table 9: Mechanisms and timeline of stakeholder engagement since route announcement

Engagement and consultation activity and mechanisms	Date
Phase 2b initial preferred route announcement	15 November 2016
Phase 2b route refinement and property consultations	15 November 2016 – 9 March 2017
Phase 2b information events to support the route refinement and property consultations	January -February 2017
Confirmation of Phase 2b route announcement	17 July 2017
Start date of engagement with local communities and stakeholders on the confirmed Phase 2b route	July 2017
Consultation on the draft EIA and Equality Impact Assessment (EQIA) Scope and Methodology Report (SMR) to inform the EIA and EQIA and the proposed relocation of the Eastern Leg Rolling Stock Depot	17 July 2017 – 29 September 2017
Phase 2b information events to support SMR and Eastern Leg Rolling Stock Depot consultations	September 2017
Phase 2b information events to provide update on design development	June-July 2018
Phase 2b consultation on the working draft ES and working draft EQIA	October – December 2018

Draft EIA SMR consultation

3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft EQIA is also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft ES and EQIA Reports which inform it.

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Stapleford to Nuthall area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to initial preferred route announcement in November 2016.

3.3.2 The main themes to emerge from stakeholder engagement in the Stapleford to Nuthall area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land requirements during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
- retention, realignment or diversion of public rights of way (PRoW) including Stapleford Footpath 13 and Trowell Footpath 5;
- temporary or permanent changes to road access including impacts to Stanton Gate and Waterloo Lane;
- impacts to traffic in Sandiacre, Stapleford, Nuthall, Trowell and Strelley during construction;
- impacts on access to local community facilities including recreational areas and open spaces including the Stoney Clouds Local Nature Reserve; and

- impacts to local businesses including Trowell Motorway Services and Nottingham Business Park.

3.3.3 Stakeholder feedback will continue to be considered as part of the ongoing design of the Proposed Scheme and will be reported in the formal ES.

3.4 Engagement and consultation with stakeholder groups

Communities

3.4.1 Community stakeholders in the Stapleford to Nuthall area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate EQIA being undertaken in parallel to the EIA.

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the community area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 10 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design of the Proposed Scheme.

Table 10: Engagement to date with community stakeholders

Stakeholder	Area of focus
Alex Norris MP - Member for Nottingham North	Engagement with MP for Nottingham North to discuss the Proposed Scheme, including timescales and current progress of design as well as discussion around the planned Engagement events
Anna Soubry MP for Broxtowe	Engagement with MP for Broxtowe to discuss the Proposed Scheme, including timescales and current progress of design as well as discussion around the planned Engagement events
Maggie Throup MP – Member for Erewash	Engagement with MP for Erewash to discuss the Proposed Scheme, including timescales and current progress of design as well as discussion around the planned Engagement events

East Midlands Housing	Meeting to discuss housing support options and engagement moving forward with the Land and Property team
Nottingham City Local Access Forum	Meeting to discuss any impacts on outdoor recreation areas, public rights of way, permissive paths, bridleway and accesses to the wider countryside
Nottinghamshire Local Access Forum	Meeting to discuss any impacts on outdoor recreation areas, public rights of way, permissive paths, bridleway and accesses to the wider countryside
Derby and Derbyshire Local Access Forum	Meeting to discuss any impacts on outdoor recreation areas, public rights of way, permissive paths, bridleway and accesses to the wider countryside
Nottinghamshire Resilience Forum	Meeting to discuss the likely impacts to the road network in the Nottinghamshire area arising from the construction of the Proposed Scheme
East Midlands Housing	Meeting to discuss potential impacts of the Proposed Scheme, and to understand what community groups are served by East Midlands Housing
Nottinghamshire Local Access Forum	Meeting to discuss potential impacts of the Proposed Scheme
Derbyshire Local Access Forum	Meeting to discuss potential impacts of the Proposed Scheme
Sandiacre residents group	Meeting and visit to the 'Sandiacre Beauty Spot' to discuss the impacts of the Proposed Scheme, obtain local information and take away concerns raised
St Giles Church, Sandiacre	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities and understand local concerns
Nottingham University Samworth Academy	Initial meeting to discuss the potential impact of the Proposed Scheme
Erewash Riders Association	Initial meeting to discuss the potential impact of the Proposed Scheme, with particular reference to impacts on local public rights of way, obtain local information and take away concerns raised
Best Foot Forward Walking Group (Strelley)	Initial meeting to discuss the potential impact of the Proposed Scheme, obtain local information and take away any concerns
Best Foot Forward Walking Group (Strelley)	Initial meeting to discuss the potential impact of the Proposed Scheme, with particular reference to impacts on local public rights of way
Autism East Midlands	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities. Provide a project update and gain take away concerns about the project. Also to collect knowledge of other autism schools/support groups along the route that may be affected. Initial meeting to discuss the Proposed Scheme
Moo Haven Horse Rescue	Introductory meeting, including a discussion around impacts to gain an understanding of the property and land ownership and what takes place on site

Local authorities and parish councils

3.4.6 Direct engagement has been undertaken with county, borough, district and parish councils within the Stapleford to Nuthall area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

3.4.7 Engagement has focused on the technical areas which inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst other topics.

3.4.8 Some key discussion and inputs gained from engagement local authorities and parish councils are summarised in Table 11.

Table 11: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Nottinghamshire County Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and working draft ES
	Engagement around representative viewpoint and photomontage locations for landscape assessment and surveys
	Meeting to discuss the traffic and transport assessment and to gain understanding of key local constraints
	Meeting to discuss sensitive ecological receptors, plans for mitigation and gather information to assist the ecological assessment within the working draft ES
Derbyshire County Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and working draft ES
	Engagement around representative view point and photomontage locations for landscape assessment and surveys
	Meeting to discuss the traffic and transport assessment and to gain understanding of key local constraints
Nottingham City Council	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration, and waste
	Meeting to discuss the wider impacts including that of traffic and transport
East Midlands Councils	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and working draft ES
	Meeting to discuss likely impacts to highways, including local roads, trunk roads and highway assets.
	Meeting to discuss the Traffic and Transport assessment and local constraints.
	Meeting to discuss development of the East Midlands Hub station
	Meeting to discuss participation in the East Midlands Councils' HS2 mitigation group
Erewash Borough Council	Various meetings to discuss project updates, timescales, impacts on local area and methodological approach to assessment of Proposed Scheme
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration, and waste
Broxtowe Borough Council	Various meetings to discuss project updates, timescales, impacts on local area and methodological approach to assessment of Proposed Scheme
Nuthall Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Stanton-by-Dale Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns

Trowell Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[24].

Expert, technical and specialist groups

3.4.10 Engagement has also been undertaken with expert, technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged to date include:

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts /The Wildlife Trusts;

[24] Supporting document: Draft Code of Construction Practice

- Woodland Trust;
- Derbyshire Wildlife Trust; and
- Nottinghamshire Wildlife Trust.

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.

3.4.12 Further information about topic-specific engagement is provided in Sections 4 to 15, where relevant.

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders to establish what infrastructure exists in the Stapleford to Nuthall area and how it may need to be modified as part of the Proposed Scheme.

3.4.14 Stakeholders include: Network Rail, Severn Trent Water, Cadent, the Oil and Pipelines Agency, Vodafone, Orange, Three, O2, EE, Airwave, Genesys, Instalcom, SSE Telecoms, GTC, Level 3, ES Pipelines, Sky Telecommunication Services Ltd, CityFibre, Zayo, Colt, Arqiva, and the Coal Authority.

Directly affected individuals, major asset owners and businesses

3.4.15 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Stapleford to Nuthall area.

3.4.16 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. For example, the location of environmental mitigation will seek to reduce the agricultural land required and the location of accommodation overbridges across the route will be considered to meet the actual needs of farmers.

3.4.17 Information gathered from four farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.18 Engagement is also continuing with key representatives for the farmers and growers industry, in particular with the National Farmers Union and Country Land and Business Association.

3.4.19 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Stapleford to Nuthall area, an information event was held at Trowell Parish Hall on 22 June 2018. Facilities were available at the

event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.20 Engagement has been undertaken with the businesses located in Nottingham Business Park to discuss the impacts of the Proposed Scheme.

3.4.21 HS2 Ltd is continuing to engage with directly affected individuals, major asset owners and businesses, as the design and assessment develops.

4 Agriculture, forestry and soils

4.1 Introduction

4.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and the likely impacts and significant effects of the construction and operation of the Proposed Scheme within the Stapleford to Nuthall area. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[25].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[26].

4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km-wide corridor centred on the route of the Proposed Scheme.

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[27] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

[25] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers
[26] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[27] Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*

the impacts on agricultural land is the extent to which land of BMV agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts on this feature have been calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation, carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.

4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction and operation of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1 (Section 8). These assumptions include the restoration of agricultural land that is required temporarily for construction back to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this would ultimately be at the discretion of the landowner. For this reason, financial compensation is not a consideration in the assessment of effects on farm holdings, as set out under Impacts on holdings below. In the majority of cases, the details of land use have been obtained from face-to-face interviews. Where this has not been possible, holding data have been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Stapleford to Nuthall area. These include the underlying soil resources that are used for food and biomass production, as well as providing other services and functions for society, and the associated pattern of agricultural and other rural land uses.

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Stapleford to Nuthall area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

The underlying geology of the study area is mapped by the British Geological Survey (BGS)[28]. Superficial deposits of alluvium are associated with the valley of the River Erewash and its tributaries, and normally comprise compressible silty clay but can also include silt, sand, peat and gravel.

4.3.3 River terrace deposits consisting of sands and gravels and associated with the River Erewash are present across western parts of Stapleford and eastern and southern parts of Sandiacre.

4.3.4 Glacial till deposits are mapped as intermittent outcrops across the sandstone plateaux to the north of Trowell and north of Strelley.

4.3.5 The bedrock throughout most of the area is of carboniferous mudstone, siltstone and sandstone belonging to the Pennine Lower and Middle Coal Measures Formations (within the Pennine Coal Measures Group). These form the bedrock geology in the central part of the area from north of Sandiacre to the north of Trowell and towards Strelley.

4.3.6 In the south of the Stapleford to Nuthall area at Stapleford, Triassic-age mudstone and siltstone of the Tarporley Siltstone Formation (part of the Mercia Mudstone Group) border a unit of pebbly sandstone of the Chester Formation (part of the Sherwood Sandstone Group).

4.3.7 The north of the area is dominated by Permian-age dolostone[29] of the Cadeby Formation (part of the Zechstein Group), with two sandstone plateaux outcropping to the south of Nuthall.

Topography and drainage

4.3.8 The main topographic feature in the south of the Stapleford to Nuthall area is the broad valley of the River Erewash, which is located at approximately 35m above Ordnance Datum (AOD) at its lowest point, and into which land in the study area drains. The river has cut into underlying mudstone, siltstone and sandstone, creating moderately sloping valley sides, some of which are steeper than seven degrees, which fall from an altitude of approximately 90m AOD to the north of Stapleford.

4.3.9 From the north-west of Stapleford to the south-west of Strelley, the topography is variably undulating due to the differing weathering rates of the underlying coal measures and is characterised by shallow to moderate gradients of up to seven degrees.

4.3.10 Catstone Hill is a sandstone outcrop to the west of Bilborough and the south of Strelley. The hilltop forms a ridge at approximately 120m AOD, with the land falling west towards the M1 at approximately 95m AOD and more steeply to the east at gradients in excess of seven degrees and in excess of 11 degrees in some places.

[28] British Geological Survey (2018). *Geology of Britain viewer*. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[29] A rock comprised of more than 90% dolomite (a mineral of magnesium carbonate)

4.3.11 To the north of Strelley, the landform comprises an elongated ridge at approximately 130m AOD, which falls gently east towards a valley at Nuthall, with gradients of less than seven degrees.

4.3.12 Land at risk of flooding is confined to the floodplain of the River Erewash and its tributaries. This land is classed as predominantly Flood Zone 3, on the Environment Agency's Flood map[30], in which there is a 1 in 100 or greater annual probability of flooding. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.13 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[31] and their general distribution is shown on the National Soil Map[32]. Soils possessing similar characteristics are amalgamated into associations.

4.3.14 There are three known groups of soil associations in the study area. The presence of each group of soils has been confirmed in parts of the study area by published survey data[33].

4.3.15 The most prevalent group comprises shallow profiles of clay loam, sandy loam or sandy silt loam developed over sandstone or limestone bedrock. The profiles belong to the Rivington 1 and Aberford associations and are freely draining and of Wetness Class I (WC I)[34]. Over most of the area surveyed at Nuthall, the depth to limestone from ground level exceeds 30cm.

4.3.16 Similar soils are identified in surveys that have been undertaken to the west of Nottingham and include sandy loam topsoil to around 30-35cm and upper subsoil to around 60-70cm depth, over medium sand lower subsoil to depth. The profiles are of WC I and are slightly stony throughout.

4.3.17 At Nuthall, this soil type includes dark brown or reddish brown medium sandy loam or medium clay loam to 30-35cm and overlies similar or yellowish red upper subsoil horizons. Lower subsoil comprises loamy medium sand with abundant sandstone fragments or occasionally medium sand.

4.3.18 The second most prevalent group comprises clay loam or clay topsoils, over slowly permeable clay subsoils of the Brockhurst 1 and Dale associations. These soils are typically poorly drained (WC IV) or are imperfectly drained (WC III) where there is underdrainage.

4.3.19 These soils are known to be present from surveys undertaken to the west of Nottingham and north of Nuthall. They comprise medium or heavy clay loam topsoil to 30-35cm, either directly over slowly permeable clay or with an intermediate upper subsoil horizon of heavy clay loam. Where directly over clay, the profiles are of WC IV.

[30] Environment Agency; Flood map for planning; https://flood-map-for-planning.service.gov.uk/
[31] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden
[32] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute
[33] Ministry of Agriculture, Fisheries and Food (MAFF) (1996), *Agricultural Land Classification, M1, Junction 26, Nottingham, Sites 1- 4*, ref 01596
[34] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained

Profiles with a permeable heavy clay loam upper subsoil are slightly better drained (WC III).

4.3.20 The third soil type comprises alluvial clays of the Fladbury 3 association in river floodplains. Profiles are affected by groundwater and are waterlogged for long periods in winter (WC IV).

Soil and land use interactions

Agricultural land quality

4.3.21 The principal soil/land use interaction is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate, topography and drainage.

4.3.22 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.

4.3.23 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[35] limitations of the land.

4.3.24 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[36] for three representative points within the study area. The data show the area to have a moderately dry and mild climate. The number of Field Capacity Days[37] (FCDs), when the moisture deficit[38] is zero, ranges from 140 to 151 days per annum, which is average for lowland England (150 days). Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately large.

4.3.25 Site factors include flood risk, which affects agricultural land quality within the River Erewash valley and its tributaries, limiting land quality to Subgrade 3b. Further details on flood risk are provided in Section 15, Water resources and flood risk. There are localised gradient limitations to agricultural land quality associated with the west-facing slope of the Erewash valley north of Stapleford, which is limited to Subgrade 3b, and the east-facing slope of Catstone Hill, which is limited to Grade 4.

4.3.26 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion on agricultural land with sandy soils. For soil wetness, each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the

[35] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[36] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*
[37] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate
[38] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season

moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.

4.3.27 The most prevalent group of soil associations, comprising well drained (WC I), coarse-textured soil profiles in the Rivington 1 and Aberford associations, is affected mostly by soil droughtiness. The severity of this limitation is determined by factors such as soil texture, stone content and depth to the bedrock. As moisture deficits are moderate to moderately large[39], droughtiness limitations are most likely to be to Grade 2 or Subgrade 3a.

4.3.28 The profiles of this soil type recorded to the west of Nottingham are classified as Grade 2 and as Subgrade 3a at Nuthall. A discrete area of this soil type within a valley to the north of Nuthall has been assessed as WC I. As subsoil horizons include medium loams to depth, there is more available water for crop growth. In these instances, the soils are classified as Grade 1 (excellent quality agricultural land).

4.3.29 The second soil type comprising fine loamy topsoils over clay subsoils has also been identified to the west of Nottingham and to the north of Nuthall. Where an upper subsoil of heavy clay loam is identified, the profiles are of WC III. Under the climatic conditions of the area, profiles of WC III with medium clay loam topsoil are limited by wetness and workability to Subgrade 3a. Where topsoils directly overlie the slowly permeable clay and the profiles are of WC IV, the wetness limitation is more severe to Subgrade 3b.

4.3.30 The alluvial clay profiles of the Fladbury 3 association affected by groundwater are poorly drained profiles of WC IV and limited to Subgrade 3b.

4.3.31 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[40] shows that there is a medium likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.

4.3.32 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

4.3.33 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[41]

[39] Moderate to moderately large crops moisture deficits are defined as those with a deficit (the balance between rainfall and potential evapotranspiration) of 75-110mm
[40] Department for Environment, Food and Rural Affairs (Defra), (2005), *Likelihood of Best and Most Versatile Agricultural Land*
[41] Department for Environment, Food and Rural Affairs (Defra), (2009), *Soil Strategy for England*

and the Government's White Paper, The Natural Choice: securing the value of nature[42], and include:

- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
- the support of ecological habitats, biodiversity and gene pools;
- support for the landscape;
- the protection of cultural heritage;
- the provision of raw materials; and
- the provision of a platform for human activities, such as construction and recreation.

4.3.34 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment of the value and sensitivity of woodland resources is reported in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.3.35 Within the study area, the floodplain of the River Erewash occupies land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils and floodplain in this study area function as a water store for flood attenuation as well as providing ecological habitat.

Land use

Land use description

4.3.36 Agricultural land use within this area is predominantly arable with some smaller mixed livestock and arable farms, and some equestrian holdings. The south of the study area is mostly urban, with farm holdings mostly in pasture used to support livestock enterprises, particularly in the Erewash floodplain. Most of the agricultural land between Trowell and Strelley is in arable cultivation. Agricultural land to the north of Strelley Conservation Area and Nuthall is also in arable cultivation, with large and regular-shaped fields.

4.3.37 Woodland is found mainly in three blocks to the north of Nuthall at New Farm Wood, Seller's Wood and Bulwell Wood. There is a small block of woodland (Shaw's Plantation) amongst arable land to the south of Strelley, along with some established tree belts, copses and plantations (including Broad Oak Plantation) in Strelley Conservation Area.

4.3.38 A number of environmental designations potentially influence land use within the study area. The Stapleford to Nuthall area is a nitrate vulnerable zone, where statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural

[42] HM Government (2011), *The Natural Choice: securing the value of nature*

land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.39 Some agricultural land is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS), which has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of Environmental Stewardship, the England Woodland Grant scheme and Catchment Sensitive Farming grants.

4.3.40 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focused than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme less than that covered under Environmental Stewardship. However, four new simpler non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up the scheme to more farmers and land managers. A small number of holdings that have land managed under an agri-environment scheme are identified in Table 12.

4.3.41 Most of the agricultural land in the study area is not within an agri-environment scheme.

Number, type and size of holdings

4.3.42 Table 12 sets out the current understanding of main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain information about farm holdings where it has not yet been possible to arrange interviews, and this information will be validated as survey work continues. Other farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.43 Table 12 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 12: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Mill Farm*	Livestock and grassland	55	Not known	None	Medium

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Cloudside Farm*	Livestock and equestrian	46	Not known	HLS	Medium
Rectory Farm	Dairy	58	None	None	High
Land south of the A609 Nottingham Road	Mixed livestock	4	Hobby farm	None	Medium
Uplands Farm*	Equestrian	60	Not known	None	Medium
Land at Moor Farm*	Arable and livestock	140	Not known	None	Medium
Farmland south of Main Street, Strelley*	Arable	50	Not known	None	Medium
Old Rectory Farm	Sheep	1	None	None	Low
Land south of M1 junction 26*	Arable	30	Not known	None	Medium
Land north of M1 junction 26*	Arable	16	Not known	None	Medium
Land west of A6002*	Arable and grassland	70	Not known	None	Medium
New Farm	Arable	43	Caravan storage, commercial lets	None	Medium

* It has not yet been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.

4.4.2 Compliance with the Code of Construction Practice (CoCP)[43] will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);

[43] Supporting document: Draft Code of Construction Practice

- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works (Section 6);
- special provisions for handling peat and peaty soils, where the disturbance of these soils cannot be avoided (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

4.4.3 As part of the ongoing development of the design, the following measures have been incorporated at this stage to avoid or mitigate adverse impacts on agriculture, forestry or soils:

- accommodation access and agricultural access incorporated into the Trowell Footpath 6 accommodation underbridge to maintain access to Rectory Farm (see Volume 2: Map CT-06-436, F5);
- accommodation access incorporated into the Trowell embankment No. 1 to the south-east of the Trowell Motorway Services to maintain access at Uplands Farm (see Volume 2: Map CT-06-437, C5);
- accommodation access at the Trowell Bridleway 14 overbridge for access to arable land to the north of Trowell (see Volume 2: Map CT-06-437,G5 to G6); and

- agricultural access through the New Farm access underbridge and realignment of the New Farm access road (see Volume 2: Map CT-06-440a, F6).

4.4.4 The effect of severance of agricultural land in the Erewash valley would be reduced by the opportunity to provide agricultural access for Cloudside Farm to land on either side of the Proposed Scheme under the viaduct spans.

4.4.5 As the design develops it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land.

4.4.6 Upon completion of construction it is currently anticipated that soils replaced for agricultural, forestry or landscape uses would be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.

4.4.7 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land.

4.4.8 Some poorly or very poorly drained land, or land with heavier textured soils (such as the Brockhurst 1, Dale and Fladbury 3 association soils) may also require particularly careful management, such as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

4.4.9 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, preclude existing land uses or sever and fragment individual fields and operational units of agricultural and forestry land. This could result in potential effects associated with the ability of affected agricultural and forestry interests to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The Proposed Scheme seeks to reduce this disruption and, where appropriate and reasonably practicable, incorporate residual parcels of land no longer effective for agricultural use due to their size and/or shape as part of environmental mitigation works, such as ecological habitat creation.

4.4.10 Land used to construct the Proposed Scheme would fall into the following main categories when work is complete:

- part of the operational railway or associated infrastructure and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.11 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 180ha of agricultural land within the Stapleford to Nuthall area during construction, of which approximately 110ha (60%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a high magnitude of impact on BMV land.

4.4.12 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land during the construction phase would be major/moderate adverse, which would be significant.

4.4.13 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil reinstated in accordance with the agreed end use for the land. Some permanently displaced soils may be used to restore land to agriculture or other uses with slightly deeper topsoil and subsoil layers, where appropriate.

Nature of the soil to be disturbed

4.4.14 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas soils with a high sand fraction in areas with the fewest number of FCDs and during the driest times of the year are the least susceptible.

4.4.15 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[44]. These principles would be followed throughout the construction period.

4.4.16 Clayey and seasonally waterlogged soils (including Brockhurst 1, Dale and Fladbury 3 associations) are least able to remain structurally stable if moved in wet conditions or

[44] Department for Environment, Food and Rural Affairs (Defra), (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*

by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.17 The disturbance of peat soils has implications for carbon emissions and biodiversity. Design development of the Proposed Scheme would seek to reduce disturbance of any deep peat soils insofar as possible. Where disturbance cannot be avoided, the peat soils would be handled with particular care to avoid compaction when wet and wind erosion when dry. When reinstated, opportunities would be taken to use peat soils to create habitats, enhance biodiversity and build carbon reserves.

4.4.18 Implementation of the measures set out in the draft CoCP would reduce the magnitude of impact on soil. The detailed soil survey data will define the sensitivity of soil, and the assessment of the effects on soils to be disturbed will be reported in the formal ES.

Impacts on holdings

4.4.19 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. During the construction period, some agricultural land would be restored and the impact on individual holdings would reduce.

4.4.20 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal ES. The formal ES will present the total area of land required on a particular holding during the construction period in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.21 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 13 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these would generally be the same during and post construction.

4.4.22 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 13: Summary of temporary effects on holdings from construction

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Mill Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Cloudside Farm Medium sensitivity	High	Low	Major/moderate adverse
Rectory Farm High sensitivity	High	High	Major adverse
Land south of the A609 Nottingham Road Medium sensitivity	High	Negligible	Major/moderate adverse
Uplands Farm Medium sensitivity	High	Low	Major/moderate adverse
Land at Moor Farm Medium sensitivity	Medium	Low	Moderate adverse
Farmland south of Main Street, Strelley Medium sensitivity	High	Negligible	Major/moderate adverse
Old Rectory Farm Low sensitivity	High	Negligible	Moderate adverse
Land south of M1 junction 26 Medium sensitivity	High	High	Major/moderate adverse
Land north of M1 junction 26 Medium sensitivity	High	Negligible	Major/moderate adverse
Land west of A6002 Medium sensitivity	High	Negligible	Major/moderate adverse
New Farm Medium sensitivity	High	Low	Major/moderate adverse

4.4.23 Overall, the construction of the Proposed Scheme could potentially affect 12 holdings in the Stapleford to Nuthall area temporarily. Based on the information currently available, all 12 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.24 Rectory Farm is currently expected to experience major adverse effects during construction arising from high impacts from the proportion of land required and from severance.

4.4.25 Nine farm holdings are expected to experience major/moderate adverse temporary effects, largely due to the proportion of land required for the Proposed Scheme during the construction period. Two holdings are expected to experience moderate adverse effects, also largely due to the proportion of land required during construction.

4.4.26 Although financial compensation would be available under existing statutory arrangements to offset these impacts, it is not a consideration in the assessment of effects on farm holdings.

Permanent effects of construction

Impacts on agricultural land

4.4.27 Interpretation of publicly available data show that the Proposed Scheme is likely to require approximately 120ha of agricultural land permanently within the Stapleford to Nuthall area, of which approximately 80ha (67%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This would be a high magnitude of impact on BMV land.

4.4.28 As BMV land in this local area is a receptor of medium sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land following construction would be major/moderate adverse, which would be significant.

Impacts on forestry land

4.4.29 It is currently expected that approximately 1.8ha of ancient woodland at New Farm Wood would be required for the construction of the Proposed Scheme. The effects on forestry land will be reported in the formal ES. The qualitative assessment of loss of woodland is presented in Section 7, Ecology and biodiversity.

Impacts on holdings

4.4.30 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 14 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

4.4.31 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 14: Summary of permanent effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Mill Farm	Negligible	Negligible	Low	Minor adverse

Holding name/ Sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential impact on farm infrastructure**	**Potential scale of effect**
Medium sensitivity				
Cloudside Farm Medium sensitivity	Low	Low	High	Major/moderate adverse
Rectory Farm High sensitivity	High	High	Medium	Major adverse
Land south of the A609 Nottingham Road Medium sensitivity	High	Negligible	High	Major/moderate adverse
Uplands Farm Medium sensitivity	Medium	Low	Medium	Moderate adverse
Land at Moor Farm Medium sensitivity	Low	Low	Low	Minor adverse
Farmland south of Main Street, Strelley Medium sensitivity	Medium	High	Low	Major/moderate adverse
Old Rectory Farm Low sensitivity	High	Negligible	High	Moderate adverse
Land south of M1 junction 26 Medium sensitivity	High	High	Low	Major/moderate adverse
Land north of M1 junction 26 Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Land west of A6002 Medium sensitivity	High	Negligible	Low	Major/moderate adverse
New Farm Medium sensitivity	High	Low	High	Major/moderate adverse

4.4.32 Overall, the construction of the Proposed Scheme could potentially permanently affect 12 holdings in the Stapleford to Nuthall area. Based on the information currently available, ten identified holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.33 One farm, Rectory Farm, is currently expected to incur major adverse permanent effects following construction, particularly from the proportion of land required and severance of land associated with the holding to the east of the Proposed Scheme.

4.4.34 Seven holdings are expected to experience major/moderate adverse permanent effects due mostly to the proportion of land required for the Proposed Scheme. There could also be a high impact on farm infrastructure at New Farm with the demolition of a farm dwelling; and at Cloudside Farm, on land south of the A609 Nottingham Road and Old Rectory Farm with the demolition of farm buildings.

4.4.35 Two farms are expected to experience moderate adverse permanent effects, due to the proportion of land required for the Proposed Scheme, and the impact on farm infrastructure.

4.4.36 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.37 Soils and their associated seed banks from the ancient woodlands would be stored separately and utilised in species translocation.

4.4.38 Other mitigation would incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.

4.4.39 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all farmers and landowners, setting out baseline conditions on the farm and the assurances and obligations that HS2 Ltd would accept upon entering the land. This would include advice and appropriate assistance where there is a need for the landowner to relocate or re-provide agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

4.4.40 Although the extent of land required by ALC grade is not yet known in the Stapleford to Nuthall area, current indications based on publicly available information are that the effect on BMV agricultural land would be major/moderate adverse temporarily during construction and permanently from construction, which would be significant. The area of land required by ALC grade will be assessed and reported in the formal ES.

4.4.41 Twelve farm holdings identified are expected to experience moderate, major/moderate or major adverse temporary effects during construction which would be significant for each holding. Ten of the 12 holdings are anticipated to experience moderate, major/moderate or major adverse permanent effects from the Proposed Scheme which would also be significant for each holding.

4.4.42 Effects on forestry land and soils to be disturbed will reported in the formal ES.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No measures are currently anticipated to be required to mitigate the operational effects of the Proposed Scheme on agriculture, forestry and soils.

Assessment of impacts and effects

4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:

- noise emanating from moving trains; and
- the propensity of operational land to harbour noxious weeds.

4.5.3 The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.4 Three sets of farm buildings at land south of the A609 Nottingham Road, Old Rectory Farm and New Farm lie within 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.5 The propensity of linear transport infrastructure to harbour and spread noxious weeds is a consequence of:

- the management of the highway and railway land; and
- the propensity of the weeds to spread onto such land from adjoining land, which could be exacerbated by the effects of climate change.

4.5.6 The presence of noxious weeds (particularly ragwort) would be controlled using an appropriate management regime that identifies and remedies areas of weed growth that might threaten adjoining agricultural interests.

Other mitigation measures

4.5.7 No other mitigation measures have been identified at this stage.

Summary of likely residual significant effects

4.5.8 No residual significant effects on agriculture, forestry and soils have been identified at this stage as a result of the operation of the Proposed Scheme.

Monitoring

4.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

4.5.10 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Stapleford to Nuthall area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality identified to date arising from the construction and operation of the Proposed Scheme within the Stapleford to Nuthall area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[45] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works, and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Broxtowe Borough Council (BBC), Erewash Borough Council (EBC), and Nottingham City Council (NoCC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[46].

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur[47]:

- from construction;
- from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads;
- where road alignments have changed; or
- from the operation of combustion plant at buildings.

5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGV), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGV) during construction of the Proposed Scheme.

[45] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.
[46] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[47] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period (2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Stapleford to Nuthall area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the A6007 Stapleford Road, the A609 Nottingham Road and the A610 Nuthall Road.

5.3.2 There are two industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Castle Waste Services and Hook 2 Sisters Ltd, an intensive farming process. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)[48] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Stapleford to Nuthall area.

Local monitoring data

5.3.4 There are currently 47 local authority diffusion tube sites located within the Stapleford to Nuthall area for monitoring NO2 concentrations. Measured concentrations in 2016 were within the air quality standard, except at one site on the B5010 Derby Road[49].

Air quality management areas

5.3.5 There are three air quality management areas (AQMAs) within the Stapleford to Nuthall area. These are the Broxtowe AQMA 1 Trowell, the Broxtowe AQMA 4 Nuthall and the Erewash AQMA 1 Sandiacre. The Broxtowe AQMA 1 Trowell was declared in February 2006 and covers Iona Drive and Tiree Close adjacent to the M1. The Broxtowe AQMA 4 Nuthall was also declared in February 2006 and is located along the B600 Nottingham Road and Back Lane. The Erewash AQMA was declared in February 2002 and is located east of the M1 to the north of junction 25. All AQMAs have been designated for exceedances of the annual mean NO2 standard.

[48] Department for Environment, Food and Rural Affairs (Defra); Defra Background Pollutant Concentration Maps; https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015
[49] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data

Receptors

5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust generating activities or traffic routes during construction or operation of the Proposed Scheme.

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include various schools and businesses.

5.3.8 There are three statutory designated ecological sites identified within the Stapleford to Nuthall area, namely Robbinetts Site of Special Scientific Interest (SSSI), Seller's Wood SSSI and Bulwell Wood SSSI. There are 19 non-statutory sensitive ecological sites identified close to the Proposed Scheme. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP)[50]. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and

[50] Supporting document: Draft Code of Construction Practice

- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

5.4.3 The draft CoCP includes the requirement for site-specific traffic management measures, such as the use of site haul routes for construction vehicles to minimise the need to use public roads.

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[51], have been assessed for their effect on dust soiling, human health[52] and ecological sites. There are residential and ecological receptors located within the Stapleford to Nuthall area.

5.4.6 It has been identified that there would be a low to medium risk of dust and human health effects from demolition activities in this area. For earthworks and construction, the risk of dust effects would range from low to high within this area, depending on the location of sensitive receptors and the magnitude of the earthwork and construction activities. There would also be a low to medium risk of human health effects from earthworks and construction. For trackout, there would be a medium to high risk of dust effects and a low to medium risk of human health effects. There would also be a low to medium risk of ecological effects from all dust generating activities.

5.4.7 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities.

Construction traffic effects

5.4.8 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.

5.4.9 The M1, the A609 Nottingham Road between the A6007 Stapleford Road and the A6002 Coventry Lane, the A610 east of M1 junction 26, the A6002 Woodhouse Way and Main Street, the A6007 Stapleford Road, the B5010 Derby Road and Bostock Lane to the M1 junction 25, the B600 Nottingham Road, the B6003 Toton Lane, Stanton Gate/Moorbridge Lane and Ilkeston Road/Lenton Street/Town Street would likely provide the primary access for construction vehicles in this area. An increase in traffic

[51] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network
[52] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10

flows as a result of construction traffic, temporary closures or diversions is anticipated on these roads. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

5.4.11 No permanent effects on local air quality are likely to arise during construction of the Proposed Scheme.

Other mitigation measures

5.4.12 No other mitigation measures are proposed at this stage in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust emissions and, therefore, no significant residual effects would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 No specific mitigation measures for air quality are proposed during the operation of the Proposed Scheme.

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition, and/or speed of road traffic and changes in road alignment.

5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

5.5.4 Direct and indirect effects from changes in air quality, such as those arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. Any effects will be reported in the formal ES.

Other mitigation measures

5.5.5 No other mitigation measures are proposed at this stage in relation to air quality in this area during operation of the Proposed Scheme.

Summary of likely residual significant effects

5.5.6 Any significant residual effects for air quality from the operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

5.5.8 Any area specific requirements for monitoring air quality effects during operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Stapleford to Nuthall area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Nottinghamshire County Council (NCC), Nottinghamshire Local Resilience Forum, Derbyshire County Council (DCC), Nottingham City Council (NoCC), Broxtowe Borough Council (BBC), Erewash Borough Council (EBC), Sandiacre Residents Group, and Trowell Community Group. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme.Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[53].

6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on community facilities and resources will be reported in the formal ES.

6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to

[53] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure then this will be discussed with the relevant local authority and local groups and reported in the formal ES.

6.2.6 The assessment in the working draft ES is based on the design information, including demolitions as set out in Section 2 available at the time of the assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.

6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.

6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, HGV traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

6.2.9 For the working draft ES, the full details of the construction traffic routes and geographical scope of likely in-combination (amenity) effects are yet to be determined. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Stapleford to Nuthall area would be approximately 10.7km in length and lie within the Erewash district of Derbyshire and the Broxtowe district of Nottinghamshire. It would extend from Sandiacre and Stapleford, in the south, passing the settlements of Stanton-by-Dale, Stanton Gate, Trowell, Strelley and Nuthall in the north. The Stapleford to Nuthall area is a mix of rural villages and urban areas near to or within the city of Nottingham. In general, the majority of community facilities are located in the larger urban areas of Sandiacre and Stapleford.

Sandiacre, Stapleford and surrounds

6.3.2 Sandiacre and Stapleford are towns located north-east of M1 Junction 25 at the border between Nottinghamshire and Derbyshire. Sandiacre is located in the Erewash district of Derbyshire, and Stapleford is located in the Rushcliffe district of Nottinghamshire. Together, the towns comprise approximately 12,000 residential properties. Some residential properties would be on the route of the Proposed Scheme. The River Erewash and Erewash Canal are located between the two towns and provide opportunities for, recreational angling and leisure craft.

6.3.3 There is a wide range of community resources in Sandiacre and Stapleford, including religious facilities such as the Stapleford Kingdom Hall of Jehovah's Witnesses, St. Giles' Church, St. Luke's Church and St. Helen's Church. There are also educational facilities (Cloudside Junior School, Ladycross Infants School, Albany Junior School, Albany Infant and Nursery School), healthcare centres, pharmacies, two libraries, youth groups, a social club and several public houses.

6.3.4 Recreational facilities within this area include Sandiacre Town Football Club, a gym and a bowls club. There are many open spaces including Sandiacre Park, St. Giles Park, Hickings Lane Recreation Ground, Queen Elizabeth Park and the Peatfield and Albany allotments.

Stanton-by-Dale, Stanton Gate and surrounds

6.3.5 Stanton-by-Dale is a village located west of the M1 and 1km north-west of Sandiacre. The nearest residential properties in the village would be approximately 1.4km west from the route of the Proposed Scheme. Stanton Gate is a hamlet located east of the M1 approximately 600m west of Stapleford. Some residential properties in Stanton Gate would be on the route of the Proposed Scheme. Together, the settlements comprise approximately 350 residential properties.

6.3.6 Community facilities within this area are primarily located within or near Stanton-by-Dale and include public houses, Stanton Hall (a nursing home), the St. Michael & All Angels Church as well as the Erewash Golf Club. The charitable organisation Moo-Haven operates a horse rescue and rehabilitation centre at an agricultural location approximately 300m south of Stanton Gate. The centre provides a home for neglected horses and hosts events for children.

6.3.7 Stanton Gate is bounded to the east by the Erewash Canal and to the north by the Stanton Gate Local Nature Reserve (LNR). The Stanton Gate LNR is used by the local community and visited by the Long Eaton Natural History Society as part of their field excursions. The Erewash Canal is frequented by pleasure boat users and also hosts recreational angling at this location. The Erewash Canal Preservation & Development Association organises occasional events along the canal such as the 50th Anniversary Rally 2018.

6.3.8 The towpath running along the Erewash Canal is part of the Nutbrook Trail, the Erewash Valley Trail and Route 67 of the National Cycle Network (NCN). The Nutbrook Trail is a 16km promoted recreational walking route. It is used by both pedestrians and cyclists between Long Eaton, Shipley Country Park and Heanor. The Erewash Valley Trail is a 48km promoted recreational route for walkers and cyclists running along the Nottinghamshire/Derbyshire border area. Route 67 of the NCN is a 180km route split into six separate sections. It spans between Long Eaton, Derbyshire to the south and Ripley, Yorkshire to the north.

Trowell

6.3.9 Trowell is a village located directly north of Stapleford. The village is split into two defined areas either side of the M1 motorway and the route of the Proposed Scheme: a village centre in the north-west and a primarily residential area in the south-east.

The village comprises approximately 1,500 residential properties. The nearest residential properties would be adjacent to the route of the Proposed Scheme.

6.3.10 There are a range of local facilities within the area including St. Helen's Church, The Festival Inn, Trowell Parish Hall and the Trowell Church of England Primary School. East of the M1, other facilities include the Pit Lane Recreation Area as well as the Trowell Garden Centre Coffee Shop. Trowell Motorway Services is located approximately 800m north of the village, where the Nottinghamshire Police Motorway Patrol Unit is based.

6.3.11 The former Nottingham Canal is located to the north of the village centre. The canal is no longer navigable and has become the Nottingham Canal LNR. The Erewash Valley Trail, continuing its route north from the Stanton-by-Dale, Stanton Gate and surrounds study area, passes through Trowell on the former towpath of the Nottingham Canal within the LNR. The River Erewash is located approximately 100m south of the village.

Strelley

6.3.12 The Strelley area includes the village of Strelley, the Strelley Estate and Woodhouse Park housing developments. Strelley village is located approximately 2km south of Junction 26 of the M1. Strelley Estate, a post-war council estate, is located directly east of the village on the eastern side of the A6002. Woodhouse Park is located approximately 300m north of the village. Together, the village and housing estates comprise of approximately 1,700 residential properties. The nearest residences in the area are located approximately 400m to the south-east from the route of the Proposed Scheme.

6.3.13 The main community resources in Strelley village include the All Saints Church and Broad Oak public house. Robin Hood Way, a promoted recreational walking route through the Nottinghamshire countryside, passes through the village on the pavement along Main Street.

6.3.14 Community resources in Strelley Estate include Strelley Recreation Ground, Strelley Social Club, Edgeway allotments and the Djanogly Strelley Academy (a primary school). The Nottingham Business Park, located directly north of the Woodhouse Park recent housing development, contains the trust headquarters for the East Midlands Ambulance Service NHS Trust and a fertility clinic (CARE Fertility Nottingham). The fertility clinic caters for both private and NHS referrals.

Nuthall

6.3.15 Nuthall is a village located near to Junction 26 of the M1. The village has two distinct areas: Old Nuthall and New Nuthall. Old Nuthall lies north-west of the A6002, bordering Kimberley, while New Nuthall lies south of the A6002, bordering Nottingham. The village comprises approximately 3,300 residential properties. Some residential properties would be on the route of the Proposed Scheme.

6.3.16 There are a range of community resources in Old Nuthall including Basil Russell Playing Fields, Saint Patrick's Church, Nuthall Methodist Church, Larkfield Junior and Infant School and the Nuthall Parish Council Temple Centre. The Nuthall Parish

Council Temple Centre is a facility owned by the Parish Council and offers indoor facilities (including a sports hall and meeting rooms) for hire as well as a playing field, which can be used in conjunction for events including parish fairs and parties. The Temple Centre is also the meeting place for the Parish Council and hosts regular coffee mornings and lunches. A bowls team, a cricket team and a football team all use the playing fields at the Temple Centre.

6.3.17 In New Nuthall, the main community resources are found in the Mornington Crescent Estate, where there is Mornington Primary School, Assarts Farm Medical Centre and a Oldmoor Lodge public house.

6.3.18 The Nuthall Railway Multi-User Access Route is a promoted PRoW used by pedestrians, cyclists and horse riders which connects Nuthall in the east to Hempshill Vale in the west. The Broxtowe Country Trail, a 43km promoted walking and cycling stretching between the River Trent in Long Eaton and the Cromford Canal in Langley Mill, travels on the same footpath as the Nuthall Railway Multi-User Access Route between Nuthall and Hempshill Vale.

6.4 Effects arising during construction

Avoidance and embedded mitigation measures

6.4.1 As part of design development, the following measures have been incorporated into the Proposed Scheme design to avoid or reduce adverse environmental impacts during construction and the loss of residential properties:

- Stanton Gate viaduct, which would enable the Proposed Scheme to pass over the River Erewash, Erewash Canal and Stanton-by-Dale LNR and enable use of these open spaces to continue and
- Nuthall Cycleway underbridge, which would enable the Nuthall Multi-User Access Route (north of the B600 Nottingham Road) to pass under the route of the Proposed Scheme and enable use of the PRoW to continue.

6.4.2 The draft Code of Construction Practice (CoCP)[54] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of public rights of way (PRoW) during construction where reasonably practicable (Section 14);

[54] Supporting document: Draft Code of Construction Practice

- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and, where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.3 No temporary effects on residential properties have been identified as a result of land required for construction of the Proposed Scheme.

Community facilities

6.4.4 No temporary effects on community facilities have been identified as a result of land required for construction of the Proposed Scheme.

Recreational facilities

6.4.5 In Nuthall, construction of the A610 Browtowe viaduct and the B600 Nuthall viaduct would require the playing field associated with the Nuthall Parish Council Temple Centre to be closed for approximately two years and three months. The playing field hosts events in conjunction with the indoor facilities in the Temple Centre, such as children's parties. A comparable alternative for users requiring only the playing field is located approximately 800m to the west of the Temple Centre (Basil Russell Playing Fields). However, there is no nearby alternative for users requiring the simultaneous use of both the indoor facilities and the playing fields at the Temple Centre. The temporary closure of the playing field would result in a major adverse effect, which would be significant.

Open space and recreational PRoW

6.4.6 In Stanton Gate, the Nutbrook Trail, the Erewash Valley Trail and the towpath of the Erewash Canal converge at Sandiacre Footpath 7 and Sandiacre Footpath 19. Approximately one km of these footpaths would be impacted by construction of the Stanton Gate viaduct for approximately four years and six months. This section of impacted footpath represents only short sections of each promoted route (6% of the Nutbrook Trail and 2% of the Erewash Valley Trail). The routes are popular with walkers, cyclists and horse riders from Nottinghamshire and Derbyshire. The Nutbrook Trail hosts occasional events (e.g. the Nutbrook Trail Wildlife Bioblitz in 2016 organised by Sustrans, the Nutbrook Trail Pleasure Ride in 2017 organised by the Erewash Riders Association). Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.7 In Stanton Gate, construction of the Stanton Gate viaduct over the Erewash canal would impact on Route 67 of the NCN, which runs along the Erewash Canal towpath. Approximately one km of the cycleway would be impacted by construction of the

viaduct for approximately four years and six months. This represents only a short section of the route (0.55%) and the majority of NCN Route 67 would still be accessible during construction. The cycling route is regularly used by sub-regional (Nottinghamshire and Derbyshire) users and there are limited similar alternatives in the area. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.8 In Stanton Gate, construction of the Stanton Gate viaduct would require the temporary closure of approximately 1.4km of the Erewash Canal. This section (equivalent to 7.4% of the entire length of the canal) would be closed for various two-hour intervals over a two-week period which would enable canal boats to navigate outside of the construction period. The canal is regularly used by sub-regional (Nottinghamshire and Derbyshire) as well as local users. The temporary closure of the canal would result in a negligible effect which would not be significant.

6.4.9 In Stanton Gate, construction of the Stanton Gate viaduct would require the Moo-Haven animal rescue centre to be closed for approximately four years and six months. The rescue centre provides a temporary home for neglected animals in the local area and hosts fundraising events which are frequented by children, including children with autism. The temporary closure of the rescue centre would result in a major adverse effect which would be significant.

6.4.10 In Stanton Gate, construction of the Stanton Gate viaduct would impact on the Stanton Gate LNR for approximately four years and six months. Construction of the viaduct would require the temporary loss of 0.54ha of the LNR equating to 74% of the LNR's total area. The LNR has no formal footpaths; however, it is used for quiet enjoyment by local residents and is frequented by members of the Long Eaton Natural History Society whom visit as part of their field excursions. The temporary loss of part of this open space would result in a moderate adverse effect which would be significant.

6.4.11 There is likely to be an impact on the accessibility to the remainder of the LNR. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.12 In Trowell, construction of the Trowell embankment would impact on the Nottingham Canal LNR for approximately three years. The Nottingham Canal LNR is split across three sections totalling 9.6km in length and 30.6ha in area. Construction of the embankment would require the temporary loss of 0.57ha of the LNR's middle section (which has an area of 7.7ha). This accounts for 0.6% of the LNR's total area. Two north-south footpaths (Trowell Footpath 23 and Trowell Footpath 10) currently enable access within the LNR at the location impacted by the Proposed Scheme. One of these footpaths (Trowell Footpath 23) would be permanently closed. The other footpath would remain partially open but diverted to another footpath (Trowell Footpath 11) in the east for approximately 500m which retains access within the LNR. Therefore, it is anticipated that the open space would continue to be available to the public throughout construction of the Proposed Scheme. There are also comparable alternatives within 500m, including separate, unaffected portions of the LNR as well

as Pit Lane and Bramcote Hills Park LNR. The temporary loss of part of this open space would result in a negligible effect which would not be significant.

6.4.13 In Trowell, construction of the Trowell embankment would impact on the Erewash Valley Trail for approximately three years. The trail is a long recreational walking route (48km) and only 0.26% of the route would be temporarily impacted. The trail is regularly used by sub-regional (Nottinghamshire and Derbyshire) users. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.14 In Nuthall, construction of the Nuthall embankment would impact on 0.13km of the Nuthall Railway Multi-User Access Route and Broxtowe Country Trail for approximately two years and six months. The 0.13km impact represents only a short section of the Broxtowe Country Trail (0.3%), however, it represents 7.5% of the total length of the Nuthall Railway Multi-User Access Route and severs its midpoint. This may deter cyclists and walkers from using the Nuthall Railway Multi-User Access Route during the construction period. The trails are used regularly by local and sub-regional (Nottinghamshire and Derbyshire) users. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.15 In Nuthall, construction of the New Farm Wood cutting and construction access road would result in the temporary loss of 1.8ha (equivalent to 33%) of the publicly accessible New Farm Wood. The woodland is highly valued by its users as a resource due to its ancient characteristics and unique ecology. Due to this, there are no comparable alternatives in the area. The temporary loss of part of this open space would result in a major adverse effect which would be significant.

Permanent effects

Residential properties

6.4.16 In Sandiacre and Stapleford, highway works associated with the A52 Brian Clough Way Bessell Lane underbridge would require the demolition of five residential properties on Bessell Lane. Highway works associated with the B5010 Derby Road overbridge would require the demolition of 20 residential properties on the B5010 Derby Road, Station Road and Rutland Grove. These residential properties would be permanently lost. The permanent loss of these properties would result in a major adverse effect which would be significant.

6.4.17 This community effect occurs at the border between the Ratcliffe-on-Soar to Long Eaton area and the Stapleford to Nuthall area and is reported in both the Volume 2 LA05 Ratcliffe-on-Soar to Long Eaton and Volume 2 LA06 Stapleford to Nuthall reports. Of the 25 residential properties demolished, seven are in the Ratcliffe-on-Soar to Long Eaton area and 18 are in the Stapleford to Nuthall area.

6.4.18 In Sandiacre, construction of the Stanton Gate viaduct would require the demolition of one residential property on Ilkeston Road. This residential property would be permanently lost.

6.4.19 In Stanton Gate, construction of the Stanton Gate viaduct would require the demolition of one residential property, The Moorings at Stanton Gate. This residential property would be permanently lost.

6.4.20 In Trowell, highway works associated with the realignment of the A609 Nottingham Road would require the demolition of four residential properties on the A609 Nottingham Road. These residential properties would be permanently lost.

6.4.21 In Nuthall, construction of the A610 Broxtowe viaduct and the B600 Nuthall viaduct would require the demolition of nine residential properties on the B600 Nottingham Road. The permanent loss of these properties would result in a moderate adverse effect which would be significant.

6.4.22 In Nuthall, construction of the Westville embankment would require the demolition of one residential property on New Farm Lane. This residential property would be permanently lost.

Community facilities

6.4.23 In Trowell, construction of the Trowell embankment would require the demolition of the Nottinghamshire Police Motorway Patrol Unit in the Trowell Motorway Services. Although this resource serves a community purpose, its function is likely to be replicable given it is used principally as a depot. The permanent loss of this facility would result in a moderate adverse effect which would be significant.

6.4.24 In Strelley, construction of the Mellors Way cutting would require the demolition of the fertility clinic (CARE Fertility Nottingham) on Lawrence Drive in the Nottingham Business Park. The nearest alternative is Nurture Fertility, which also caters for NHS as well as private referrals. Nurture Fertility is 11.1km away and is the only other fertility clinic in Nottingham and its surrounding area. The permanent loss of this facility would result in a major adverse effect which would be significant.

Recreational facilities

6.4.25 In Nuthall, construction of the A610 Browtowe embankment No. 2 and the B600 Nuthall viaduct would permanently require land within the playing field associated with the Nuthall Parish Council Temple Centre. The land which would be required is in the north-west corner of the playing field and is equivalent to 10% of the playing fields' total area. The playing field has no formal use and users would still be able to hire the majority of the field for functions, parties and other uses. The permanent loss of part of this open space would result in a minor adverse effect which would not be significant.

Open space and recreational PRoW

6.4.26 In Stanton Gate, construction of the Stanton Gate viaduct would permanently require land currently used by the Moo-Haven animal rescue centre. The land which would be required is equivalent to 5.8% of the total area used by the rescue centre. It is expected that activities on the remaining land would be able to operate, but at a reduced capacity. The permanent loss of land within the rescue centre would result in a moderate adverse effect which would be significant.

6.4.27 In Trowell, construction of the Trowell embankment would require the permanent closure of an area of the Nottingham Canal LNR. Construction of the embankment would require the permanent loss of 0.22ha of the LNR's middle section accounting for 0.8% of the LNR's total area. One of the two footpaths enabling access to the LNR

at the location impacted by the Proposed Scheme (Trowell Footpath 23) would be permanently closed. The other footpath, Trowell Footpath 10, would be permanently realigned for approximately 500m (to pass under the A609 underbridge, along the A609 Nottingham Road and along Trowell Footpath 11) before re-joining the existing Trowell Footpath 10 which retains access within the LNR. Therefore, it is anticipated that the open space would continue to be available to the public throughout construction of the Proposed Scheme. There are comparable alternatives to the LNR within 500m, including other separated, unaffected portions of the Nottingham Canal LNR as well as Pit Lane Trowell LNR and Bramcote Hills Park LNR. The permanent loss of part of this open space would result in a negligible effect which would not be significant.

6.4.28 In Trowell, construction of the Trowell embankment would require the permanent realignment of a section of the Erewash Valley Trail. The footpath which the trail follows in the Nottingham Canal LNR (Trowell Footpath 10) would be permanently realigned to a highway cutting north of the current path. The trail is a long distance recreational walking route (48km) of which 0.5km (1%) would be permanently realigned. The trail is regularly used by sub-regional (Nottinghamshire and Derbyshire) users. The permanent realignment of this trail would result in a negligible effect which would not be significant.

6.4.29 In Nuthall, construction of the New Farm Wood cutting would result in the permanent loss of 1.4ha (equivalent to 23%) of the New Farm Wood. The woodland is highly valued by its users as a resource due to its ancient characteristics and unique ecology. Due to this, there are no comparable alternatives in the area. The permanent loss of part of this open space would result in a major adverse effect which would be significant.

Other mitigation measures

6.4.30 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in this assessment.

6.4.31 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.4.32 Land required for construction of the Proposed Scheme is likely to result in temporary residual significant effects on the following community resources:

- the playing field associated with the Nuthall Parish Council Temple Centre in Nuthall;
- the Moo-Haven animal rescue centre in Stanton Gate;
- Stanton Gate LNR in Stanton Gate; and
- New Farm Wood in Nuthall

6.4.33 Land required for construction of the Proposed Scheme is likely to result in permanent residual significant effects:

- loss of residential properties on Bessell Lane, the B5010 Derby Road, Station Road and Rutland Grove in Stapleford and Sandiacre;
- loss of residential properties on the B600 Nottingham Road in Nuthall;
- demolition of the Nottinghamshire Police Motorway Patrol Unit in Trowell;
- demolition of the CARE fertility clinic in Strelley;
- loss of land in the Moo-Haven animal rescue centre in Stanton Gate; and
- loss of land within New Farm Wood in Nuthall.

Cumulative effects

6.4.34 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.4.35 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 Avoidance and mitigation measures will be reported in the formal ES.

Assessment of impacts and effects

6.5.2 Operation of the Proposed Scheme could lead to in-combination effects on the community in this area which will be reported in the formal ES.

Other mitigation measures

6.5.3 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.5.4 A summary of the likely residual significant effects will be reported in the formal ES.

Cumulative effects

6.5.5 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.5.6 No cumulative effects have been identified at this time. Any combined effects on a community during operation of the Proposed Scheme, which would result in cumulative effects, will be reported in the formal ES.

Monitoring

6.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

6.5.8 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that would contribute to the in-combination assessments, will be described in the relevant topic sections of the formal ES.

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report provides a summary of the predicted impacts and significant effects on species and habitats identified to date in the Stapleford to Nuthall area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, Nottinghamshire Wildlife Trust, Nottinghamshire County Council (NCC), Derbyshire Wildlife Trust and Derbyshire County Council (DCC) has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA06 Map Book.

7.1.4 All distances and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1 Introduction and Methodology (Section 8) and the Scope and Methodology Report (SMR)[55].

7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.

7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. The surveys include (but are not limited to) broad habitat and detailed plant surveys, great crested newt surveys, wintering and breeding bird surveys, bat surveys, otter and water vole surveys. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment; the designated sites, habitats and species recorded in this area as known at this time.

[55] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

7.3.2 Land required for the Proposed Scheme in the Stapleford to Nuthall area consists mainly of agricultural land, woodland and the floodplain of the River Erewash and its tributaries. In the southern section of this area, the landscape is dominated by the urban areas of Stapleford and Sandiacre. In the north, the Proposed Scheme in this area would run parallel to the M1, past Stanton Gate through Trowell and Nuthall.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA06 Map Book.

Designated sites

7.3.4 There are no internationally important sites relevant to the assessment in the Stapleford to Nuthall area.

7.3.5 There are two nationally important sites of special scientific interest (SSSI) that are relevant to the assessment in the Stapleford to Nuthall area. For each of these sites, the land required for the Proposed Scheme is within the Impact Risk Zone[56] relevant to railway infrastructure as identified by Natural England. They are:

- Seller's Wood SSSI, covering an area of 14.6ha, is designated for its regionally notable broad-leaved semi-natural woodland. The woodland supports a diverse flora, including a large number of plant species characteristic of lowland ancient semi-natural woodland. It also includes a number of well-vegetated ponds which contain a diverse aquatic fauna. This SSSI is located west of Bulwell, and is adjacent to the land required for the Proposed Scheme; and
- Bulwell Wood SSSI, covering an area of 17.1ha, is designated for its regionally notable ancient semi-natural woodland and unpolluted open water habitats. The woodland supports a number of plant species characteristic of lowland ancient semi-natural woodland. The clean-water pool (Bulwell Wood Hall Pond) supports a well-developed aquatic plant and animal community. The latter includes white-clawed crayfish, although this species is not a reason for designation of the SSSI. This SSSI is located south of Hucknall Airfield and is adjacent to the land required for the Proposed Scheme within both the Stapleford to Nuthall area and the Hucknall to Selston area to the north.

7.3.6 There are six local nature reserves (LNR) relevant to the assessment in the Stapleford to Nuthall area, each of which is considered to be up to county/metropolitan value, unless otherwise stated. They are:

- Stony Clouds LNR, covering an area of 9.1ha. This LNR encompasses, but extends beyond the boundary of Stony Clouds LNR and Adjacent Grassland Local Wildlife Site (LWS). This LNR supports both neutral and acid grassland, woodland and scrub habitats. This LNR is located 140m west of the land required for the Proposed Scheme at its nearest point, to the north of Sandiacre;
- Stanton Gate LNR, covering an area of 0.7ha. The LNR supports a mosaic of habitats including semi-improved, species-rich grassland, marshy grassland and

[56] The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts

scrub. This LNR is partly within the land required for the Proposed Scheme, to the north of Sandiacre between the M1 and Erewash Canal;

- Pit Lane Trowell LNR, covering an area of 5.4ha. The LNR is a former open cast site with grassland and young tree plantations and connects other LNR in the area with the River Erewash. This LNR is located 440m east of the land required for the Proposed Scheme, to the north of Stapleford and based on the site description is considered to be of district/bough value;
- Nottingham Canal LNR, covering an area of 7.7ha. The LNR comprises 9.6km of disused canal running along the Erewash Valley from Bramcote to Eastwood. The LNR areas which are located within and adjacent to the land required for the Proposed Scheme supports areas of standing water, woodland and hedgerow with trees. This LNR is located partly within the land required for the Proposed Scheme;
- Trowell Marsh LNR, covering an area of 0.8ha. The LNR supports areas of neutral grassland, broadleaved semi-natural woodland and ponds. This LNR is located 380m west of the land required for the Proposed Scheme, to the east of Hallam Fields; and
- Sellars Wood LNR, covering an area of 14.6ha, supports ancient semi-natural woodland. This site has the same boundaries as Seller's Wood SSSI and is adjacent to the land required for the Proposed Scheme. This woodland is referred to as Seller's Wood hereafter, except where the LNR is being referred to in isolation. The interest features of the LNR are the same as those defined on the citation for the SSSI described above, and the LNR is of national importance. The LNR also supports a population of the Nationally Rare hoverfly Triglyphus primus.

7.3.7 There are 33 notified LWS relevant to the assessment in the Stapleford to Nuthall area. For this assessment, formally notified LWS have been included here and habitats within potential LWS are described under the relevant habitat subsections. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. Due to the habitats and species present, the notified LWS sites are considered to be of county/metropolitan value. They are:

- Erewash Canal LWS, covering an area of 26.5ha, is designated for standing open water and aquatic plant species, including grass-wrack pondweed which is a species of principal importance. Between Sandiacre and Stanton Gate the LWS is partially located within the land required for the Proposed Scheme;
- Sandiacre Marsh LWS, covering an area of 0.2ha, is designated for its lowland swamp habitat. This site is located entirely within the land required for the Proposed Scheme located between the Erewash Canal and Erewash Valley Line;
- Stony Clouds LNR and adjacent grassland LWS covers an area of 9.3ha. It is designated for its unimproved acid grassland. This site is located entirely within the boundary of Stoney Clouds LNR and extends beyond the LNR boundary to

encompass an additional field. It is located 140m west of the land required for the Proposed Scheme;

- Moorbridge Lane Grasslands South, Stapleford LWS, covering an area of 12.5ha supports grassland with scattered trees and scrub. It is located adjacent to the land required for the Proposed Scheme, to the west of Stapleford and adjacent to the eastern bank of the River Erewash;
- Stanton Gate LNR LWS covering an area of 0.7ha, is designated for its mosaic of habitats including semi-improved grassland and tall herb fen. It is partly within the land required for the Proposed Scheme. This site is located entirely within the boundary of Stanton Gate LNR;
- Moorbridge Lane Wetland North LWS, covering an area of 5.6ha supports grassland with scattered trees and scrub. It is located partly within the land required for the Proposed Scheme, to the west of Stapleford and adjacent to the eastern bank of the River Erewash;
- West Hallam Towpath Scrub LWS, covering an area of 4.1ha, is designated for standing open water and water vole population in the canal, as well as a habitat mosaic which includes tall herbs and grasses, grazed pastures as well as marsh, swamp and wet woodland. It is partly located within the land required for the Proposed Scheme at Stanton Gate;
- Trowell Marsh LNR LWS covering an area of 2.4ha, supports broadleaved woodland and grassland. It is located 380m west of the land required for the Proposed Scheme. Part of this LWS (0.8ha) forms Trowell Marsh LNR;
- Nottingham Canal LWS, covering an area of 8.6ha supports broadleaved woodland, scrub and standing water. This site encompasses Nottingham Canal LNR. It is partly located within the land required for the Proposed Scheme, to the east of Trowell;
- Motorway Grassland, Trowell LWS, covering an area of 1ha supports grassland and scattered trees. It is located 50m west of the land required for the Proposed Scheme, to the east of Trowell and to the west of the M1;
- Oldmoor Wood LWS (also a Woodland Trust site), covering an area of 14.8ha supports broadleaved woodland. It is located to the east of Cossall and to the west of the M1, and 150m west of the land required for the Proposed Scheme;
- Holly Copse, Strelley LWS, covering an area of 0.6ha supports broadleaved woodland. It is located to the east of Cossall and to the west of the M1, and 190m west of the land required for the Proposed Scheme;
- Strelley Hall Park LWS, covering an area of 35ha supports semi-improved grassland and broadleaved woodland. It is located adjacent to the land required for the Proposed Scheme adjacent to the village of Strelley and north-west of Bilborough;
- M1 Woodland LWS, covering an area of 1.3ha supports broadleaved woodland. It is surrounded by the land required for the Proposed Scheme to the north of Nottingham Business Park;

- Chilwell Dam Plantation LWS, covering an area of 2.3ha supports broadleaved woodland. It is located 170m east of the land required for the Proposed Scheme to the east of the A6002 Bilborough Road;
- Verge Wood LWS, covering an area of 5.3ha supports broadleaved woodland. It is located 100m west of the land required for the Proposed Scheme to the east of Swingate and to the west of the M1;
- Temple Lake LWS, covering an area of 4.9ha supports a lake, grassland and broadleaved woodland. It is located 120m west of the land required for the Proposed Scheme to the south of Larkfields and to the west of the M1;
- Temple Lake Woods LWS, covering an area of 4.1ha supports broadleaved woodland. It is located 270m west of the land required for the Proposed Scheme to the south of Larkfields and to the west of the M1;
- Hempshill Roundabout LWS, covering an area of 0.7ha supports broadleaved woodland and grassland. It is located within the roundabout at Hempshill, where the A610 Nottingham Road meets the A6002 Woodhouse Way. It is 45m east of the land required for the Proposed Scheme;
- Newlane Pastures LWS, covering an area of 6ha supports grassland and is located 60m west of the land required for the Proposed Scheme to the east of New Nuthall and to the west of the M1;
- High Wood, Nuthall LWS, covering an area of 0.7ha supports broadleaved woodland. It is located 380m east of the land required for the Proposed Scheme, at High Wood Cemetery;
- Nuthall Cutting LWS, covering an area of 5.5ha supports broadleaved woodland and grassland. It is partly located within the land required for the Proposed Scheme to the west of Bulwell;
- Low Wood LWS, covering an area of 1.2ha supports broadleaved woodland. It is located 280m east of the land required for the Proposed Scheme to the west of Hempshill Vale;
- Blenheim Disused Railway LWS, covering an area of 1.3ha supports broadleaved woodland and grassland. It is partly within the land required for the Proposed Scheme to the south of Blenheim Industrial Estate;
- Kimberley Cutting LWS, covering an area of 7.5ha supports broadleaved woodland and grassland. It is located 75m from the land required for the Proposed Scheme to the north of New Nuthall;
- New Farm Wood LWS, covering an area of 5.9ha, most of which is ancient semi-natural woodland. It is partly located within the land required for the Proposed Scheme to the west of Bulwell;
- Seller's Wood LWS, covering an area of 14.6ha, most of which is ancient semi-natural woodland. This site has the same boundaries as Seller's Wood SSSI and LNR as described above and is adjacent to land required for the Proposed Scheme;

- Bulwell Wood and Pond LWS, covering an area of 17.3ha, much of which is ancient semi-natural woodland. It is partly located within the land required for the Proposed Scheme to the west of Bulwell. Most of the LWS is located within the boundary of Bulwell Wood SSSI, as described above, but also encompasses two connected hedgerows with mature trees and a pond located outside the boundary of the SSSI;
- Blenheim Farm LWS, compromising two discrete land parcels which together cover an area of 1ha, supports standing water, grassland and broadleaved woodland. Both land parcels included within the LWS are located between 340m and 440from the land required for the Proposed Scheme to the north of Blenheim Industrial Estate, Bulwell;
- Blenheim Lane Ponds LWS, covering an area of 3.1ha supports standing water, grassland and broadleaved woodland. It is located 140m east of the land required for the Proposed Scheme to the east of Bulwell Wood;
- Blenheim Lane Grassland LWS, covering an area of 5.2ha supports grassland with areas of standing water. It is located 340m east of the land required for the Proposed Scheme to the east of Bulwell Wood;
- Blenheim Lane Hedgerows LWS, covering an area of 1ha supports hedgerows on both sides of the lane. It is located 220m east of the land required for the Proposed Scheme to the east of Bulwell Wood; and
- Hucknall Airfield LWS covering an area of 92ha, supports grassland and scattered scrub. The LWS is adjacent to the land required for the Proposed Scheme to the north of Bulwell Wood.

7.3.8 There are three Ancient Woodland Inventory Sites (AWIS), all of which are ancient semi-natural woodlands of potential relevance to the assessment in the Stapleford to Nuthall area. They are:

- New Farm Wood, which is a 5.2ha AWIS located within the land required for the Proposed Scheme. This ancient semi-natural woodland is located entirely within the boundary of New Farm Wood LWS but does not include all of the woodland in the LWS. It is of county/metropolitan value;
- Seller's Wood, which is a 13.8ha AWIS located immediately adjacent to the land required for the Proposed Scheme. The ancient woodland is the reason for designation of Seller's Wood SSSI and is of national value; and
- Bulwell Wood, which is an 11.2ha AWIS located immediately adjacent to the land required for the Proposed Scheme. This ancient semi-natural woodland is the reason for designation of Bulwell Wood SSSI and is of national value. The AWIS does not include all of the woodland in the SSSI.

7.3.9 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

Habitats

7.3.10 The following habitat types which occur in this area are relevant to the assessment.

Woodland

7.3.11 In addition to the woodlands located within designated sites, there are four other areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[57], and Nottinghamshire[58] and Derbyshire[59] Biodiversity Action Plan (BAP) habitats), which would be within or partly within the land required for the Proposed Scheme. These woodland areas are located in the following areas:

- between the Erewash Canal and River Erewash;
- north and south of the A609 Nottingham Road;
- Trowell Motorway Services and along Waterloo Lane; and
- north of Nuthall, adjacent to the M1.

7.3.12 On a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to county/metropolitan value.

Grassland

7.3.13 Grasslands outside designated sites occur within the land required for the Proposed Scheme. This includes grasslands identified as potential LWS on the floodplain of the River Erewash and adjacent to the Erewash Canal at Sandiacre, a grassland scrub mosaic east of Old Rectory Farm, and grassland at Strelley Hall, which may all qualify as a habitat of principal importance and local BAP habitat. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands), these grasslands are considered to be of up to district/borough value, except those within the potential LWS which are considered to be of up to county/metropolitan value.

Hedgerows

7.3.14 Many of the hedgerows in the Stapleford to Nuthall area are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[60]. In addition, they could also provide commuting corridors, nesting and feeding habitats for wildlife. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

[57] Section 41 (41) of the Natural Environment and Rural Communities Act 2006
[58] The Nottinghamshire Biodiversity Action Group (1998). *Local Biodiversity Action Plan for Nottinghamshire.* Nottinghamshire County Council. Available online at: http://www.nottsbag.org.uk/projects.htm#bap
[59] Lowland Derbyshire Biodiversity Partnership (2011) *Lowland Derbyshire Biodiversity Action Plan 2011-2020.* Available online at: https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/conservation/ecology/lowland-derbyshire-biodiversity-action-plan/lowland-derbyshire-biodiversity-action-plan-lbap-2011-2020.pdf
[60] 'Statutory Instrument 1997 No. 1160' *The Hedgerows Regulations 1997*

Watercourses

7.3.15 In addition to the watercourses located within designated sites, the River Erewash and an additional five smaller watercourses would be crossed by the Proposed Scheme.

7.3.16 The River Erewash may support habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, it is considered to be of up to county/metropolitan value. The five smaller watercourses are considered to be of up to district/borough value, pending confirmation through field surveys of their associated habitat context and water quality status.

Water bodies

7.3.17 There are 11 ponds that are located within, or partly within, the land required for the Proposed Scheme. Some may qualify as habitats of principal importance, or local BAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newt). On a precautionary basis, pending the findings of field surveys, these ponds are considered to be of up to county/metropolitan value.

Ancient and veteran trees

7.3.18 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within the land required for the Proposed Scheme. On a precautionary basis and pending the results of surveys, it is considered that each tree would be of district/borough value. Information on ancient and veteran trees will be confirmed upon further survey and be reported in the formal ES.

Protected and notable species

7.3.19 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 15.

Table 15*:* Species potentially relevant to the assessment within the Stapleford to Nuthall area

Resource/feature	Value	Rationale
Bats	Up to regional	Desk study information shows that at least six bat species have been recorded in the vicinity of the Proposed Scheme in the Stapleford to Nuthall area, including common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat, Daubenton's bat and whiskered/Brandt's bat. There are recent records of bat roosts within 1km of the land required for the Proposed Scheme, including a site used by Brandt's bat, brown long-eared bat and common pipistrelle in Sandiacre; brown long-eared bat roosts in Stapleford and Bulwell; a common and soprano pipistrelle roost in Broxtowe; and several common pipistrelle bat roosts in Nuthall. High quality habitat for bats is present within and adjacent to the land required for the Proposed Scheme, including the River Erewash, Erewash Canal, Stanton Gate LNR, Nottingham Canal LNR and woodland complexes to the north of Nuthall comprising New Farm Wood, High Wood, Low Wood, Nuthall Cutting, Seller's Wood and Bulwell Wood. These habitats, as well as the buildings and structures to be impacted by the Proposed Scheme, have the potential to support important roost sites, foraging areas and commuting routes of the bat species known to

		be present in the Stapleford to Nuthall area, as well as other bat species. Important sites for rarer bat species could be of up to regional value.
Otter	Up to county/metropolitan	Records of otter have been identified in the vicinity of the River Erewash and Erewash Canal, including at Stanton Gate from 2014 within 100m of land required for the Proposed Scheme. Suitable habitat for otter is present along all relevant watercourses, together with adjacent terrestrial habitat including woodland, scrub and other dense vegetation. Otter is likely to be present within the land required for the Proposed Scheme.
Water vole	Up to county/metropolitan	Populations of water vole are rare and continue to decline in Derbyshire and Nottinghamshire. Records of water vole have been identified in the River Erewash and Erewash Canal through desktop study[61], including a 2013 record from Stanton Lock within 30m of the land required for the Proposed Scheme, and a 2015 record from the former Nottingham Canal at Trowell within 100m of land required for the Proposed Scheme. Therefore, pending detailed survey, it is likely that water vole is present on watercourses within the land required for the Proposed Scheme.
Polecat	Up to county/metropolitan	Populations of polecat are rare in Nottinghamshire and Derbyshire. Habitat suitable for this species is present including hedgerows, farmland and woodland.
Great crested newt	County/metropolitan	Ongoing surveys to date have confirmed the presence of great crested newt in the vicinity of Strelley. There is suitable aquatic and terrestrial habitat for great crested newt within and adjacent to the land required for the Proposed Scheme, with 11 ponds being located within the land required for the Proposed Scheme, and an additional 24 ponds located within 250m from the land required for the Proposed Scheme.
Birds	Up to county/metropolitan	The farmland and woodland is suitable for breeding and wintering birds. Willow tit and spotted flycatcher have been recorded within Nottingham Canal LNR[62] and could be present in other areas of suitable habitat along the Proposed Scheme. A range of typical common woodland breeding and wintering birds are also likely to be present. Desk study data[63] include records of Species of Principal Importance including willow tit, and Schedule 1 species including barn owl, kingfisher and hobby within 500m of the land required for the Proposed Scheme.
White-clawed crayfish	Up to county/metropolitan	White-clawed crayfish are known to occur in watercourses in the upper catchment of the River Erewash, although their populations are declining in Nottinghamshire and Derbyshire. There are records for white-clawed crayfish from 2014 in Woodhall Farm Lake (located within 250m of land required for the Proposed Scheme), and in Bulwell Wood SSSI pond (located within 20m of land required for the Proposed Scheme)[64].

[61] Ecological data received from Nottinghamshire County Council and Derbyshire County Council
[62] The Nottingham Canal Local Nature Reserve Management Plan – Third Edition 2012-2016 – Prepared by EMEC Ecology for Broxtowe Borough Council
[63] Ecological data received from Nottinghamshire County Council and Derbyshire County Council
[64] Ecological data received from Nottinghamshire County Council

Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates is likely to be present in all of the watercourses and water bodies associated with the land required for the Proposed Scheme. Records of notable sites for aquatic invertebrates have been identified through desk study, including from historic records for a pond in Seller's Wood LWS, which was designated in part for its notable water beetle assemblage[65].
Terrestrial Invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is likely to be present in areas of woodland, scrub, hedgerows and grassland. There are records of terrestrial invertebrates from Stanton Gate LNR, including the latticed heath moth, which is a Species of Principal Importance.
Fish	Up to district/borough	Suitable habitat for fish is present in the all of the watercourses and water bodies associated with the land required for the Proposed Scheme (as described above in the habitats section). There are records in the River Erewash of 10 fish species including European bullhead (an Annex II[66] species), barbel and grayling (Annex V[67] species), European eel and brown trout.
Reptiles	Up to district/borough	There are records of grass snake within 1km of the Proposed Scheme within the Stapleford area and also in the vicinity of Stony Clouds LNR. A number of habitat corridors, which may support reptiles, including grass snake and common lizard, are present. These include the Erewash Canal, Nottingham Canal and River Erewash, as well as other areas such as railway lines and grassland habitats associated with Moorbridge Lane Grasslands South LWS and Stanton Gate LNR.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigation for the losses of habitat and effects on species:

- Stanton Gate viaduct, which crosses over the River Erewash and the Erewash Canal would avoid direct effects to these watercourses and allow free passage for wildlife beneath them, including along the rivers and their banks;
- new woodland planting totalling 66.4ha would contribute to compensation for losses of woodland and enhance connectivity between remaining woodlands;
- proposed grassland habitat creation totalling 6ha would contribute to compensation for the grassland losses from the Proposed Scheme;
- provision of new ponds (e.g. at Strelley), which would form part of the measures to address loss of water bodies and effects on great crested newt and other species;

[65] Ecological data received from Nottinghamshire County Council
[66] Listed on Annex II of the Council directive 92/43/EEC on the conservation of natural habitat and of wild fauna and flora
[67] Listed on Annex V of the Council directive 92/43/EEC on the conservation of natural habitat and of wild fauna and flora

- new species-rich hedgerows (3.7km), using appropriate native species, would assist in compensating for the loss of hedgerows and re-connect the ecological network in the surrounding areas. This includes plantings along the boundary of the Proposed Scheme and around field edges in the Strelley area;
- Strelley tunnel would avoid direct impacts on Strelley Hall Park LWS, woodland habitat to the north of Strelley, and any veteran trees that may be present in Strelley Hall Park LWS; and
- construction of the Nuthall Cycleway underpass would reduce severance on Nuthall Cutting LWS.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[68], which includes translocation of protected species where appropriate.

7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

7.4.4 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. All assessments have been undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

[68] Supporting document: Draft Code of Construction Practice

Designated sites

7.4.5 Seller's Wood SSSI and the associated LNR, LWS and AWIS would not be directly affected by the construction of the Proposed Scheme. The New Farm Wood cutting and Westville embankment would be located 100m to the west of the site and a balancing pond would be located 40m to the north of the SSSI boundary. It is anticipated that potential indirect effects would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects.

7.4.6 While excavation and dewatering could result in localised and controlled impacts on groundwater flows and levels and the balancing pond could alter surface water flows, the SSSI is beyond the area subject to dewatering effects and it is considered that implementation of mitigation measures contained in the draft CoCP would be sufficient to maintain groundwater levels in the SSSI and maintain surface water flows.

7.4.7 Woodland planting to be incorporated in the Proposed Scheme would increase the area of woodland in this locality and would also reduce impacts arising from the management of adjacent agricultural land by providing a habitat buffer and linkage between woodland areas.

7.4.8 Bulwell Wood SSSI and the associated AWIS would not be directly affected by the construction of the Proposed Scheme. The Westville embankment would be located 40m to the west of this site. The AWIS would not be affected through impacts on ground and surface water, but construction of a drainage channel running adjacent to the SSSI could result in indirect effects through disruption of the hydrological function of the SSSI.

7.4.9 There is also potential for an adverse indirect effect on Bulwell Wood SSSI through impacts on the clean water pond, a designated feature of interest for the SSSI, as a result of upstream construction works in the adjacent Hucknall to Selston area affecting the connected Bulwell Wood and Pond LWS and supply of water to the SSSI. Other construction effects could also result in temporary indirect effects on the SSSI. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of these impacts to a level where there would be no significant effects. However, on a precautionary basis and in the absence of further information regarding drainage for the Proposed Scheme in relation to Bulwell Wood and Pond LWS, at this stage the assessment assumes there would be an adverse effect which would be significant at up to national level.

7.4.10 The woodland planting included in the Proposed Scheme would be beneficial for the integrity of Bulwell Wood SSSI and AWIS as it will protect the woodland from disturbance and farming activities, increase the size of the woodland and provide a link to other areas of woodland.

7.4.11 Construction of the Stanton Gate viaduct would result in the permanent loss of 0.5ha (74%) of Stanton Gate LNR and LWS. Pending further survey and consultation, the loss of habitat would result in a permanent adverse effect on the integrity of Stanton

Gate LNR and LWS that would be significant at the county/metropolitan level in each case.

7.4.12 Construction of Stanton Gate viaduct would result in the permanent loss of the whole of Sandiacre Marsh LWS (0.2ha). The loss of habitat would result in a permanent adverse effect on the integrity of Sandiacre Marsh that would be significant at the county/metropolitan level.

7.4.13 Construction of Trowell embankment and associated drainage works would result in the permanent loss of 0.2ha of Nottingham Canal LNR and LWS, with an additional 0.2ha loss from the LWS where it extends beyond the boundary of the LNR. This equates to a loss of 2% of the LNR, and 5% of the LWS. In addition to habitat loss, there would also be severance and fragmentation of habitat integrity of the LNR and LWS. This would add to and extend the existing severance associated with the M1, which is located 100m to the west of the Trowell embankment. This may also constrain access to allow long-term habitat management in the LNR and LWS, and result in the drying and loss of wetland habitats due to edge effects and changes in hydrology. These habitat losses and changes would result in a permanent adverse effect on the integrity of Nottingham Canal LNR and LWS that would be significant at the county/metropolitan level in each case.

7.4.14 Construction of a balancing pond would result in the permanent loss of 0.6ha (10%) of Moorbridge Lane Wetland North LWS. The loss of habitat would result in a permanent adverse effect on the integrity of Moorbridge Lane Wetland North LWS that would be significant at the county/metropolitan level.

7.4.15 Construction of the M1 realignment would result in the permanent loss of approximately 1.1ha (26%) of West Hallam Towpath Scrub LWS. The loss of habitat would result in a permanent adverse effect on the integrity of West Hallam Towpath Scrub LWS that would be significant at the county/metropolitan level.

7.4.16 Construction of Nuthall embankment would result in the permanent loss of 0.5ha (10%) of Nuthall Cutting LWS. This habitat loss would result in a permanent adverse effect on the integrity of the Nuthall Cutting LWS that would be significant at county/metropolitan level.

7.4.17 Construction of New Farm Wood cutting would result in the loss of 1.8ha of ancient woodland habitat within New Farm Wood LWS and AWIS (equivalent to 30% of the LWS and 33% of the AWIS), with the remainder of the AWIS being within the land required for the Proposed Scheme for the purpose of ecological enhancement of the remaining woodland. New woodland planting would also be provided but would not compensate for the loss of ancient semi-natural woodland which is an irreplaceable habitat. This habitat loss would result in a permanent adverse effect on the integrity of New Farm Wood LWS and AWIS that would be significant at the county/metropolitan level in each case.

7.4.18 Construction of the Westville embankment would result in the loss of 0.4ha of woodland edge habitat in the Bulwell Wood and Pond LWS (loss of 3% of the LWS). The loss is outside the boundary of Bulwell Wood SSSI and AWIS. As most of the habitat loss from the LWS would occur in the adjacent Hucknall to Selston area

(0.4ha), this is reported in the assessment for the adjacent Hucknall to Selston area, which concludes that habitat loss and associated habitat severance would result in a permanent adverse effect on the integrity of Bulwell Wood and Pond LWS that would be significant at up to the county/metropolitan level.

7.4.19 Construction of an access track would result in the permanent loss of 0.2ha (14%) of Blenheim Disused Railway LWS. This habitat loss would result in a permanent adverse effect on the integrity of Blenheim Disused Railway LWS that would be significant at county/metropolitan level.

7.4.20 Blenheim Farm LWS would not be directly or indirectly affected by construction of the Proposed Scheme in the Stapleford to Nuthall area. There is potential for an adverse indirect effect on the LWS through temporary or permanent loss or alteration to flows and/or quality of the surface water supply to ponds within the LWS as a result of construction works within the boundary of Bulwell Wood and Pond LWS within the adjacent Hucknall to Selston area. A precautionary approach is taken to the assessment whereby in the absence of additional mitigation there would be an adverse effect on the integrity of Blenheim Farm LWS that is significant at up to the county/metropolitan level.

7.4.21 Blenheim Lane Ponds LWS would not be directly or indirectly affected by construction of the Proposed Scheme in the Stapleford to Nuthall area. There is potential for an adverse indirect effect on the LWS through temporary or permanent loss or alteration to flows and/or quality of the surface water supply to ponds within the LWS as a result of construction within the boundary of Bulwell Wood and Pond LWS in the adjacent Hucknall to Selston area. A precautionary approach is taken to the assessment whereby in the absence of additional mitigation there would be an adverse effect on the integrity of Blenheim Lane Ponds LWS that is significant at up to the county/metropolitan level.

7.4.22 There would be no significant direct or indirect effects to Hucknall Airfield LWS arising from construction in the Stapleford to Nuthall area. However, construction of Westville embankment within the adjacent Hucknall to Selston area would result in the loss of 4ha of Hucknall Airfield LWS (loss of 5% of the LWS). All habitat loss will be within the Hucknall to Selston area (LA07) and would result in a permanent adverse effect on site integrity that would be significant at up to the county/metropolitan level.

Habitats

Woodland

7.4.23 Construction of the Proposed Scheme in the Stapleford to Nuthall area would result in the loss of 11ha of broadleaved woodland outside of designated sites. This loss includes woodland along existing railway lines, on M1 embankments and along Waterloo Lane. This is a permanent adverse effect that is significant at up to the county/metropolitan level. On a precautionary basis, the proposed planting of woodland (woodland habitat creation and landscape mitigation planting) would compensate for losses of existing woodland so that the residual effect (following establishment of new woodland) would be reduced to a level that is not significant. However, if the ongoing review identifies the presence of additional

ancient woodland, the residual effect would be significant at up to the county/metropolitan level.

Grassland

7.4.24 In the absence of further survey data, it is estimated that the Proposed Scheme could result in the loss of up to 24ha of semi-improved grassland, including 0.9ha from the River Erewash Grassland potential LWS, 7ha from the Ilkeston Road Pastures potential LWS, 1.4ha from an unnamed potential LWS, and 8ha of grassland on the floodplain of the River Erewash. It has been assumed that none of the other grassland that would be lost is unimproved. This is a permanent adverse effect that is significant at up to the county/metropolitan level for grasslands within potential LWS and at district/borough level for other grasslands. Whilst the proposed grassland creation would compensate for loss of existing grassland, until further surveys and assessment are completed the loss of these grasslands is considered on a precautionary basis to have a residual adverse effect on grassland habitats that would be significant at up to district/borough level.

Hedgerows

7.4.25 Construction of the Proposed Scheme would result in the permanent loss of 7km of hedgerows, and would result in severance of the network in many places, adversely affecting habitat connectivity with the surrounding area. Some of the affected hedgerows may be habitat of principal importance, local BAP habitat or 'important' under The Hedgerows Regulations 1997.

7.4.26 The Proposed Scheme includes new hedgerow planting which would help compensate for losses. Further hedgerow planting would be proposed as part of the design development. In the absence of this additional mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.27 Section 15, Water resources and flood risk, identifies the potential for watercourse habitats to be directly and indirectly affected by construction of the Proposed Scheme through:

- realignment of the River Erewash beneath the Proposed Scheme and realigned M1; and
- realignment of the unnamed tributary of the River Erewash.

7.4.28 Where affected watercourses are natural channels, the Proposed Scheme would incorporate appropriate features to retain and, where reasonably practicable, enhance their condition. Pending confirmation of the habitats present and the design to mitigate potential adverse effects (including shading from Stanton Gate viaduct), the construction works affecting the River Erewash and its tributaries, are considered to result in a permanent adverse effect that would be significant at up to county/metropolitan level.

Water bodies

7.4.29 Eleven water bodies would be lost as a result of construction of the Proposed Scheme and associated temporary works. These losses would be a permanent adverse effect that is significant at up to county/metropolitan level. Replacement ponds are to be created, for example at Strelley, which would compensate for habitat losses. On a precautionary basis, pending further survey information and assessment, it is considered that the residual effect would be significant at up to district/borough level, particularly if it is confirmed through field surveys that they support animal or plant species of principal importance or high conservation status.

Ancient and veteran trees

7.4.30 It is assumed that if any ancient and veteran trees within the land required for the Proposed Scheme in the Stapleford to Nuthall area, they would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at district/borough level in each case.

Species

Bats

7.4.31 At least six bat species have been recorded within the Stapleford to Nuthall area. The demolition of buildings/structures and the permanent removal of vegetation may have impacts on bats, including potential loss of roost sites, reduction in the availability of foraging resources, and fragmentation of commuting routes. This could particularly affect breeding populations of bats within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP.

7.4.32 The proposed woodland, grassland and hedgerow planting will help to reduce impacts to bats and further mitigation will be identified following ongoing surveys and assessment. On a precautionary basis, in the absence of further survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to the regional level.

Otter

7.4.33 Temporary and permanent habitat loss would occur along several watercourses, including loss of tree and scrub cover along the River Erewash and the Erewash Canal. There would also be temporary habitat loss through realignment of the River Erewash, and realignment and culverting of smaller watercourses crossed by the Proposed Scheme. While there is potential for otter to be disturbed and displaced by construction activities, it is likely that significant effects would be avoided through measures in the draft CoCP. On a precautionary basis, in the absence of survey information, it is considered that the above habitat losses would result in an adverse effect on otter that would be significant at up to the county/metropolitan level.

Water vole

7.4.34 Temporary and permanent habitat loss would occur along several watercourses, including the loss of wetland habitats along the River Erewash and the Erewash Canal. The Stanton Gate viaduct over the River Erewash, Erewash Canal and two minor watercourses would reduce the requirement for permanent losses and severance of water vole habitats along the watercourse corridors, although the viaduct would not mitigate temporary habitat losses. Indirect effects from construction activities may result in disturbance to water vole during the construction period, and prevent them from moving along the watercourse corridors. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. On a precautionary basis, in the absence of survey information, it is considered that the above habitat losses would result in an adverse effect on water vole that would be significant at up to the county/metropolitan level.

Polecat

7.4.35 The loss of woodland, grassland and hedgerows could affect polecat. On a precautionary basis in the absence of survey information, the species is assumed to be present and the effects of permanent habitat loss on this species would be significant at up to the county/metropolitan level.

Great crested newt

7.4.36 From surveys carried out to date, great crested newt is confirmed as present in three ponds to the south of Strelley Hall Park LWS. One of these ponds is located immediately adjacent to the land required for the Proposed Scheme. Construction of the Strelley tunnel south portal and associated infrastructure would result in the loss of terrestrial habitat (grassland, hedgerows and trees) within 250m of two ponds, and would sever terrestrial habitat linkages between these two ponds.

7.4.37 In absence of a full survey dataset for great crested newt in the Stapleford to Nuthall area, it has been assumed that all 11 ponds (and surrounding terrestrial habitat) within the land required for the Proposed Scheme may support great crested newt. The loss of ponds supporting great crested newt and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newt across this area. In addition, the loss or isolation of terrestrial habitat supporting great crested newt populations associated with retained ponds outside the land required for the Proposed Scheme may also adversely affect this species.

7.4.38 Where great crested newt is present, two new ponds would be created for every one lost, and this would contribute towards reducing the effects to not significant. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. In the absence of further survey information and the full mitigation design, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newt that would be significant at up to the county/metropolitan level.

Birds

7.4.39 The Proposed Scheme would result in the loss, fragmentation, severance and/or disturbance of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These are likely to include barn owl, a Schedule 1 species, which may be present within the land required for the Proposed Scheme and may include other Schedule 1 species such as kingfisher and hobby, and Red List species including willow tit. On a precautionary basis, in the absence of further survey information, it is considered that that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.40 The Proposed Scheme would result in indirect impacts to habitat suitable for white-clawed crayfish in Bulwell Wood SSSI and further downstream, due to potential alterations to water supply due to changes in drainage in the Hucknall to Selston area. On a precautionary basis, in the absence of survey information, it is considered that that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

7.4.41 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates other than white-clawed crayfish (including species of principal importance). On a precautionary basis, in the absence of survey information, it is considered that the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Terrestrial invertebrates

7.4.42 The land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates (including species of principal importance). On a precautionary basis, in the absence of survey information, is considered that that the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Fish

7.4.43 The River Erewash and a tributary of the River Erewash would be affected by construction of the Proposed Scheme through realignment, and watercourses would be culverted in six locations. This may result in direct and indirect effects on fish. These watercourses may require assessment under the Water Framework Directive WFD[69]. On a precautionary basis, in the absence of survey information, it is considered that that the Proposed Scheme would result in temporary and permanent adverse effects that would be significant at up to the district/borough level.

[69] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (The Water Framework Directive WFD)

Reptiles

7.4.44 There are records for grass snake within the land required for the Proposed Scheme and also within 100m of the land required for the Proposed Scheme, associated with the Erewash Canal and River Erewash. Suitable habitat is likely to be present for reptiles, including grass snake near the River Erewash, Erewash Canal and Nottingham Canal and common lizard and slow worm in suitable grassland and scrub habitats. On a precautionary basis, in the absence of survey information, it is considered that construction of the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

7.4.45 Effects on other habitats and species that are significant at the local/parish level will be reported in the formal ES.

7.4.46 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered where appropriate. These effects will be reported in the formal ES.

Other mitigation measures

7.4.47 Further measures currently being considered, but which are not yet part of the design and will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:

- opportunities to enhance watercourses, including the River Erewash, during realignment for the Proposed Scheme;
- potential wetland habitat creation in replacement floodplain storage areas e.g. at the location of the M1 realignment;
- provision of additional broad-leaved woodland (non-ancient) to replace those lost, and/or enhancement of remaining woodlands;
- provision of additional hedgerows which would offset the losses and maintain the connectivity of the network;
- options to create new species-rich grasslands (including translocation where appropriate) to compensate for grassland losses including at Stanton Gate LNR;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction;
- design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats;
- the need for inclusion of structures to reduce severance effects on bats ;
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the

permanent works but within the land required for the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal. Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders; and

- ancient woodland is an irreplaceable resource and this loss is considered to be a permanent adverse residual effect. The loss of ancient woodland would be partly compensated through a package of measures bespoke to the woodland affected. Ancient woodland soil with its associated seed bank would be salvaged and translocated to receptor sites that have, wherever possible, been chosen because they link to and/or are adjacent to ancient woodland fragments. This would seek to increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, enhancement of retained woodland, and translocation of coppice stools and dead wood, would be undertaken as appropriate.

Summary of likely residual significant effects

7.4.48 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 16.

Table 16: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Bulwell Wood SSSI	Permanent adverse effect due to changes in hydrology.	Up to national
Stanton Gate LNR and LWS	Permanent adverse effect on site integrity due to loss of 0.5ha (74%) of species-rich grassland and scrub habitat.	County/metropolitan
Nottingham Canal LNR and LWS	Permanent adverse effect on site integrity due to loss of 0.4ha of habitat (encompassing 2% of the LNR and 5% of the LWS), and associated habitat severance and fragmentation.	County/metropolitan
Bulwell Wood and Pond LWS	Permanent adverse effect on site integrity due to loss of 0.4ha (3% of the LWS) of woodland with associated pond across the combined Stapleford to Nuthall, and Hucknall to Selston areas.	Up to county/metropolitan
Sandiacre Marsh LWS	Permanent adverse effect on site integrity due to loss of 100% of habitat resource.	County/metropolitan

Moorbridge Lane Wetland North LWS	Permanent adverse effect on site integrity due to loss of 0.6ha (10%) of habitat.	County/metropolitan
West Hallam Towpath Scrub LWS	Permanent adverse effect on site integrity due to loss of 1.1ha (26%) of habitat and associated habitat severance and fragmentation.	County/metropolitan
Nuthall Cutting LWS	Permanent adverse effect on site integrity due to loss of 0.5ha (10%) of habitat.	County/metropolitan
New Farm Wood LWS and AWIS	Permanent adverse effect on site integrity due to loss of 1.8ha (33% of the AWIS and 30% of the LWS) of ancient semi-natural woodland habitat.	County/metropolitan
Blenheim Disused Railway LWS	Permanent adverse effect on site integrity due to loss of 0.2ha (14%) of habitat.	County/metropolitan
Blenheim Farm LWS	Permanent adverse effect on site integrity due to changes in hydrology due to the loss of an upstream pond supplying the LWS.	Up to county/metropolitan
Blenheim Lane Ponds LWS	Permanent adverse effect on site integrity due to changes in hydrology due to the loss of an upstream pond supplying the LWS.	Up to county/metropolitan
Hucknall Airfield LWS	Permanent adverse effect on site integrity due to loss of 4ha (5% of the LWS).	Up to county/metropolitan
Woodland	Permanent loss of up to 11ha of woodland outside designated sites including woodland of potential LWS quality. Potential adverse effect on ancient woodland. New woodland planting is included in the Proposed Scheme design.	Up to county/metropolitan
Grassland	Permanent adverse effect on the integrity of up to 24ha of semi-improved grassland habitat, including grassland of potential LWS quality, and floodplain grassland. Grassland creation is included in the Proposed Scheme design.	Up to district/borough
Hedgerow	Permanent loss and severance of 7km of hedgerows. Hedgerow creation is	Up to district/borough

	included in the Proposed Scheme design.	
Watercourses	Potential adverse effects on WFD status of watercourses to be realigned.	Up to county/metropolitan
Water bodies	Permanent loss of 11 water bodies. New water bodies are included in scheme design to address losses.	Up to district/borough
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees.	Up to district/borough (in each case)
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Potential permanent adverse effect on conservation status due to loss of habitat in the form of resting sites and foraging habitat.	Up to county/metropolitan
Water vole	Potential permanent adverse effect on conservation status due to loss of riparian habitat and fragmentation of habitat.	Up to county/metropolitan
Polecat	Potential permanent adverse effect on conservation status due to loss of foraging habitat and fragmentation.	Up to county/metropolitan
Great crested newt	Loss of 11 ponds and surrounding terrestrial habitat which may support great crested newt.	Up to county/metropolitan
Birds	Potential permanent adverse effect on conservation status due to loss, fragmentation and/or severance of habitat for nesting and feeding.	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat and indirect effects.	Up to county/metropolitan
Aquatic Invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level
Terrestrial Invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level

Fish	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough level

7.5 Effects arising during operation

Avoidance and mitigation measures

7.5.1 There are no specific measures currently identified to avoid or mitigate ecological effects during operation of the Proposed Scheme within this section of the route.

Assessment of impacts and effects

7.5.2 This section considers the impacts and effects on ecological features during operation of the Proposed Scheme. All assessments are based on a precautionary basis, in the absence of survey information.

7.5.3 Bats are at risk of being struck by trains or possibly harmed by turbulence, particularly at frequently used commuting/foraging routes which cross the Proposed Scheme. This represents a potential permanent adverse effect on conservation status of the bat species concerned that would be significant at up to the regional level.

7.5.4 Barn owls are at risk of colliding with trains, particularly near the River Erewash, where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

7.5.5 Effects on other habitats and species likely to be significant at the local/parish level during operation will be assessed and reported in the formal ES.

Other mitigation measures

7.5.6 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[70] which has been developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with landowners; and
- other structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 17.

Table 17: Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains.	Up to regional
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

Monitoring

7.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

7.5.9 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Stapleford to Nuthall area.

[70] Currently in development for Phase One of HS2

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Stapleford to Nuthall area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies is underway, including with Public Health England (PHE), Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Stapleford to Nuthall area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA06 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)[71].

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

8.2.4 The health determinants of relevance within the Stapleford to Nuthall area are:

- for impacts during construction (temporary and permanent):

[71] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

  - neighbourhood quality;
  - access to services, health and social care;
  - access to green space, recreation and physical activity; and
  - social capital[72].
- for impacts during operation (permanent):
  - neighbourhood quality

8.2.5 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.

8.2.6 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a concise review of the key literature and included in the formal ES. The evidence varies in its strength; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.7 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.2.8 Potential health effects have been identified based on information that is available at this stage of the assessment. A full assessment of health effects, applying the assessment criteria set out in the SMR, will be provided in the formal ES.

8.3 Environmental baseline

Existing baseline

Description of communities in the Stapleford to Nuthall area

8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below, including those settlements which are situated within

[72] The connections between the individuals within communities, and the inclination that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to tangibly support each other

1km of the route of the Proposed Scheme. A description of community facilities is provided in Section 6, Community.

8.3.2 The route of the Proposed Scheme would initially run through mainly urban areas, comprising densely populated settlements to the west of Nottingham. These built-up areas along the route of the Proposed Scheme are Stapleford, Sandiacre and Trowell, and they predominantly consist of residential areas, light industrial buildings and land, and recreational open space.

8.3.3 Further north, the route of the Proposed Scheme passes through more rural areas, particularly between Trowell and Nuthall, with agriculture being the main land use. The route of the Proposed Scheme would pass close to the settlements of Stanton-by-Dale, Strelley and Nuthall.

Sandiacre, Stapleford and surrounds

8.3.4 Sandiacre and Stapleford are towns located on the Nottinghamshire and Derbyshire border, with Nottinghamshire located directly west and Derbyshire located directly east of the route of the Proposed Scheme. The River Erewash and Erewash Canal are located between the two towns and provide opportunities for recreation in the area.

8.3.5 Together, Sandiacre and Stapleford comprise approximately 12,000 residential properties, some of which would lie within land required for the construction of the Proposed Scheme. There is a wide range of community resources in Sandiacre and Stapleford, including religious facilities such as the Stapleford Kingdom Hall of Jehovah's Witnesses, St. Giles' Church, St. Luke's Church and St. Helen's Church. There are also educational facilities (Cloudside Junior School, Ladycross Infants School, Albany Junior School, Albany Infant and Nursery School), healthcare centres, pharmacies, two libraries, youth groups, a social club and several public houses. Recreational facilities within this area include Sandiacre Town Football Club, a gym and a bowls club. There are many open spaces including Sandiacre Park, St. Giles Park, Hickings Lane Recreation Ground, Queen Elizabeth Park and the Peatfield and Albany allotments.

Stanton-by-Dale, Stanton Gate and surrounds

8.3.6 Stanton-by-Dale is a village located approximately 1.4km west of route of the Proposed Scheme. Stanton Gate is a hamlet situated approximately 2km west of the route of the Proposed Scheme and is bounded to the east by the Erewash Canal and to the north by Stanton Gate Local Nature Reserve (LNR). The Erewash Canal is part of the recreational walking routes of the Nutbrook Trail and the Erewash Valley Trail, and is frequented by pleasure boat users and also hosts recreational angling. Together, Stanton-by-Dale and Stanton Gate comprise approximately 350 residential properties.

8.3.7 Community resources in Stanton-by-Dale include public houses, Stanton Hall (a nursing home), St. Michael & All Angels Church, as well as the Erewash Golf Club. There are no community resources within Stanton Gate.

Trowell and surrounds

8.3.8 Trowell is a village in the Broxtowe District of Nottinghamshire located directly north of Stapleford. The village is split into two defined areas either side of the M1 motorway and lies adjacent to the route of the Proposed Scheme. Most of the village lies between the River Erewash and the Nottingham Canal LNR. Trowell comprises approximately 1,500 residential properties, the closest of which would lie adjacent to the route of the Proposed Scheme.

8.3.9 There are a range of community resources in Trowell, including St. Helen's Church, The Festival Inn, Trowell Parish Hall and the Trowell Church of England Primary School. East of the M1, other facilities include Pit Lane Recreation Area as well as the Trowell Garden Centre Coffee Shop.

Strelley and surrounds

8.3.10 Strelley is a village located to the west of Nottinghamshire approximately 400m to the south-east of the route of the Proposed Scheme. The village is separated from the Strelley Estate, a post-war council estate lying in the City of Nottingham, by the A6002 Woodhouse Way. While the estate is generally built-up, Strelley village comprises a few individual houses bordering Main Street. Robin Hood Way, a promoted recreational walking route, passes through the village along Main Street. Strelley comprises approximately 1,700 residential properties, the closest of which are located approximately 400m to the south-east of the route of the Proposed Scheme.

8.3.11 Community resources in Strelley include the All Saints' Church[73], Broad Oak public house, and Robin Hood Way recreational route. Community facilities in Strelley Estate include Strelley Recreational Ground, Strelley Social Club, Edgeway allotments, the Djanogly Strelley Academy (a primary school) and CARE Fertility Nottingham.

Nuthall and surrounds

8.3.12 Nuthall is a village situated directly to the west of route of the Proposed Scheme. The village includes two distinct areas: Old Nuthall, which lies directly to the west of the Proposed Scheme, and New Nuthall, bordering Nottingham and Broxtowe Country Park. Nuthall comprises approximately 3,300 residential properties, the closest of which would lie within the land required for the construction of the Proposed Scheme.

8.3.13 There are a range of community resources in Old Nuthall, including Basil Russell Playing Fields, Saint Patrick's Church, Nuthall Methodist Church, Nuthall Parish Council Temple Centre, and Larkfield Junior and Infant School. In New Nuthall, the main community resources are found in the Mornington Crescent Estate, where there is Mornington Primary School, Assarts Farm Medical Centre and Oldmoor Lodge public house.

[73] Also referred to as the Church of All Saints in the Historic Environment section

Demographic and health profile of the Stapleford to Nuthall area

8.3.14 The local communities potentially affected by the Proposed Scheme in the Stapleford to Nuthall area have a relatively large total population density, commensurate with the mainly urban nature of the area.

8.3.15 Data provided by the Office for National Statistics[74] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.16 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[75], and the health domain (a sub-set of the indices of multiple deprivation). The area as a whole is considered to be more resilient than the national average with regard to changes in relevant health determinants, and with few vulnerabilities in terms of the health status of the population.

8.3.17 The available data provide detail down to ward level and enable a profile to be made of the population within the Stapleford to Nuthall area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. As far as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, insofar as reasonably practicable;
- reducing visual intrusion and noise, insofar as reasonably practicable;
- incorporating landscape design and screening into the design; and
- permanent realignment and diversion of a number of public rights of way (PRoW) and roads to maintain access (see Section 14, Traffic and transport for further detail).

8.4.2 The locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable.

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the

[74] The Office for National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area.
[75] Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

draft Code of Construction Practice (CoCP)[76], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.

8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

8.4.6 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd would include:

- improving or altering the remaining portion of the community facility;
- improving other existing community facilities in the area that could reduce the effect;
- improving accessibility to other community facilities; and/or
- identifying land owned by the relevant local authority that could be brought into use as a community facility with its agreement.

Assessment of impacts and effects

Neighbourhood quality

8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels of satisfaction with their living environment may change. In turn, this could affect mental wellbeing or behaviours such as the use of outside space.

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGVs). These will be assessed in the relevant sections of the ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

[76] Supporting document: Draft Code of Construction Practice

8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.

8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Stapleford to Nuthall area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent[77] impacts on neighbourhood quality in areas close to construction sites, including residential areas at Sandiacre, Stapleford, Stanton-by-Dale, Trowell, Strelley and Nuthall. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration.

8.4.14 It is currently expected that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

8.4.15 Traffic and transport impacts in the Stapleford to Nuthall area would include:

- construction vehicle movements to and from the various construction compounds and sites;
- temporary and permanent road closures and associated diversions; and
- temporary and permanent alternative routes for PRoW.

[77] The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months – 2 years), and long term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

8.4.16 Construction traffic, including HGVs, may be present on a number of roads in the area, as listed in Section 14, Traffic and transport.

8.4.17 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments over man-made environments, and that exposure to views of natural environments is associated with increased wellbeing.

8.4.18 Settlements in the Stapleford to Nuthall area include the largely urbanised towns of Sandiacre and Stapleford and the rural villages of Stanton-by-Dale, Stanton Gate, Trowell, Strelley, and Nuthall. Construction activities and permanent structures would be visible from a number of locations due to the scale of the Proposed Scheme. Section 11, Landscape and visual, identifies locations that may experience changes in existing views, including country roads, PRoW and views from properties close to the Proposed Scheme. Effects on views of the rural landscape may have negative effects on residents' perceptions of the quality and character of their local environment, leading to a reduction in wellbeing.

8.4.19 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality. This will be assessed in the formal ES.

Access to services, health and social care

8.4.20 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also weak to moderate evidence to suggest that transport problems are a key barrier to people's ability to access these services. There is moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

8.4.21 The Stapleford to Nuthall area is mixed in character with both urban and rural areas. The southern section of the route of the Proposed Scheme in this area, particularly the settlements of Sandiacre and Stapleford, are urban in nature, with a large range of shops and services, with broad selection, availability and capacity offering greater than average community resilience to changes in access and accessibility to such amenities and facilities during construction.

8.4.22 The northern section of the route of the Proposed Scheme in the Stapleford to Nuthall area is predominantly rural in character. Typically, there is a reliance on shops and services in nearby towns and villages. Opportunities to access alternative facilities are limited, resulting in the necessity to travel longer distances to access alternative facilities. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be assessed in the formal ES.

8.4.23 The construction of the Strelley tunnel would result in the demolition of a fertility clinic (CARE Fertility Nottingham) on Lawrence Drive in the Nottingham Business Park. The CARE fertility clinic provides a medical treatment service to patients from a wide geographical area (serving Nottingham and other areas of the East Midlands) with the nearest alternative CARE facilities located in Leicester and Derby. The nearest alternative fertility clinic service is Nurture Fertility (11.1km away). Access to fertility services makes a positive contribution to the wellbeing of individuals through providing access to treatment which is not universally available through the NHS. The permanent loss of this facility may potentially adversely affect the wellbeing of users of the facility, depending on their ability to access an alternative facility. The loss of this facility is unlikely to affect the majority of the population living within the local area, as only a small number of residents living within and surrounding the Stapleford to Nuthall area are likely to be using the service, and therefore health and wellbeing effects are likely to be limited.

Access to green space, recreation and physical activity

8.4.24 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.25 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:

- impacts of construction traffic, including HGVs, on pedestrians and cyclists;
- any loss of green space or facility used for physical activity; and
- the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.

8.4.26 The route of the Proposed Scheme would intersect a number of PRoW in the Stapleford to Nuthall area. The effects on amenity and recreational value of these footpath networks, and therefore, levels of physical activity and associated health and wellbeing benefits, will be reported in the formal ES.

8.4.27 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme. Some construction traffic, however, including HGVs, would be present on local roads, as outlined in Section 14, Traffic and transport. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. In the case of recreational users, it is considered that alternative routes are likely to be available in most cases, and therefore that impacts on the affected roads would not reduce overall levels of recreational NMUs. For those using affected routes for active travel to work or to access shops and services, there is the possibility that people would choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

8.4.28 The entire playing field associated with the Nuthall Parish Council Temple Centre would be temporarily inaccessible for the duration of construction; for approximately

two years and three months. In addition, approximately 10% of the playing field would be permanently lost due to the construction of the A610 Broxtowe viaduct and the B600 Nuthall viaduct. The playing field, situated in the east of Nuthall village, provides recreational space, including football and cricket pitches, a tennis court, bowls lawn, and equipped play space. The playing field is home to a number of sports clubs, and offers areas for walking and informal play and recreation. The playing field can host events in conjunction with the indoor facilities in the Temple Centre. A comparable alternative for users requiring only the playing field is located approximately 800m to the west of the Temple Centre (Basil Russell Playing Fields). However, there is no nearby alternative for users which offers both indoor facilities and playing fields. The Temple Centre makes a positive contribution to the wellbeing of local communities, particularly children and young people, and older people, by providing opportunities for physical activity and access to green space which encourage healthy lifestyles. The temporary loss of access and permanent loss of 10% of this facility would have an adverse effect on health and wellbeing.

8.4.29 It is estimated that approximately 33% of New Farm Wood would be temporarily lost for a period of one during construction, and 23% of New Farm Wood would be permanently lost due to the construction of the New Farm Wood cutting. New Farm Wood is situated adjacent to the M1, to the north-east of Nuthall and provides recreational walking trails. Access to the wood provides a positive contribution to the local community through the provision of an area for passive recreation and physical activity, and access to open space. The temporary loss of 33% of the woodland and permanent loss of 23% of the woodland would have an adverse effect on health and wellbeing.

8.4.30 It is estimated that approximately 74% of the Stanton Gate LNR would be temporarily lost for a period of approximately four years and six months due to the construction of the Stanton Gate viaduct. The LNR provides an area for passive recreation and a pleasant open green space and is used by members of the Long Eaton Natural History Society for field excursions. The temporary loss of 74% of this facility would have an adverse effect on health and wellbeing.

Social capital

8.4.31 The connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. The Office for National Statistics defines social capital as follows:

"In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust."[78]

[78] Office for National Statistics- Measuring Social Capital. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

8.4.32 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.33 Settlements in the Stapleford to Nuthall area include villages that support small, well-established communities. Feedback from community consultation indicates that people's levels of trust in their communities and community cohesion are strong. The size of the temporary construction workforce maybe substantial relative to the size of a number of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including satellite compounds in the vicinity of Stapleford, Strelley, Trowell and Nuthall. The duration of the works at each site would range from approximately one year to four years and six months. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within local settlements.

8.4.34 The introduction of a temporary construction workforce into communities has the potential to alter people's perceptions and interactions within their communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

8.4.35 The draft CoCP[79] includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.36 The Community section of the ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

8.4.37 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its

[79] HS2 Ltd, (2017), *HS2 Phase 2b Draft Code of Construction Practice*. A draft CoCP has been prepared. It will remain a draft document through the parliamentary process and will be finalised at Royal Assent. The CoCP sets out measures to be implemented by the nominated undertaker.

characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.38 There is the potential for such effects to occur at Sandiacre and Stapleford where it is currently expected that 26 residential properties would be demolished as a result of the highway works associated construction of the A52 Brian Clough Way Bessell Lane underbridge, the B5010 Derby Road overbridge and Stanton Gate viaduct. Of these 26 properties, 25 are located at the boundary between the Ratcliffe-on-Soar to Long Eaton area (LA05) and the Stapleford to Nuthall area. The health and well-being effect on these 25 properties is reported in both the Volume 2: Community area report LA05 Ratcliffe-on-Soar to Long Eaton and this report. The erosion of social networks resulting from these demolitions would have the potential to reduce social capital, reducing the beneficial health effects that are gained through social contact and support for the remaining community.

8.4.39 In Stanton Gate, construction of the Stanton Gate viaduct would require the demolition of one residential property. However, the demolition of this property would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.40 In Trowell, highway works associated with the realignment of the A609 Nottingham Road would require the demolition of four residential properties along the A609 Nottingham Road. However, the demolition of these four properties would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.41 In Nuthall, construction of the A610 Broxtowe viaduct and the B600 Nuthall viaduct, and the Westville embankment would require the demolition of ten residential properties. However, the demolition of these ten properties would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.42 Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.43 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities. Potential health and well-being effects will be reported in the formal ES.

Other mitigation measures

8.4.44 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.

8.4.45 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

8.4.46 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential adverse effects identified in this assessment. Any other mitigation measures will be described in the formal ES.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Stapleford to Nuthall area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

8.5.4 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Stapleford to Nuthall area. Consideration is given to the extent and significance (value) of heritage assets including archaeological and palaeo-environmental remains, historic buildings, the built environment and historic landscape.

9.1.2 Engagement has been undertaken with Historic England, Derbyshire County Council (DCC), Erewash Borough Council (EBC) and Nottinghamshire County Council (NCC). The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book. Only designated heritage assets within the Stapleford to Nuthall area are shown on maps CT-10-367b to CT-10-371a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed MNT and MDR). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[80], including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

[80] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 500m. This is referred to in the remainder of this assessment as the 500m study area. The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas. This is referred to in the remainder of this assessment as the 250m study areas.

9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.

9.2.5 The historic environment methodology includes the consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.

9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage value of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has, in the main, been undertaken on that basis. However, an exception to this is Strelley Conservation Area which, although it falls partially within the land required for the construction of the Proposed Scheme, would not be physically impacted. Also, in relation to the following assets, although the asset is within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant:

- the Erewash Canal (MDR8908);
- Erewash Valley Line, Trent Junction to Tupton (MDR12415);
- earthworks of medieval ridge and furrow (MDR22457);
- evidence of early mining activity either side of the M1, Stanton Gate Golf Course (MDR5556); and
- the site of Stapleford Mill, Sandiacre (MDR14934).

9.2.9 With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

9.2.10 Common features of the historic landscape such as marl pits, field boundaries, and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

9.2.11 In undertaking the assessment the following limitations were identified and assumptions made:

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;
- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.2.12 At the time of writing the Nottinghamshire HER data were not fully available and will be reported in full in the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data were collated from a variety of sources including:

- the NHLE (Historic England register of designated heritage assets)[81];
- Derbyshire and Nottinghamshire HERs;
- conservation area appraisals; and
- historic maps and aerial photography.

9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

9.3.3 One designated heritage asset is located partially or wholly within the land required for the Proposed Scheme; Strelley Conservation Area of moderate value.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study area:

- four scheduled monuments, comprising an Anglian High Cross in the Churchyard of St. Helen's Church, Stapleford (NHLE 1012870, which is also a Grade I listed building NHLE 1278059); coal mining remains at Broad Oak Farm (NHLE 1017654); a moat and fishpond, 240m south-east of All Saints Church, Strelley (NHLE

[81] Historic England; *National Heritage List for England*. Available online at: https://historicengland.org.uk/listing/the-list/

1008525); and the Lock Up and Pinfold at Lawrence Street in Sandiacre (NHLE 1007042). All are considered to be of high value;

- three Grade I listed buildings, comprising the Church of St. Giles, Sandiacre (NHLE 1204475); the Anglo-Saxon cross 50m east of Church of St. Helen (also referred to as Anglian High Cross, and a scheduled monument NHLE 1012870), Stapleford (NHLE 1278059); and Church of All Saints[82], Strelley (NHLE 1248224). All are considered to be of high value;
- eight Grade II* listed buildings, including six churches, the gothic summerhouse at No. 9 The Mews, Nuthall (NHLE 1248177) and Willoughy Almshouses and adjoining boundary wall, Cossall (NHLE 1247951). All are considered to be of high value;
- seventy-two Grade II listed buildings, including 11 agricultural structures, 29 domestic buildings, 10 items of street furniture (including five memorials), seven structures associated with the water network; and nine other industrial, commercial and religious buildings. There are a number of other Grade II listings, including four structures associated with the Strelley Estate, which comprise Strelley Hall (NHLE 1248225); the stables, dairy cottage and gate lodge at Strelley Hall (NHLE 1277994); the kitchen garden walls 250m north-west of Strelley Hall (NHLE 1278007); and the Ice House 200m south-east of Strelley Hall (NHLE 1248330). There are also two Grade II listings within the former Nuthall estate comprising the gate pier from the former Nuthall Temple (NHLE 1248188) and the Lake Bridge (NHLE 1248173). All are considered to be of moderate value; and
- nine Conservation Areas comprising Risley Conservation Area, Sandiacre Canal Side Conservation Area, Sandiacre Cloud Side Conservation Area, Stanton-By-Dale Conservation Area, Stapleford Church Street Conservation Area, Stapleford Nottingham Road Conservation Area, Cossall Conservation Area, Nuthall Conservation Area and Kimberley Conservation Area. All are considered to be of moderate value.

Non-designated assets

9.3.5 The following non-designated asset of moderate value lies partially within the land required for the Proposed Scheme: the Erewash Canal (MDR8908).

9.3.6 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:

- Erewash Valley Line, Trent Junction to Tupton (MDR12415);
- earthwork medieval ridge and furrow, Ilkeston Road, Sandiacre (MDR22457);
- evidence of early mining activity either side of the M1, Stanton Gate Golf Course (MDR5556); and
- the site of Stapleford Mill, Sandiacre (MDR14934).

[82] This is also shown on OS mapping as All Saints' Church

9.3.7 Non-designated heritage assets located partially or wholly within the 250m urban study area include:

- two Roman settlements of moderate value; and
- twenty-nine assets of low value, comprising prehistoric and Roman finds, and finds and features of unknown date.

9.3.8 Non-designated heritage assets located partially or wholly within the 500m rural study area include eight buildings identified as being of local historic and architectural interest by NCC, all located within Strelley Conservation Area.

Historic environment overview

9.3.9 The River Erewash runs through Stapleford along the southern section of the Stapleford to Nuthall area, with the study area following the river valley through Stapleford. The area around the river contains Pleistocene (the last Ice Age, ending *c.* 11,700 BC) alluvium deposits; however, there is no evidence of early prehistoric activity in the 500m study area. The lack of permanent settlement means that evidence is mostly limited to individual find spots within the 500m study area, including prehistoric flints (MNT1994) and an Iron Age quern (MDR 5519), with some finds, such as flint axes (MNT385, MNT5182) and an Iron Age shield boss (MNT613) having been found within the River Trent to the south of the Stapleford to Nuthall area.

9.3.10 The earliest recorded site, other than isolated find spots discussed above, is a possible Iron Age ditch, which was identified at St Helen's Church in Trowell. In addition to this, late prehistoric finds were recovered during fieldwalking (EDR3019) on the Derwent Valley Aqueduct-Strelley Reservoir link.

9.3.11 During the Roman period, the East Midlands saw a larger number of both urban settlements and rural farming, such as at Redhill to the south of the Stapleford to Nuthall area. Roman finds have been identified in the parish of Strelley, including two fantail brooches and Roman pottery sherds. A probable Roman fort was located within the study area at Broxtowe, approximately 1.2km from the land required for construction of the Proposed Scheme. The fort was likely one of three positioned along the Trent Valley, suggesting a linked route. They may have been positioned to watch the Brigantian border. The finds in the 500m study area may be related to the occupation in Broxtowe. From excavated evidence, it appears that most Roman sites in this area were abandoned after 70AD.

9.3.12 The parishes within the Stapleford to Nuthall area appear to have been divided up in the early medieval period. This is demonstrated by the boundaries between Strelley and Bilborough (MNT1593, MNT5987) and Strelley and Cossall (MNT26010), which have their origins in this period. Many of the villages are also listed in the Domesday Book. Further archaeological evidence of this period is limited; however, the village of Trowell dates back to at least the 9th century, with permission for a church granted in AD801. An Anglo-Saxon cross (NHLE 1012870 and NHLE 1278059) is recorded in the churchyard of the Church of St. Helen in Stapleford (NHLE 1248029). A number of the place-names in the area are also recorded in the Domesday Book, including Bilborough, Cossall, Nuthall and Stapleford. Therefore, these villages likely had their

origins in the early medieval period. At Sandiacre, the 11th century Church of St Giles (NHLE 1204475) provides evidence for the medieval origins of the settlement. The church stands in a prominent position within the medieval core of Sandiacre, overlooking the river valley. The settlement itself has subsequently expanded as part of the 18th and 19th century industrialisation of the area, merging with Long Eaton to the south, while the river itself maintains a separation with Stapleford to the east.

9.3.13 Three extant buildings were built during the medieval period, and elements of their surviving medieval fabric survives. There are the churches of St. Helen's (NHLE 1278008) in Trowell, the church of St. Patrick in Nuthall (NHLE 1248182), and the church of All Saints in Strelley (NHLE 1248224). During this period, the construction of manor houses by land-owning families was common. Examples include the Strelley Estate which dates to the 12th century. The estate is now characterised by changes in the 18th century, including the building of the present Strelley Hall (NHLE 1248225); however, remnants of the medieval core survives in the scheduled moat and fish ponds (NHLE 1008525), all encompassed within the Strelley Conservation Area.

9.3.14 Within the 500m study area, the post-medieval period is very well documented. The area shows extensive evidence of industrial activity, including many assets relating to local mining activity. Various mining remains and bell pits are present throughout the numerous parishes in the study area. Mining in the area has been carried out since at the least the 15th-16th centuries. There is extensive evidence of industrial activity relating to mining in the Stapleford to Nuthall area. The earliest evidence dates to the 15th-16th centuries at Strelley Hall and Nuthall, and includes shafts and pits, which were dug into the outcrop, but did not join up underground (NHLE 1017654, MNT7195), while to the south of the study area is evidence for early mining at Stanton-by-Dale (MDR5556). The advancements in technology in the 18th and 19th centuries allowed for greater depths of mines and more productive transportation including canals, leading to higher levels of trade of coal. Collieries near to the Proposed Scheme include Bilborough, Trowell, Watnall and Wollaton.

9.3.15 Transport links were also developed in the later part of the post-medieval period, as evidenced by the canal network with both the Erewash Canal (MDR8908) and the former Nottingham Canal running through the study area, alongside the continuation of the Erewash Valley railway Line (MDR12415). Associated with the canals, are a number of listed locks and bridges, including the Grade II listed Canal Bridge on Erewash Canal at SK 484 376 (NHLE 1204499) and Nottingham Canal Swansea Bridge (NHLE 1248333). Many of these industrial and transport assets continued in use into the 20th century; their value highlighted by the presence of World War II defensive structures, such as the a ruck machine gun post near Sandiacre (MDR13599).

9.3.16 Other notable industrial activity includes lace factories in Stapleford and Sandiacre, including the Grade II listed Mill complex at Springfield Mills (NHLE 1204469 and 1087916). These are associated with the East Midland's lace and silk industries, becoming an international exporting trade for Nottingham from the 1840s.

9.3.17 Beyond Sandiacre, the study area follows the M1 corridor which now defines much of its later 20th century character. This section of the motorway was constructed

between 1965 and 1968, as part of Britain's first comprehensive motorway, with Trowell Services completed in 1967.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[83] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

9.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts would occur to assets both within the land required for the Proposed Scheme and to assets in the wider study area as a result of changes to their settings.

9.4.4 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.

9.4.5 The Grade I listed Church of All Saints, Strelley (NHLE 1248224) is an asset of high value located 75m to the north-east of the Proposed Scheme. The church has architectural and historic value in its physical fabric with elements surviving from the 13th century. The building also has evidential value as evidence of the earlier settlement to the east of the present hall and retains contextual interest as part of the Strelley Estate. The setting of the church is focused on the parkland which extends to the north and the associated estate buildings to the west. However, the church also makes an important statement of power, both ecclesiastical and manorial, within the wider landscape with its high topographical position making it prominent in the open views to the south. The construction of the mined Strelley tunnel and Strelley tunnel south portal will affect these views. Although the topography will limit impacts on

[83] Supporting document: Draft Code of Construction Practice

views from the church, both the static elements of construction (including the Strelley tunnel south main compound) and the dynamic elements (including construction traffic and plant) will be clearly visible in views towards the asset from the south. This will affect the ability to fully appreciate the deliberate prominence of the building within the landscape. This would result in an impact of low magnitude and a moderate adverse effect.

Permanent effects

9.4.6 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

9.4.7 The following significant effect is currently expected to occur as a result of the permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.

9.4.8 The Church of St. Giles, Sandiacre (NHLE 1204475) is a Grade I listed building of high value located 190m to the west of the Proposed Scheme. The church has its origins in the 11th century and is of architectural and historic interest. Its significance is enhanced by its deliberate prominence on a high point within the landscape, located within the historic core of the settlement and with commanding views across the river valley. This prominence enhances the importance of the church's setting with the tall tower making it a deliberate landmark within the landscape, emphasising the importance of the church to the community. The construction of the Proposed Scheme, including the Stanton Gate viaduct, would reduce the prominence of the asset within the landscape, particularly from the east. This would impact the ability to fully appreciate the relationship between the asset and its landscape setting, particularly the deliberate prominent positioning. This would result in an impact of low magnitude and a moderate adverse effect.

Other mitigation measures

9.4.9 No additional construction phase mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and
- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

9.4.10 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and would be restricted to the duration of the construction works.

9.4.11 As no specific mitigation measures have yet been identified in relation to heritage assets described above, the residual effects are the same as those reported under

permanent effects. Over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme is assimilated into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the Map Series CT-06 within the Volume 2: LA06 Map Book:

- noise mitigation measures have been included within the Proposed Scheme that could reduce potential impacts on some heritage assets; and
- landscape planting could increasingly reduce impacts on the setting of the designated assets within the study area as it matures. This is relevant for this assessment in relation to the Grade I listed Church of All Saints, Strelley (NHLE 1248224).

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.

9.5.3 During the operation of the Proposed Scheme no further groundworks are anticipated and as such there would be no further physical effects on heritage assets arising from the operation of the Proposed Scheme.

9.5.4 Impacts on heritage assets due to changes in their settings arising from the presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would endure through the operation of the Proposed Scheme.

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise of the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

9.5.6 There would be no significant effects as a result of the operation of the Proposed Scheme in relation to the Church of St. Giles, Sandiacre (NHLE 1204475), a Grade I listed building of high value. Therefore, the significance of effect would remain as described for the permanent construction phase effect.

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation have not been identified, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

9.5.8 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Stapleford to Nuthall area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licencing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Nottinghamshire County Council (NCC), Nottingham City Council (NoCC), Derbyshire County Council (DCC), Erewash Borough Council (EBC), Broxtowe Borough Council (BBC), the Environment Agency, the Coal Authority, the Animal and Plant Health Agency (APHA), the Geological Society Regional Group East Midlands and the Open University Geological Society East Midlands. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[84].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme. In the case of groundwater abstractions, this buffer is increased up to 1km.

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the

[84] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.

10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.7 The minerals assessment is based upon the mineral resources[85] identified on published mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the mineral plan).

10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the BGS, the Coal Authority, NCC, NoCC, DCC, EBC, BBC, Public Health England (PHE), the Environment Agency, Natural England, APHA, as well as from local geological trusts.

Geology

10.3.2 This section describes the underlying ground conditions within the Stapleford to Nuthall area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[86,87].

[85] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)'
[86] British Geological Survey, (2014), Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904
[87] British Geological Survey, (2008), A Formational Framework for the Mercia Mudstone Group, Research Report RR/08/04. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=866

10.3.3 Table 18 provides a summary of the geology (made ground, superficial and bedrock units) underlying the study area.

Table 18: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	In the southern part of the study area between Sandiacre and Stanton Gate and between Trowell and Strelley.	Artificial ground comprising variable deposits of reworked natural and man-made materials.	Not classified
Superficial			
Head deposits	Located east of Nuthall at the eastern limits of the study area.	Typically gravel, sand and clay. Can include peat and organic material.	Unproductive strata
Alluvium	Associated with the River Erewash in the south of the study area, and crossed by the route of the Proposed Scheme around Stapleford, with localised areas further north and east of Nuthall.	Clay, silt, sand and gravel.	Secondary A
River terrace deposits	Within western parts of Stapleford, eastern and southern parts of Sandiacre in the south of the study area, along the Erewash Canal and associated with the River Erewash.	Sand and gravel.	Secondary A
Glacial till[88]	Present to the north of Trowell, between the city of Nottingham and the M1.	Variable typically comprising sandy, silty clay with pebbles.	Secondary (Undifferentiated)
Bedrock			
Mercia Mudstone Group - Sidmouth Mudstone Formation	Within the southern part of the study area, in the Sandiacre area.	Mudstone and siltstone with thin beds of dolomitic siltstone and sandstone.	Secondary B
Mercia Mudstone Group - Tarporley Siltstone Formation	Within the southern part of the study area, in the Sandiacre and Stapleford area.	Sandstone, mudstone and siltstone.	Secondary B (mudstone and siltstone) Secondary A (sandstone)
Sherwood Sandstone Group – Chester Formation	Present within the southern part of the study area in the Sandiacre and Stapleford area.	Conglomerate, sandstone with mudstone.	Principal
Lenton Sandstone Formation	Outcrops mainly within the Strelley area and to the north of Nuthall with an isolated outcrop on the northern edge of Sandiacre.	Sandstone with mudstone and conglomerate.	Principal

[88] Glacial till is sometimes called diamicton in the BGS lexicon. The term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case 'glacial till' refers to diamicton of glacial origin

Geology	Distribution	Formation description	Aquifer classification
Zechstein Group – Edlington Formation	Localised outcrops from the Strelley area up to the northern extent of the study area.	Mudstone with siltstone and sandstone. Dolostone (dolomitic limestone) and gypsum/anhydrite (sulphate rich minerals) are also locally encountered.	Secondary B
Zechstein Group – Cadeby Formation	Outcrops from the area of Strelley up to the northern extent of the study area.	Dolostone (dolomitic limestone) with mudstone, dolomitic siltstone and sandstone.	Principal
Pennine Coal Measures Group - Pennine Middle Coal Measures Formation	Located across the study area from the area north of Trowell Motorway Services to the area north-east of Olemoor Wood, and to the west of Broxtowe.	Mudstone, siltstone, sandstone and with coal seams.	Secondary A
Pennine Coal Measures Group - Pennine Lower Coal Measures Formation Wingfield Flags Formation	Present across the area north of Sandiacre and Stapleford up to the north of Trowell then continuing beneath the overlying Pennine Middle Coal Measures Formation.	Mudstone, siltstone, sandstone and with coal seams.	Secondary A

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the study area, which may comprise more significant deposits of made ground.

10.3.5 The BGS geological mapping[89], including artificial ground mapping data, indicates the presence of made ground in the southern part of the study area between Sandiacre and Stanton Gate, corresponding with railway land and industrial development along the west bank of the River Erewash and the Erewash Canal. Infilled ground is also mapped by the BGS in the central part of the study area between Trowell and Strelley, corresponding with historic open cast coal mining areas.

10.3.6 No known farm burial or pyre sites associated with the 1967 and 2001 outbreaks of foot and mouth disease (FMD) are known to be present within the Stapleford to Nuthall area. The 2001 to 2002 FMD outbreak risk assessment map[90] identifies the Stapleford to Nuthall area within a FMD free county. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

[89] BGS (2014), geological map sheet 125 (Derby) 1:50,000 scale (Solid and Drift) and BGS (2016), Geology - 50,000 (DiGMapGB-50), Artificial Version 8
[90] Animal Plant and Health Agency (2001), *Foot and Mouth Disease 2001 County Status Map 01.10.2001*

Superficial geology

10.3.7 Head deposits are associated with slopes, forming down-slope layers and fans of accumulated material. Head deposits are present locally to the east of Nuthall, on the edge of the land required for the construction of the Proposed Scheme. These typically comprise sand and gravel but can also contain lenses of silt, clay, peat and organic material.

10.3.8 Alluvial deposits variably comprising silty clay, silt, sand, peat and gravel occur along the courses of streams and rivers. Alluvium associated with the River Erewash is present in the south of the study area.

10.3.9 River terrace deposits consisting of sands and gravels associated with the River Erewash are present across western parts of Stapleford and eastern and southern parts of Sandiacre.

10.3.10 Glacial till deposits typically comprising sandy, silty clay with gravel is present as intermittent outcrops adjacent to the north of Trowell, between Nottingham and the M1. Glacial till also underlies the Proposed Scheme to the north of Strelley.

Bedrock geology

10.3.11 The Mercia Mudstone Group underlies only the southern parts of the study area around the Sandiacre and Stapleford area. The Mercia Mudstone Group within this area comprises the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation.

10.3.12 The younger Sidmouth Mudstone Formation comprises predominantly mudstones and siltstones with occasional thin beds of dolomitic siltstone and sandstone. The older Tarporley Siltstone Formation generally has more sandstone content than the Sidmouth Mudstone Formation and is described as siltstones, mudstones and sandstones.

10.3.13 The Chester Formation of the Sherwood Sandstone Group outcrops within the northern area of Sandiacre and west of Stapleford. The Chester Formation varies regionally but is locally described as conglomerates and pebbly sandstones with mudstone or sandstone. To the north of Sandiacre, there is a north-west to south-east trending fault that results in a faulted contact with the older Pennine Coal Measures Group.

10.3.14 From Strelley to the northern extent of the study area, the Cadeby Formation (Zechstein Group) is the main shallow bedrock geology. The Cadeby Formation is a dolomitic limestone with mudstone, dolomitic siltstone and sandstone. Overlying the Cadeby Formation is the Edlington Formation. The Edlington Formation is a mudstone, with siltstone and sandstone. However, locally within the Nottinghamshire area, sandstone is more common. Dolostone and the sulphate rich minerals, gypsum/anhydrite, may also be present within this unit. Occasionally in this area there are also outcrops of the younger Lenton Sandstone Formation above the Edlington Formation. The Lenton Sandstone Formation comprises sandstones with beds of mudstone and conglomerate.

10.3.15 The coal measures in general form the shallow bedrock geology for the central section of the study area. The Lower and Middle Pennine Coal Measures are generally described as interbedded mudstone, siltstone and pale grey sandstone with coal seams. The Middle Pennine Coal Measures contain more coal seams throughout the unit. Within the Lower Pennine Coal Measures, there are localised units of the Wingfield Flags Formation which are sandstones with siltstones.

Radon

10.3.16 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential dataset[91].

10.3.17 Three locations within the study area are located within radon affected areas. This includes the sections of the route of the Proposed Scheme at Stanton Gate, at Trowell and between Strelley and Hucknall Airfield.

10.3.18 In the areas of Stanton Gate and Trowell, between 1% and 3% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties. For the section from Strelley to Hucknall Airfield, between 3% and 5% of homes are estimated to have radon levels at or above the action level. For the remainder of the study area, less than 1% of homes are estimated to be at or above the radon action level.

Groundwater

10.3.19 Five aquifer designations have been identified within the study area, as defined by the Environment Agency[92]:

- the Sherwood Sandstone Group, comprising the Chester Formation, the Lenton Sandstone Formation and the Cadeby Formation of the Zechstein Group are designated Principal aquifers;
- river terrace deposits and alluvium superficial deposits; the Lower and Middle Pennine Coal Measures of the Pennine Coal Measures Group, and the sandstone units of the Tarporley Siltstone Formation of the Mercia Mudstone Group are designated as Secondary A aquifers;
- the Sidmouth Mudstone Formation and mudstone and siltstone units of the Tarporley Siltstone Formation, both of the Mercia Mudstone Group, and the Edlington Formation of the Zechstein Group have been designated Secondary B aquifers;
- glacial till is designated a Secondary Undifferentiated aquifer; and
- head deposits are designated Unproductive strata.

[91] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. Accessed May 2018. This data set underpins Public Health England's Indicative Atlas on Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers , A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 978-0-85951-608-2.29 pp) available at www.ukradon.org/information/ukmaps
[92] Environment Agency (2017), New groundwater vulnerability mapping methodology mapping in England and Wales, Report SC040016/R

10.3.20 The Environment Agency reports that there is one licensed private groundwater abstraction located within the study area. This abstraction is positioned east of Watnall, 840m west of the land required for the construction of the Proposed Scheme, and it relates to use of groundwater for dust suppression. It is recognised that other unlicensed abstractions may exist.

10.3.21 The southern extent of the Proposed Scheme lies within a total catchment groundwater Source Protection Zone[93] (SPZ3) between Sandiacre and Stanton Gate. The northern extent of the study area is also within an SPZ3 which lies 100m to the east of the land required for the construction of the Proposed Scheme, north of Nuthall. No inner (Zone 1) or outer (Zone 2) SPZ are identified within the study area. The study area is not situated within a groundwater Drinking Water Safeguard Zone.

10.3.22 Details of licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.23 Further information on the groundwater in the Stapleford to Nuthall area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.24 The River Erewash is designated as a main river by the Environment Agency and is crossed twice by the route of the Proposed Scheme; once to the east of Sandiacre and again to the north-west of Stapleford. The principal tributaries of this river within the study area comprise Boundary Brook and Nut Brook.

10.3.25 The Erewash Canal that flows parallel to the River Erewash, is crossed twice by the Proposed Scheme to the north of Sandiacre and Nut Brook and discharges to the Erewash Canal in New Stanton. The Proposed Scheme would also cross the former Nottingham Canal to the east of Trowell.

10.3.26 Two small drains referred to as the tributary of the Erewash Canal (1)[94] located in Sandiacre and the tributary of the Erewash Canal (3) located north-west of Stapleford would be crossed by the route of the Proposed Scheme. Three ordinary watercourses will also be crossed by the route of the Proposed Scheme. These are referred to as the tributary of the Erewash Canal (2) located near Stanton Gate, the tributary of the River Erewash (1) which is crossed twice in Trowell, and the tributary of the River Leen (1) located in Trowell.

10.3.27 There are 14 ponds located within the land required for the construction of the Proposed Scheme. Further information on these ponds is provided in Section 7, Ecology and biodiversity.

[93] A groundwater SPZ is a defined area within which groundwater is abstracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source

[94] Numbers in brackets refer to unnamed tributaries connected to a downstream named watercourse. Where more than one tributary of any named watercourse is intersected, these are numbered sequentially from south to north

10.3.28 Artificial water bodies within the study area include The Lake, also known as Temple Lake, located 120m west of the land required for the construction of the Proposed Scheme in Nuthall and Catstone Hill Reservoir located 190m east of the land required for the construction of Proposed Scheme in Strelley.

10.3.29 Surface water bodies in the Stapleford to Nuthall area are described in more detail in Section 15, Water resources and flood risk.

10.3.30 The Environment Agency reports that there are no licensed private surface water abstractions located within the study area. The study area does not lie within a surface water Drinking Water Safeguard Zone.

Current and historical land use

10.3.31 Current potentially contaminative land uses within the study area include 19 industrial and commercial sites. The key potentially contaminative sites are:

- a vehicle dismantling yard;
- a precision engineering premises;
- an electronics manufacturer;
- a cutting machine manufacturing premises; and
- a railway equipment manufacturer.

10.3.32 Historical land uses identified within the study area with the potential to have caused contamination include eight historical landfill sites, approximately 50 mining sites and approximately 22 industrial sites. The key historical potentially contaminative sites are:

- a former brick yard/works;
- a former dye works/engineering works;
- a former foundry;
- a former gas works/upholstery works; and
- the former Hucknall Airfield located in the north of the study area within the Hucknall to Selston area (Volume 2: Community area LA07, Hucknall to Selston).

10.3.33 Further details of the key current and historical contaminative land uses within the study area are shown in Table 19,Table 20 and Table 21.

Table 19 Current and historical landfill sites located in the study area

Name and Area Reference	Location	Description
S.W. Bailey and Sons (LA06-32)	Located east of the northern end of Town Street, Sandiacre and 50m west of the land required for the construction of the Proposed Scheme.	The Environment Agency records state that the historical landfill was licensed in 31 December 1974 to receive inert and industrial waste up until 23 December 1986. The landfill occupied an area of approximately 630m².
Church Farm (LA06-46, LA06-47, LA06-110, LA06-122 and LA06-252)	Located to the east of Ilkeston Road in Sandiacre 5m from the land required for the construction of the Proposed Scheme.	Environment Agency records show the historical landfill was operated by Mr J Hut and received inert waste between 6 December 1991 and 31 March 1993. The landfill occupied an area of approximately 1.8ha.
Unnamed Local Authority Recorded Landfill (LA06-115)	Located to the north of Stanton Road in Sandiacre. The boundary of the north-eastern boundary of the landfill encroaches into the study area boundary.	EBC records show the historical landfill accepted municipal waste and closed in 1974. The landfill occupied an area of approximately 2.5ha.
Erewash Valley Golf Club (LA06-253)	Located immediately to the east of Sevenoaks Road, Stanton-by-Dale, Ilkeston which is 100m to the west of the land required for the Proposed Scheme.	Environment Agency records state the historical landfill was operated by Sinbad Plant Limited and licenced to receive industrial waste from 31 December 1989 to 8 September 1991. The landfill occupied an area of approximately 6.58ha.
Old Works Tip (LA06-192)	Located off Lows Lane, Stanton-by-Dale, Ilkeston which is 20m west of the land required for the Proposed Scheme.	The Environment Agency records state the historical landfill was operated by Stanton and Staveley and licensed to receive inert and industrial waste between 17 February 1978 and 27 April 1994. The landfill occupied an area of approximately 13.3ha.
Land off Dabell Avenue/Matrix Grade (LA06-97 and LA06-254)	Located on Blenheim Industrial Estate off Blenheim Park Road which is directly adjacent to land required for the construction of the Proposed Scheme.	Environment Agency records state the historical landfill was licensed to receive inert and industrial waste between 31 December 1989 and 31 December 1990. The license was held by Matrix Grade Limited. The landfill occupied an area of approximately 5.1ha.
Hucknall Airfield (LA06-326)	Located within the study area, but also within the Hucknall to Selston area (LA07) in the western part of Hucknall Airfield.	Environment Agency records state the historical landfill was licensed to receive inert waste between 31 December 1957 and 31 December 1993. The licence was held by Rolls Royce Limited. The landfill occupied an area of approximately 1.95ha.
Eel Hole Farm (LA06-328)	Located within the study area, but also within the Hucknall to Selston area (LA07) in the western part of Hucknall Airfield. The landfill is situated within the north-west corner of the larger Hucknall Airfield landfill.	Environment Agency records state the historical landfill was licensed to receive inert waste between 31 December 1976 and 31 March 1994. The licence was held by John Rowland Blant. The landfill occupied an area of approximately 0.52ha.

Table 20 Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
Swancar Farm (LA06-338)	Located close to the former Nottingham Canal. The route of the Proposed Scheme would cross the historical open cast mining site for approximately 100m.	Infilled historical open cast coal mining site. No further information is currently known. .
Shortwood (within Robbinetts licensed area) (LA06-73 to LA06-77, LA06-248, LA06-280, LA06-281, LA06-333 and LA06-334)	North of Trowell Motorway Services (southbound). The route of the Proposed Scheme would cross the historical open cast site for approximately 750m.	Infilled historical open cast coal mining site. The thickness is assumed to be approximately 5m based upon depth to uppermost coal seam from the nearby historical borehole records.
Catstone Hill (LA06-79, LA06-141, LA06-177, LA06-179, LA06-206, LA06-287, LA06-288, LA06-290 and LA06-335 to LA-06-337)	Located south of Strelley. The route of the Proposed Scheme would cross the historical open cast site for approximately 1.2km.	Historical open cast coal mining site and reportedly infilled with mudstone, sandstone, clay, shaly mudstone and ironstone (reworked Pennine Coal Measures Group).
Mine entries (multiple site IDs)	Mainly within the area of the Robbinetts and Catstone Hill open cast sites.	Approximately 250 mine entries/shafts are located within the study area. Approximately 30 of these mine entries would be intersected by the route of the Proposed Scheme.

Table 21 Key current and historical industrial sites located within the study area

Name and Area Reference	Location	Description
Historical gas works and upholstery works (LA06-14)	Located in Sandiacre to the north of Cross Street. The site is located 5m west of the land required for the construction of the Proposed Scheme.	The historical maps indicate the site was occupied by a gas works from between 1883 to 1913 and then an upholstery works up to 1997. A seating manufacturing company is currently registered to the site. The land was determined as Contaminated Land under Part 2A of the Environment Protection Act 1990[95]. Further information is provided in section 'Other regulatory data'.
Espirit Automation Limited (LA06-44)	Located in Sandiacre 165m west of the land required for the construction of the Proposed Scheme.	Current cutting machine manufacturer.
Autumn Engineering (LA06-33)	Located on the Ascot Park Industrial Estate, Sandiacre, 20m west of the land required for the construction of the Proposed Scheme.	Current precision engineering premises.
Laystone Electronics Limited (LA06-33)	Located on the Ascot Park Industrial Estate, Sandiacre, 20m west of the land required for the	Current electronics manufacture.

[95] Environment Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance, (April 2012), Her Majesty's Stationery Office (HMSO)

Name and Area Reference	Location	Description
	construction of the Proposed Scheme.	
Megavaux Limited (LA06-08)	Located at the southern extent of the study area, immediately north of the B5010 Derby Road within the land required for the construction of the Proposed Scheme.	Current car breakers and dismantlers.
Progress Rail Services (LA06-03)	Located at the southern extent of the study area, immediately north of the B5010 Derby Road within the land required for the construction of the Proposed Scheme.	Current railway equipment manufacturers.
Historic brick yard/works (LA06-160)	The site is located in Stanton Gate and would be crossed by the route of the Proposed Scheme.	A brick yard and brick works with railway line, extraction pit, and circular structures (possible tank). Subsequently the pit is indicated to be a pond on historical mapping from 1883 to 1913. The pit/pond is indicated to have been infilled after this point. The site is currently predominantly occupied by agricultural land/public open space.
Historical dye works and engineering works (LA06-12)	The site is located to the north of the B5010 Derby Road in Sandiacre is within the land required for the construction of the Proposed Scheme.	The dye works is first shown on historical mapping from 1933/1938 and is present until the 1988/1993. An engineering works including tanks and an electricity sub-station is marked on the 1973/1978 map. Current mapping shows derelict land/industrial use at the site but the type of use is not known.
Historical foundry (Stanton Iron Works) (LA06-56)	Located to the north-west of Stanton Gate, to the west of the M1. The eastern boundary extends into the land required for the construction of the Proposed Scheme.	Historical mapping indicates that the foundry was operational between the late 1800 and the late 1990 and later became known as the Stanton Iron Works. The land is currently occupied by an industrial estate.
Historical Hucknall Airfield (LA6-326)	Located in the north of the study area within the Hucknall to Selston area (LA07). The western end of the airfield would be crossed by the route of the Proposed Scheme.	Historical mapping indicates the site had been occupied by an airfield since 1916 and has operated as a military airbase and a Rolls Royce test centre. The airfield is not currently operational.

10.3.34 Contaminants commonly associated with sites in Table 19, Table 20 and Table 21 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate.

10.3.35 Contaminants commonly associated with coal mining and mineral sites could include heavy metals, acid mine waters with low pH values and mine gases such as methane, carbon dioxide and hydrogen sulphide.

Other regulatory data

10.3.36 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences). There were 40 minor (Category 3) pollution incidents to controlled waters reported over a six year period between 1995 and 2001.

10.3.37 Information provided by EBC shows that the land historically occupied by a gas works in Sandiacre (LA06-14, see Table 21) was determined as Contaminated Land under Part 2A of the Environment Protection Act 1990. The historical gas works was located 5m west of the land required for the construction of the Proposed Scheme, on the opposite side of the River Erewash and is currently occupied by depot type buildings. A seating manufacturing company is currently registered to operate on the site.

10.3.38 Three active fuel stations are located within the study area. Two of these are located at the Trowell Motorway Services (northbound and southbound). The M1 southbound fuel station is located directly adjacent to the land required for the construction of the Proposed Scheme. The northbound fuel station is 175m south of the Proposed Scheme. The third active fuel station is located in Nuthall and is approximately 215m east of the Proposed Scheme. One inactive fuel station is positioned in the southern part of the study area, approximately 205m to the east of the land required for the Proposed Scheme within Stapleford.

10.3.39 There are four authorised environmental permits (formerly Local Authority Pollution Prevention and Control permits) registered within the study area. The permits are registered to the three active and one inactive fuel stations.

10.3.40 The Environment Agency reports that there are 13 consented discharges to surface waters, and four of these are within the land required for the construction of the Proposed Scheme. There are no groundwater discharge consents within the study area. Further details on these consents can be found in Section 15, Water resources and flood risk.

10.3.41 There are two nationally significant ecological designated sites, as defined in the land quality section of the SMR[96], within the study area, as follows:

- Seller's Wood is designated as a SSSI and is located in the northern part of the study area, adjacent to the eastern side of the land required for the construction of the Proposed Scheme; and
- Bulwell Wood is designated as a SSSI and is located adjacent to the east of the northern end of the study area, adjacent east of the land required for the construction of the Proposed Scheme.

10.3.42 Further information on ecological designated sites in the study area is provided in Section 7, Ecology and biodiversity.

[96] Sensitive ecological receptors are defined as national designations such as SSSI

Mining/mineral resources

10.3.43 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These can include limestone and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Minerals plans

10.3.44 NCC is responsible for overall mineral and waste local plans for Nottinghamshire. The Minerals Local Plan (MLP) for Nottinghamshire[97] was adopted in December 2005 and sets out the policies aimed at controlling mineral related developments up to 2014. The plan is currently in the process of being replaced by a new MLP which will cover the period 2016 to 2036. An issues and options consultation document[98] has been published as part of the new plan preparation process.

10.3.45 The 2005 extant NCC MLP does not list any mineral extraction allocation sites within the study area. In addition, the MLP oil resources plan shows there are no oil fields within the study area.

10.3.46 The southern extent of the Proposed Scheme between Sandiacre and Sandwell lies partially within Derbyshire. The policies and proposals for mineral workings are set out in the MLP for Derby and Derbyshire[99] which was first adopted in April 2000 and amended in February 2002. DCC and Derby City Council are currently preparing a new MLP. The current - MLP does not list any mineral extraction allocation sites, mineral safeguarding (MSA) or mineral consultation areas within the study area.

10.3.47 The locations of specific proposed MSA within the study area are described below.

Limestone

10.3.48 The Land and Planning Policies document (Local Plan Part 2)[100] forms part of the Local Plan for Nottingham City. The Local Plan Part 2 sets out NCC's approach to mineral planning in Nottingham City. The document identifies a limestone MSA within the west of the city which would be intersected by the route of the Proposed Scheme between Strelley and Nuthall.

10.3.49 The limestone MSA is not detailed with the adopted minerals plan. It has therefore not been considered further in the assessment.

Coal mining

Open cast coal mining

10.3.50 The NCC issues and options consultation document shows that there is a proposed MSA within the study area concerning surface coal. The MSA, which covers the

[97] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan*
[98] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan - Issues and Options Consultation*
[99] Derbyshire County Council and Derby City Council, (2002), *Derby and Derbyshire Minerals Local Plan*
[100] Nottingham City Council, (September 2017), *Nottingham City Land and Planning Policies Development Plan Document, Local Plan Part 2*

majority of the southern half of the study area, would intersect the route of the Proposed Scheme between Stanton Gate and Strelley.

10.3.51 The shallow coal MSA is proposed and is not within the adopted minerals plan. It has not therefore, been considered further in the assessment.

10.3.52 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through an area of licensed historical open cast coal mining which partially incorporates a worked area named Shortwood. However, the route of the Proposed Scheme would avoid the actual recorded worked areas. This is located to the north of the Trowell Motorway Services and lies within the wider Robbinetts future open cast licensed area. There are localised areas of unlicensed historical open cast coal mining in the vicinity of the former Nottingham Canal and the Trowell Motorway Services. One area is known as Swancar Farm, and there is an extensive area to the south of Strelley that covers approximately 900m of the route of the Proposed Scheme named Catstone Hill.

10.3.53 To the north of Trowell Motorway Services, the route of the Proposed Scheme would intersect an open cast licensed area with potential for future open cast mining named Robbinetts. This licensed area encompasses the majority of the Shortwood historical open cast mining area.

Deep coal mining

10.3.54 The Coal Authority maps identify an area of probable shallow coal mining workings and an area of probable deeper coal mining workings which would be crossed by the route of the Proposed Scheme locally to the north of Stanton Gate and to the north of the Trowell Motorway Services, respectively. An abandoned access tunnel associated with coal mining is shown to intersect the route of the Proposed Scheme from east to west in Nuthall.

10.3.55 The underground working area described above also has a large number of mine entries that indicated the recorded entrance to a mine working. The route of the Proposed Scheme passes over a number of these mine entries. It is unknown whether the entries are shafts or adits.

10.3.56 There are known to be at least 15 observed coal seams and 20 inferred coal seams which potentially extend to the ground surface and would be crossed by the route of the Proposed Scheme in the area north of Sandiacre to Strelley. These coal seams relate to where the Pennine Coal Measures outcrop at ground surface based on published BGS mapping.

Petroleum exploration and development licence (PEDL /hydrocarbons)

10.3.57 There is one current licence for onshore oil and gas activity[101]. This relates to licence reference PEDL302, and the licensee, Warwick Energy Exploration Limited. The start date is indicated to be the 21 July 2016, ending 20 July 2046.

[101] Oil and Gas Authority, Onshore Interactive Maps. Available online at: https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa

10.3.58 The licence applies to an area of 10,000ha in extent which is crossed by the route of the Proposed Scheme in the areas between Sandiacre and north of Trowell. The route of the Proposed Scheme would intersect a Bowland Shale Prospective Area between Sandiacre and north of Stapleford.

10.3.59 There are two historical exploratory wells within the area of the current PEDL licence which were drilled to assess conventional oil and gas. These pre-date the licence which is for unconventional (shale) gas. Neither of the historical exploratory wells are located within the study area.

Geo-conservation resources

10.3.60 No geological SSSI or LGS sites have been identified within the study area. Therefore no assessment of geo-conservation resources has been undertaken.

Receptors

10.3.61 The sensitive receptors that have been identified within the study area are summarised in Table 22. A definition of receptor sensitivity is given in the SMR.

Table 22: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, schools, study centres, play areas, parks and public open space.	High
		Employees and visitors at commercial areas, retail parks and areas, hotels.	Moderate
		Commercial or industrial development.	Low
	Groundwater	Principal aquifer - Sherwood Sandstone Group and Cadeby Formation of the Zechstein Group.	High
		Secondary A aquifer – Tarporley Siltstone Formation, Lower and Middle Pennine Coal Measures, river terrace deposits, and alluvium.	Moderate
		Secondary B aquifer – Sidmouth Mudstone Formation and Tarporley Siltstone Formation. Secondary (Undifferentiated) aquifer – glacial till and head deposits.	Low
	Surface water	River Erewash, Boundary Brook, Nut Brook, Erewash Canal, former Nottingham Canal, The Lake and Oldmoor Pond.	Moderate
	Built environment	Underground structures and buried services.	Low
	Natural environment	Seller's Wood and Bullwell Wood SSSI.	High

Issue	Receptor type	Receptor description	Receptor sensitivity
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Proposed surface coal and limestone MSA.	Medium
	Oil and gas activity	PEDL302 oil and gas exploration licence. Bowland Shale Prospective Area.	Medium

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[102]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Section 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Section 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Section 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul routes to reduce compaction/degradation of soils (Section 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Section 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also

[102] Supporting document: Draft Code of Construction Practice

requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[103] and British Standards BS10175[104] and BS8576[105] , Construction Industry Research and Information Association (CIRIA) SP32[106]and any other mining related guidance and regulations.

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[107]. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA06 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

[103] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*
[104] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*
[105] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*
[106] CIRIA (1983) SP32, Construction over abandoned mine workings
[107] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A simple summary of the baseline CSM is provided in Table 23. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 23: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[108]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[109]						
LA06-01, LA06-05, LA06-08, LA06-160, LA06-167, LA06-267, LA06-36, LA06-45, LA06-56, LA06-63, and LA06-76.	Key sites include: current BP fuel filling station, former brick yard/works, current train repair company, former wagon works, current vehicle dismantling yard and former Stanton Iron Works (Industrial/commercial group)	Very low to moderate	Low to moderate	Moderate/low	Low	Low
LA06-09, LA06-10, LA06-190, LA06-191, LA06-213, LA06-269, LA06-316, LA06-332, LA06-61 and LA06-11	Various former and current railway land (Railway land group)	Low to moderate/low	Low to moderate	Moderate/low	Low	Low
LA06-230 and LA06-79	Former Cottage Farm and old Rectory Farm (Farm group)	Very low to low	Low	Very low	Very low	Very low
LA06-326 and LA06-134	Former Hucknall Airfield Landfill and former pit assumed infilled	Low to moderate/low	Low to moderate/low	Moderate/low	Low	Low to moderate/low

[108] Each potentially contaminated site is allocated a unique reference number
[109] 'On site' is within the area of land required for construction of the Proposed Scheme

Area reference108	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
	(Landfill group)					
LA06-132, LA06-135, LA06-136 andLA06-139	Marshland (Marshland group)	Very low	N/A[110]	N/A	N/A	Low
LA06-141, LA06-146, LA06-158, LA06-175, LA06-179, LA06-206, LA06-278, LA06-279, LA06-282, LA06-288, LA06-290, LA06-291, LA06-304, LA06-306, LA06-310, LA06-313, LA06-315, LA06-335, LA06-338, and LA06-74	Former Catstone Hill open cast coal mine, former Shortwood open cast coal mine, Swancar Farm open cast coal mine, shallow mining areas and multiple mine entries (Shallow mining group)	Very low to moderate/low	Low	Very low	Low	Low
LA06-82	Current Nottingham Business Park and former tramway	Very low to low	Moderate/low	Very low	N/A	Low
LA06-12	Former dye works and engineering works	Low to moderate/low	Moderate/low to moderate	N/A	N/A	Low
Off site[111]						
LA06-02, LA06-04, LA06-06, LA06-103, LA06-105, LA06-116, LA06-117, LA06-120, LA06-121, LA06-123, LA06-124, LA06-128, LA06-13, LA06-14, LA06-15, LA06-17, LA06-19, LA06-20, LA06-22, LA06-25, LA06-26, LA06-261, LA06-262, LA06-28, LA06-29, LA06-30, LA06-33, LA06-35, LA06-37, LA06-38, LA06-39, LA06-40, LA06-44, LA06-52, LA06-65, LA06-75, LA06-84 and LA06-92	Key sites include: current and former industrial areas including gas and oil engine works, gas works, textile works, iron foundries, upholstery works, garages, fuel filling station, cutting machine manufacturer, electronics manufacturer, precision engineers and a sewage works (Off siteindustrial/commercial group)	Very low to moderate	Low to moderate	Moderate/low	Low	Low
LA06-07, LA06-100, LA06-127, LA06-21, LA06-222, LA06-242, LA06-31, LA06-41, LA06-112, LA06-51, LA06-66 and LA06-64	Telephone exchange, former and current depots/warehouses, former and current pumping stations, electricity sub-station, tyres and service centre and former smithy(iron works) (Off site light industrial/commercial group)	Very low to low	Low	Low	Low	Low

[110] N/A refers to the receptor being absent or a receptor being not applicable to the contaminant source being assessed
[111] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it

Area reference108	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA06-214, LA06-265, LA06-330 and LA06-149	Various former railway land site (Off site railway land group)	Very low to moderate to low	Low to moderate/low	Moderate/low	Low	Very low to low
LA06-110, LA06-115, LA06-129, LA06-148, LA06-252, LA06-253, LA06-254, LA06-328, LA06-47, LA06-97, LA06-32, LA06-122, LA06-192, LA06-326, LA06-46, LA06-137, LA06-138, and LA06-151	Seven historic landfills and six areas of infilled land and water. Two of the historic landfills have multiple Site ID's – see Table 2 for details. (Off site landfill group)	Low to moderate/low	Low to moderate	Moderate/low	Low	Low to moderate/low
LA06-156, LA06-159, LA06-169, LA06-174, LA06-176, LA06-186, LA06-202, LA06-241, LA06-248, LA06-271, LA06-272, LA06-273, LA06-274, LA06-275, LA06-281, LA06-283, LA06-284, LA06-285, LA06-286, LA06-287, LA06-289, LA06-301, LA06-303, LA06-307, LA06-311, LA06-333, LA06-336, LA06-337, LA06-341, LA06-77, LA06-206, LA06-340 and LA06-342	Former Catstone Hill and Shortwood open cast coal mines, former coal pits, shallow coal mining areas and multiple mine entries (Off site shallow mining group)	Very low to moderate/low	Low	Low	Low	Low
LA06-48, LA06-78, LA06-91 and LA06-95.	Three church sites with graveyards and a cemetery (Off site cemetery group)	Very low	Very low to low	N/A	Very low	Very low
LA06-177	Former Catstonehill Farm	N/A	Low	N/A	Very low	N/A
LA06-03	Former Iron Foundry and Lace Factory	Low to moderate/low	Moderate/low	Moderate/low	Low	Low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general

measures in the draft CoCP. This would also include mining related contamination risks.

10.4.14 In the event that unexpected contamination is encountered during the construction of the route in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

10.4.15 All of the sites set out in Table 23 have been assessed for the change in impact associated with the construction stage of the work. Table 24 presents a summary of resulting construction effects that have been found to be significant. All other sites referenced in Table 23 were found to have non-significant effects.

Table 24: Summary of construction CSM effects

Name and area ref	Receptor	Main baseline risk	Main construction risk	Temporary effect
On site				
LA06-141, LA06-146, LA06-158, LA06-175, LA06-179, LA06-206, LA06-278, LA06-279, LA06-282, LA06-288, LA06-290, LA06-291, LA06-304, LA06-306, LA06-310, LA06-313, LA06-315, LA06-335, LA06-338, and LA06-74 Former Catstone Hill open cast coal mine, former Shortwood open cast coal mine, Swancar Farm open cast coal mine, shallow mining areas and multiple mine entries (Shallow mining group)	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Low	Moderate/low to moderate	Minor to moderate adverse (significant)
	Controlled waters - groundwater	Low	Moderate	Moderate adverse (significant)
	Controlled waters – surface waters	Very low	Moderate/low	Moderate adverse (significant)
Off site				
LA06-156, LA06-159, LA06-169, LA06-174, LA06-176, LA06-186, LA06-202, LA06-241, LA06-248, LA06-271, LA06-272, LA06-273, LA06-274, LA06-275, LA06-281, LA06-283, LA06-284, LA06-285, LA06-286, LA06-287, LA06-289, LA06-301, LA06-303, LA06-307, LA06-311, LA06-333, LA06-336, LA06-337, LA06-341, LA06-77, LA06-206, LA06-340 and LA06-342	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Very low to low	Low to moderate/low	Minor to moderate adverse (significant)
	Controlled waters – groundwater	Low	Moderate	Moderate adverse (significant)

Name and area ref	Receptor	Main baseline risk	Main construction risk	Temporary effect
Former Catstone Hill and Shortwood open cast coal mines, former coal pits, shallow coal mining areas and multiple mine entries (Off site shallow mining group)	Controlled waters - surface waters	Low	Moderate	Moderate adverse (significant)

10.4.16 The extent to which mine water and mine gas is controlled is subject to ongoing investigation. For mining sites, potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. Any mitigation measures required will be identified, in consultation with authoritative consultees, including measures to be set out in the draft CoCP, to mitigate any significant effects.

10.4.17 For other sites unrelated to mining, the adoption of the draft CoCP makes it unlikely that there will be significant adverse effects, but it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. These minor adverse impacts at the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.18 The assessment has considered the engineering design together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issues have been identified which the draft CoCP will address:

- the Toton trough, an open cut concrete channel that would be up to 3m below ground level would be constructed in the south of the study area, adjacent west to the footprint of the former dye works and engineering works (LA06-12). Earthworks could have the potential to encounter contaminated soils and shallow groundwater which may have migrated from this source and impact upon the underlying Secondary A aquifer and the River Erewash; and
- within the eastern extent of the former Stanton Ironworks site, the Proposed Scheme would require the realignment of the M1, to the west of its existing alignment at ground level and on an embankment. The embankments would include associated landscape earthworks. In addition to the ironworks, the site was historically occupied by a foundry/railway sidings and is currently occupied by various commercial/industrial land uses. Earthworks could have the potential to impact on water quality in the area including the Erewash Canal and River Erewash and also the underlying Secondary A aquifer.

10.4.19 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials.

Permanent effects

10.4.20 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.

10.4.21 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be neutral even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in adverse effects and an improvement would result in beneficial effects.

10.4.22 All of the sites set out in Table 23 have been assessed for the change in impact associated with the permanent post-construction stage. Table 25 presents the summary of the resulting post-construction effects that have been found to be significant. All other sites referenced in Table 23 were found to have non-significant effects.

Table 25: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA06-01, LA06-05, LA06-08, LA06-160, LA06-167, LA06-267, LA06-36, LA06-45, LA06-56, LA06-63, and LA06-76. (Industrial/commercial group) Key sites include: current BP fuel filling station, former brick yard/works, current train repair company, former wagon works, current vehicle dismantling yard and former Stanton Iron Works	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Moderate/low	Very low to low	Minor to moderate beneficial (significant)
	Controlled waters – surface water	Moderate/low	Very low to low	Minor to moderate beneficial (significant)
LA06-09, LA06-10, LA06-190, LA06-191, LA06-213, LA06-269, LA06-316, LA06-332, LA06-61 and LA06-11 (Railway land group) Various former and current railway land	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Moderate/low	Very low to low	Minor to moderate beneficial (significant)
	Controlled waters – surface water	Moderate/low	Very low to low	Minor to moderate beneficial (significant)
LA06-82 Current Nottingham Business Park and former tramway	Controlled waters – groundwater (Principal and Secondary B Aquifer)	Moderate/low	Very low to low	Minor to moderate beneficial (significant)

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA06-12 Former dye works and engineering works	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Moderate/low	Very low to low	Minor to moderate beneficial (significant)

10.4.23 Table 25 indicates that where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there will in most instances, be overall moderate beneficial effects which are considered to be significant.

10.4.24 In relation to the potential significant effects associated with mining sites at construction stage, there will be a greater level of knowledge and understanding of the mine workings ground model and the best means to mitigate the potential effects on a permanent basis.

10.4.25 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people, controlled waters, property, and ecological and geological areas would be controlled to an acceptable level.

Mining/mineral resources

10.4.26 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[112] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.27 There are no MSA defined in the adopted minerals plans and all MSA discussed previously are proposed and therefore not considered as part of the assessment.

10.4.28 There is an area licensed by the Coal Authority for potential future coal open cast extraction known as Robbinetts located north of the Trowell Motorway Services.

10.4.29 There is one current licence for coal bed methane exploitation; PEDL 302 which includes the route of the Proposed Scheme between Sandiacre and north of Trowell. The route of the Proposed Scheme would also intersect the Bowland Shale Prospective Area between Sandiacre and north of Stapleford.

Temporary effects

10.4.30 Temporary adverse effects may occur where construction compounds are proposed within an MSA or mineral designation. In such cases, there would be a temporary

[112] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site

sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

Coal mining – open cast

10.4.31 The Proposed Scheme construction requires a 66om long area of cutting within the Robbinetts which is licensed for future open cast coal, and which is present to the east and west of the M1 motorway. Coal Authority information shows that large parts of this licensed area have historically been open cast mined. It is possible that mineral extraction could take place prior to construction works commencing for the Proposed Scheme.

10.4.32 The effect of construction of the Proposed Scheme on the licensed area for future coal open cast would be negligible.

Petroleum exploration and development licence (PEDL /hydrocarbons)

10.4.33 It is unlikely that the Proposed Scheme will place a constraint on the future exploration or exploitation of the oil or gas resources. Due to the nature of the resource, extraction does not have to occur directly above it, therefore the effect of construction of the Proposed Scheme on the PEDL or Bowland Shale Prospect Area is expected to be negligible.

Permanent effects

10.4.34 The majority of effects on mining and mineral sites would be permanent. Where overlain by the footprint of the permanent works, with a strip of mineral becoming sterilised.

Coal mining – open cast

10.4.35 A 66om long area of cutting into the Robbinetts future licensed open cast area may sterilise a part of this area, although any surface coal will be in part removed during construction of the cutting. It is also possible that much of the resource may have been removed already. As a proportion of the area potentially sterilised to the overall Robbinetts licensed area and given the low demand for coal extraction, and that large areas have been worked already the overall effect is considered to be minor adverse, and therefore not significant.

Petroleum exploration and development licences (PEDL)

10.4.36 Petroleum exploration and development licence 302 includes the route of the Proposed Scheme between Sandiacre and north of Trowell. The route of the Proposed Scheme would also intersect the Bowland Shale Prospective Area between Sandiacre and north of Stapleford. However, it is unlikely that the Proposed Scheme will place a constraint on future exploration or exploitation of oil or gas resources. The effects of the Proposed Scheme on the identified PEDL or Bowland Shale Prospect Area would be negligible.

10.4.37 Table 26 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 26: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Robbinetts	Licensed area	Future open cast area	High	Minor	Minor adverse (N)
PEDL302	Licensed by UK Oil and Gas Authority	Oil and gas exploration licence	Medium	Negligible	Negligible (N)
Bowland Shale Prospect Area	As defined by the BGS and UK Oil and Gas Authority	Prospect areas for shale gas exploration	Medium	Negligible	Negligible (N)

Geo-conservation sites

10.4.38 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.39 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

10.4.40 Mitigation of the effects on mineral resources within the MSA could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the Coal Authority, and any other relevant parties to assist in achieving an effective management of minerals within the affected licensed area.

Summary of likely residual significant effects

10.4.41 For mining sites, the potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. For all other sites, and based on the information currently available and with the application of the mitigation measures detailed above, no likely residual significant effects are anticipated with respect to land quality. However, where remediation is undertaken there may be significant beneficial residual effects.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include three auto-transformer stations, located at Waterloo Lane, Stanton Gate and New Farm Wood. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Stapleford to Nuthall area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also to the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with East Midlands Councils, Nottinghamshire County Council (NCC), Nottingham City Council (NoCC), Erewash Borough Council (EBC) and Broxtowe Borough Council (BBC) has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: LA06 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[113].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July to September 2017.Winter surveys were undertaken from January to March 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES.

11.2.3 At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made

[113] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.4 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement will be used to further refine the study area to focus on likely significant effects.

11.2.5 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.

11.2.6 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area.

11.2.7 This assessment is based on preliminary design information and makes reasonable worst case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.8 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.2.9 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The Stapleford to Nuthall area extends from the B5010 Derby Road, between Sandiacre and Stapleford in the south, past Nuthall to the land west of the former Hucknall aerodrome north-west of Bulwell Wood. The study area includes river valley landscapes (including the River Erewash, Erewash Canal and the Nottingham Canal), urban areas of Sandiacre and Stapleford in the south and agricultural land to the north around Kimberley and Nuthall.

11.3.2 Major transport infrastructure, such as the M1 crosses the study area connecting Long Eaton in the south with Hucknall in the north, the A610 Nuthall Road and the A609 Nottingham Road cross the study area on an east-west orientation. The area also includes a section of the Erewash Canal, which follows the alignment of the River Erewash through Sandiacre and Stapleford and the former Nottingham Canal to the east of Trowell. The former Nottingham Canal, which crosses through the study area north to south through the central area, is no longer navigable and has become the Nottingham Canal Local Nature Reserve (LNR).

11.3.3 Land use within this study area varies from residential in urban areas and urban-fringes, to recreational and pastures farmland within the River Erewash valley to the south and to the north Stapleford. Land use within the central section of this area is largely agricultural farmland and scattered farmsteads.

11.3.4 The settlement pattern of the study area is characterised by small towns consisting mainly of brick built, post war urban expansions from historic cores smaller old mining villages, with rows of mining stone and brick built cottages and some isolated scattered farmsteads. The small towns and villages combine in areas to form urban conurbations to the west of Nottingham. The River Erewash forms the boundary between Broxtowe and Erewash Districts and forms a shallow river valley, through urban and urban fringe landscapes.

11.3.5 Strelley historic parkland is located within the central section of the study area. The parkland features some remnant parkland trees and vegetation located around Strelley Hall which is a Grade II listed building, originally of the 12th century and substantially altered in various architectural styles in the 18th and 19th centuries. The hall forms the core of the Strelley Conservation Area along with its associated village. The parkland is located within the Greenwood Community Forest which is a Nottingham Community Forest as part of the Greenwood Partnership. The parkland's scenic nature provides a unique quality to this area making it distinct in landscape character.

11.3.6 Within the wider agricultural landscape, there is a large open field pattern, with few remnant hedgerow field boundaries. It is a productive farmland of mostly arable land use on undulating land. There are small pockets of deciduous woodland and the occasional mature tree. The rolling form of the landscape populated with small blocks of woodland including New Farm Wood, Sellers Wood and Bulwell Wood Ancient

Woodlands provides scenic and unique qualities to the rural landscape, although degraded by the expansive field patterns and loss of hedgerows.

11.3.7 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined upon completion of the historic landscape characterisation exercise and these final LCAs will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[114], the Derbyshire County Council (DCC) Landscape Character Assessment[115] and the Greater Nottingham Landscape Character Assessment by NCC[116].

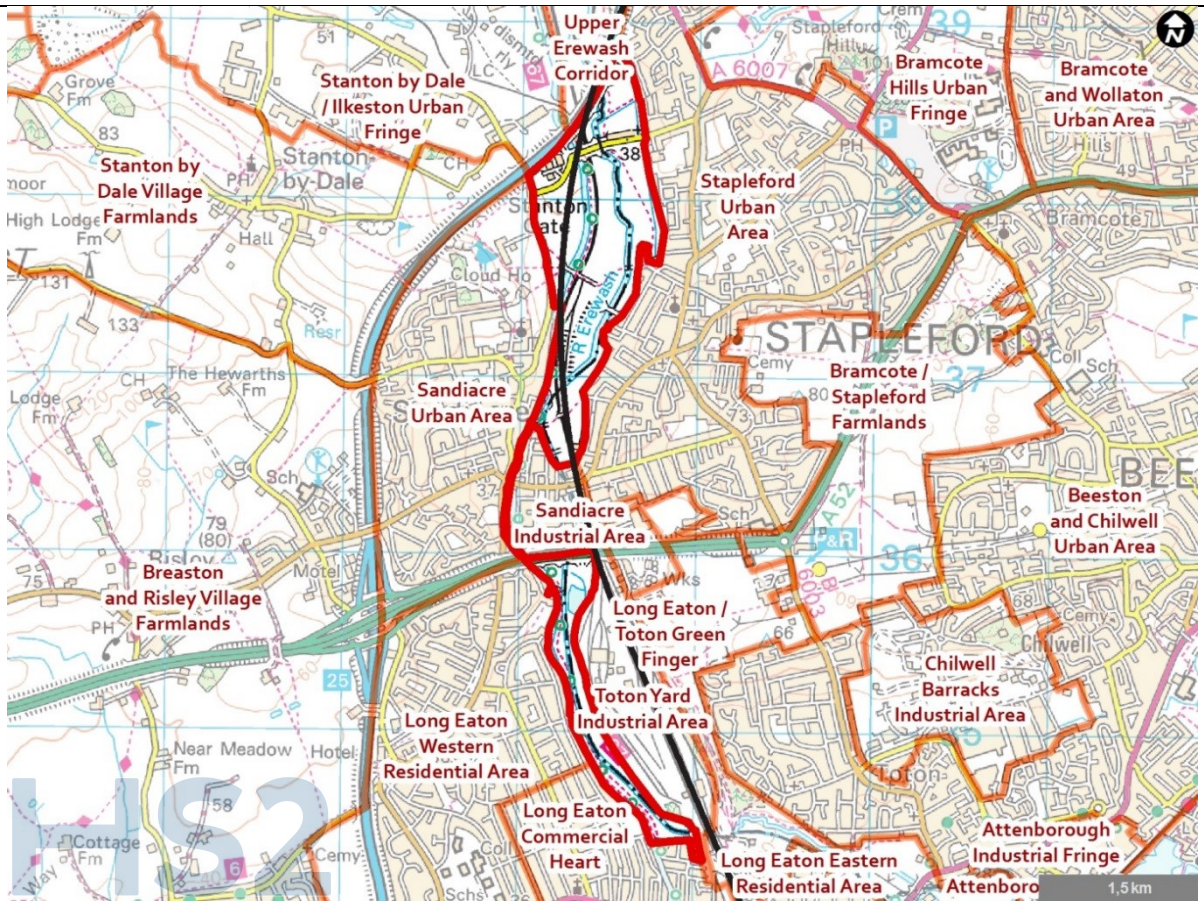
11.3.8 These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions. The LCA areas within the published Landscape Character Assessments for Derbyshire and Greater Nottingham have been sub-divided further to provide a smaller scale assessment level.

11.3.9 For the purposes of this assessment, the Stapleford to Nuthall study area has been subdivided into fifteen LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

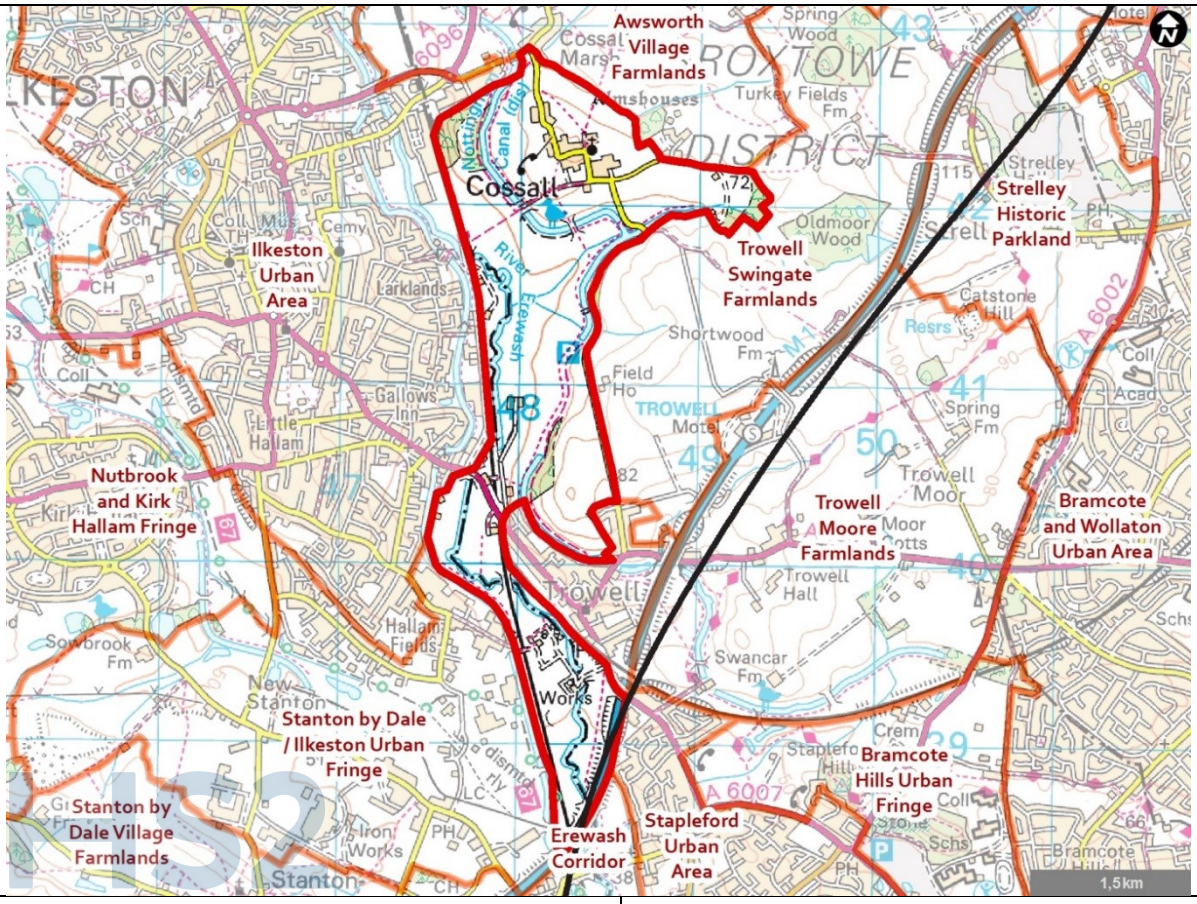
11.3.10 Seven of the fifteen LCAs would not be significantly affected by the Proposed Scheme on account of distance, land form and urban built form. The Sandiacre Urban Area and Bullwell wood LCAs would be significantly affected by the Proposed Scheme and are included in Volume 2: Community area report LA05 report Ratcliffe-on-Soar to Long Eaton and Volume 2: Community area report LA07 Hucknall to Selston as they are located for the most part within these areas. A summary of the remaining seven LCAs that would be significantly affected within the Stapleford to Nuthall area is provided in Table 27.

[114] Natural England (2013, 2014), *National Character Area profiles*, available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles
[115] Derby County Council (2000), *Derby County Landscape Character Assessment,* available on online at: http://www.derbyshire.gov.uk/environment/conservation/landscapecharacter/
[116] Nottinghamshire County Council (2009), *Greater Nottinghamshire Character Assessment,* available online at : http://cms.nottinghamshire.gov.uk/home/environment/landimprovements/landscapecharacter.htm

Table 27: Summary of significantly affected LCAs

Erewash Corridor	
	
Enclosed pasture fields and a small block of woodland planting 	A rolling, wooded landscape across the river valley 
The Erewash Corridor LCA is an attractive narrow, low lying alluvial floodplain, set within the broad valley of the River Erewash. The river itself meanders through grazing meadows and is not visually prominent, although some of its banks are highly vegetated with tree and shrub growth, creating a linear feature within the landscape. There are large areas of grassland, some of which are maintained, sparse hedgerows and pockets of scrub and trees along the Erewash Valley Line. There is a network of PRoW, including the Erewash Valley Trail, and Nutbrook Trail, with some paths crossing the Erewash Valley Line along existing footbridges, connecting both sides of the landscape along the canal, providing recreational value. Brick terraced properties and large modern industrial units are located to the west of the Erewash Canal, which results in a more urbanised character to the south. Land use becomes more rural to the north, linking to farmland with preserved ridge and furrow earthwork, created by a system of ploughing during the middle ages adjacent to the Erewash Canal and Stony Clouds LNR. Light spill from the urban areas and the M1 can be seen in the night sky within this LCA. The perception of the landscape is that it is a mostly tranquil area varying in condition and land use, the river valley is surrounded by numerous urban elements in the landscape such as the M1 and adjacent industrial and residential areas. The overall value of this LCA is medium derived from its relative tranquillity, scenic qualities and recreational value.	

Upper Erewash Corridor



Vast pasture farmland with Trowell in the distance, over the M1

Hedgerow lined agricultural fields towards the M1 from Waterloo Lane

The Upper Erewash Corridor LCA is a largely attractive, narrow, low lying, alluvial floodplain set within the broad valley of the River Erewash its character is similar to that of the Erewash Corridor LCA. However, this LCA has a more rural character especially to the north where farming is the main land use, with both pasture and arable fields and isolated residential properties. The Ilkeston Water Treatment Plant and the M1, in the south of the LCA detract from the scenic elements.

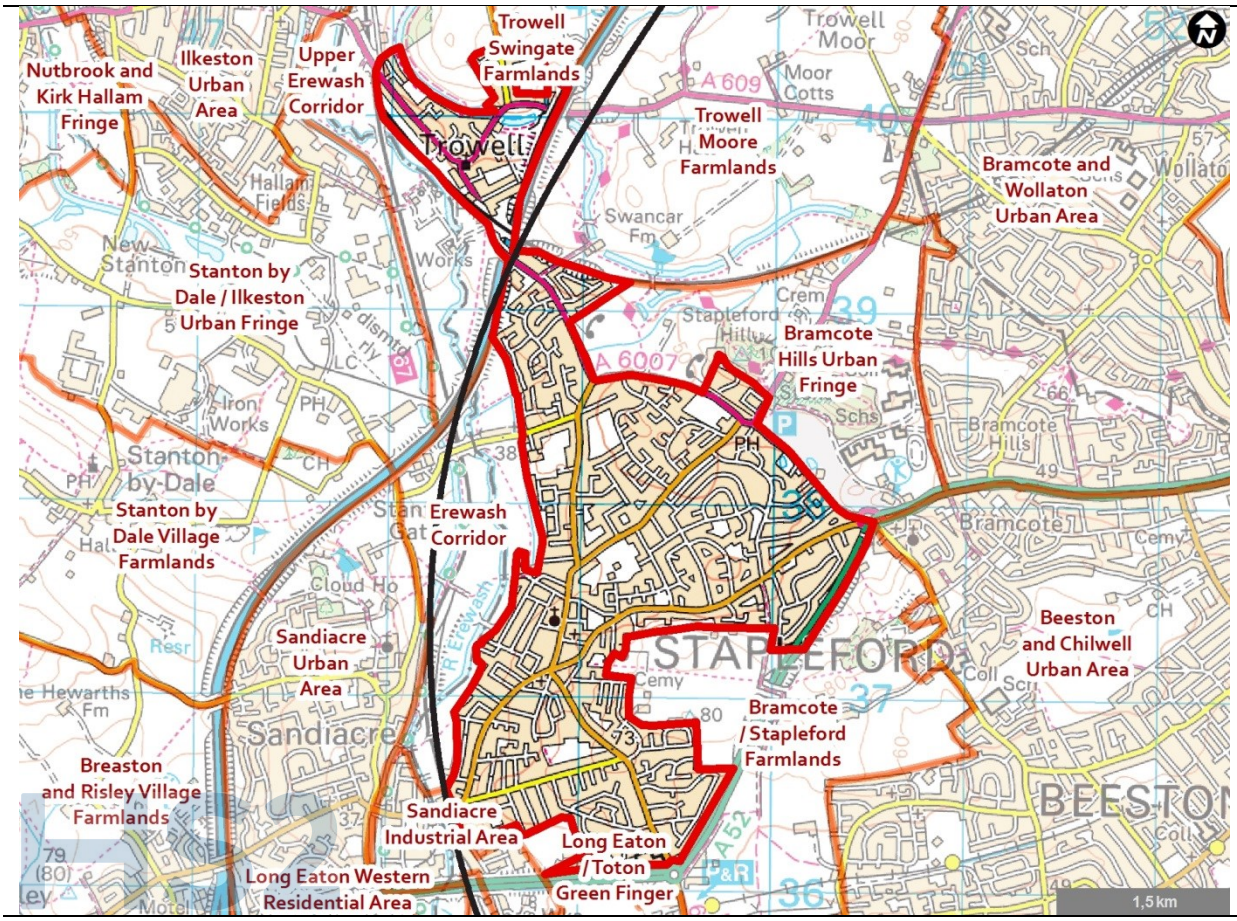
There are large areas of farmland, some hedgerows, block planting along the Erewash Valley Line and around the water treatment works, riverside vegetation, and small native woodland blocks. Belts of woodland help to screen and filter views of the M1 transport infrastructure, industry and rail infrastructure.

Settlement within the LCA comprises of the historic village of Cossall, a designated conservation area, located to the north of the LCA and bound by the former Nottingham Canal on its western side. This is an attractive village centred on St Catherine Church.

A network of PRoW cross the area including the popular promoted Nutbrook Trail route, former Nottingham Canal Towpath and Nature Reserve, along with smaller local paths that provide recreational value. The rural character of the LCA has a tranquil perception, but the surrounding urban elements in the landscape such as the M1 and adjacent industrial area introduce movement and a bustling character.

The overall character of this LCA is medium derived from it mainly rural character, relative tranquillity, recreational value and scenic qualities.

Stapleford Urban Area



Mill Road, new properties with the Erewash Corridor, vegetation behind

The Stapleford Urban Area LCA is situated on a relatively flat landscape. The settlement has expanded around the historic core of St. Helen's Church (Grade I listed building) and its origin can be dated back to Norman times. The towns' location between the River Trent and River Erewash provided trade routes, the town then further grew through the hosiery trade in the 18th century with the building style within the core reflecting this growth. Church Street and Nottingham Road Conservation Areas are located within the LCA and contain an important cluster of 19th century buildings related to the hosiery industry, some of which are listed as being of special historic or architectural interest, adding value to the character area.

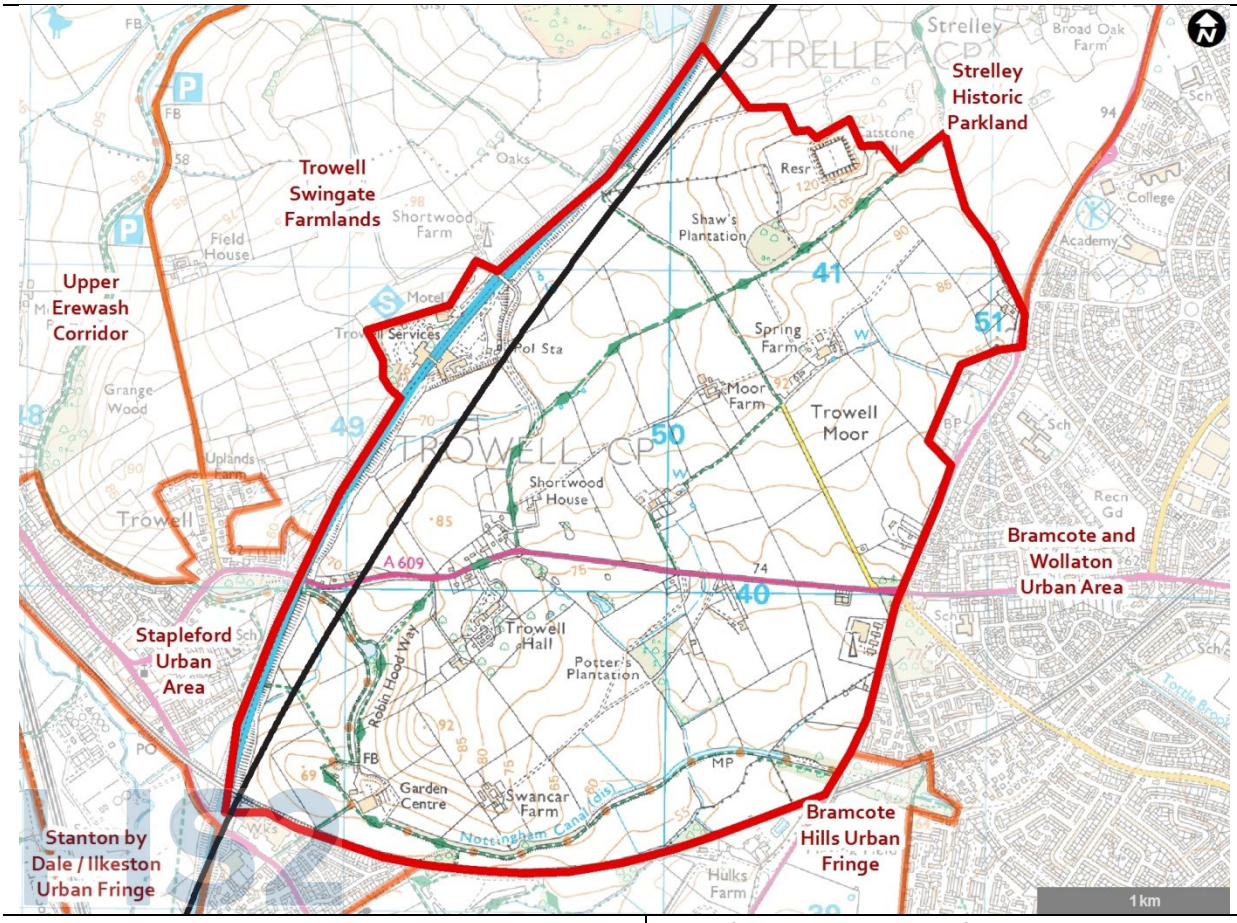
Away from the core, residential properties are mostly brick built mid-late 20th century, located on terraces in the west and large estates to the north. Retail units located along the B5010 Derby Road are sinuous with other UK towns and are limited in distinctiveness. Large scale infrastructure, busy traffic associated with the A52 Brian Clough Way and the M1 detract from the perception and appearance of the town.

Trowell village is situated to the north of the M1. Thought to be Saxon in origin, it was then industrialised by the presence of iron works. Trowell was chosen as the 'Festival Village' for the 1951 Festival of Britain. Not a typical 'chocolate box' village it was chosen to reflect the English Village where rural life is passing away and industrial communities introduced. The industrial works have now gone and the village is linked to the communities in Stapleford and Sandiacre. Trowell has a mix of property styles built in brick

situated close together to form a community. There are small open spaces situated mainly within Stapleford including allotments and playing fields, namely Archers Field Recreational Ground, Queen Elizabeth Park, and Hickings Lane Recreational Ground.

The overall value of this LCA is medium derived from the historic residential area and the presence of the Church Street and the Nottingham Road Conservation Areas.

Trowell Moor Farmlands



A rural productive landscape, semi enclosed with mature tree and hedgerows

View of the M1 across pasture fields and hedgerows

The Trowell Moor Farmlands LCA is productive, mostly arable, farmland located on undulating topography stretching from Stapleford to Strelley. The M1 passes through the LCA in a south-north direction, along the western boundary of the LCA.

This LCA is located within the Greenwood Community Forest which is a Nottingham Community Forest as part of the Greenwood Partnership[117]. There are small pockets of deciduous woodland and occasional mature trees and hedgerow field boundaries. Settlement within the LCA consist of large isolated farmsteads and small residential areas on the B600 Nottingham Road.

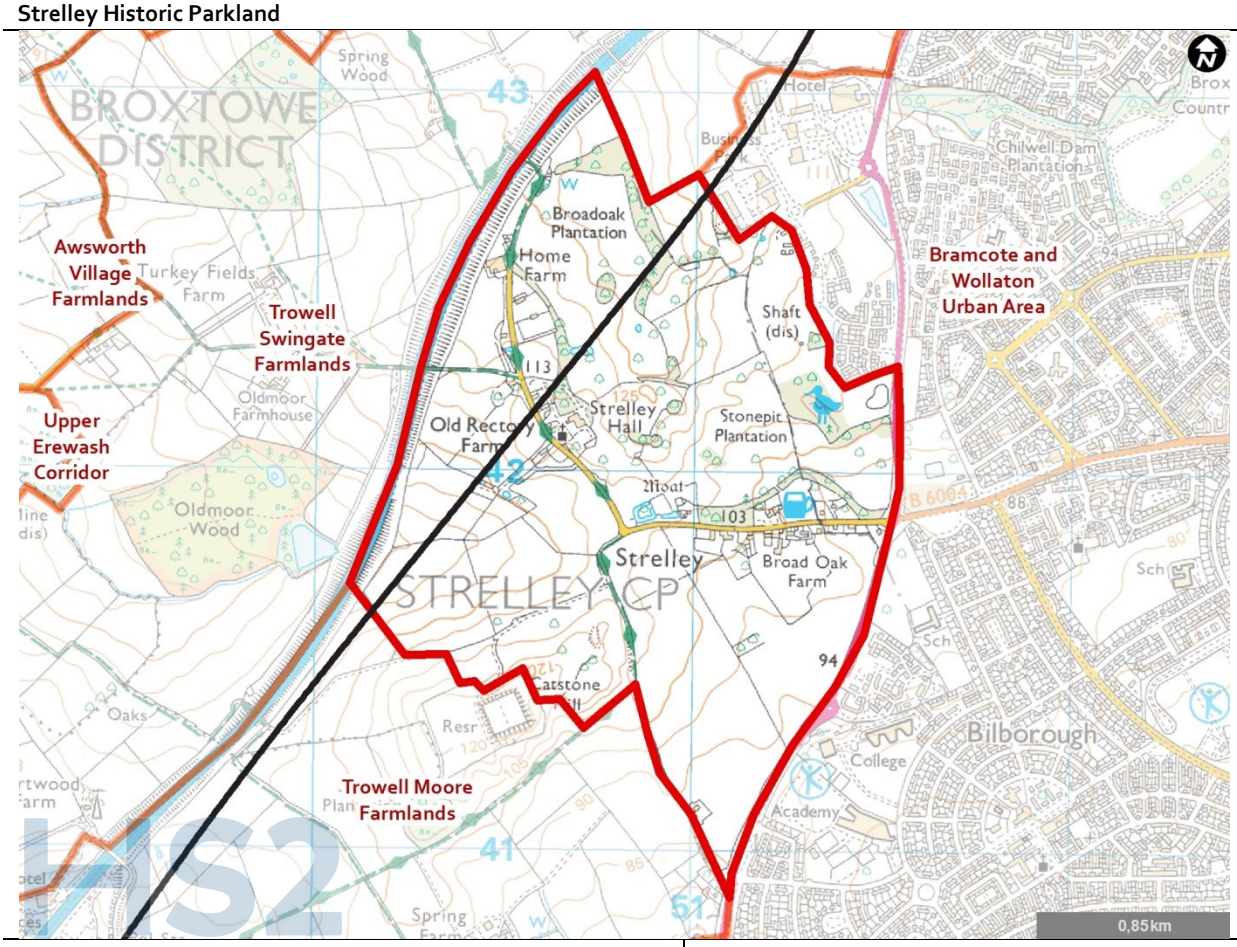
[117] The Greenwood Partnership is a partnership between the following councils and regulatory bodies: Nottinghamshire County Council, Ashfield District Council, Broxtowe Borough Council, Gedling Borough Council, Mansfield District Council, Newark & Sherwood District Council, The Forestry Commission and Natural England

There are historic designations within this LCA which includes the Grade II listed Trowell Hall which is situated along the B600 Nottingham Road. Listed bridges within this LCA include the Nottingham Canal Swansea Bridge (Grade II) and Nottingham Canal Swancar Bridge (Grade II) which are located along the former Nottingham Canal. The influence these designations have on the landscape is localised.

The rolling landscape form has some scenic quality and is relatively tranquil despite the presence of the M1 and Trowell Motorway Services which influences the character of the area by adding traffic movements, noise and light. The former Nottingham Canal LNR provides recreation value for fishing and use of the towpaths, including forming part of the Robin Hood Way promoted recreational walking route. The canal also provides some scenic quality within the wider rolling landscape.

The overall value of this LCA is medium derived from a varying quality of rural landscape and historic elements.

Strelley Historic Parkland



Example of the mature lone tree and pasture fields within the parkland setting

Dense vegetation along the M1 bridge crossing toward Strelley Hall

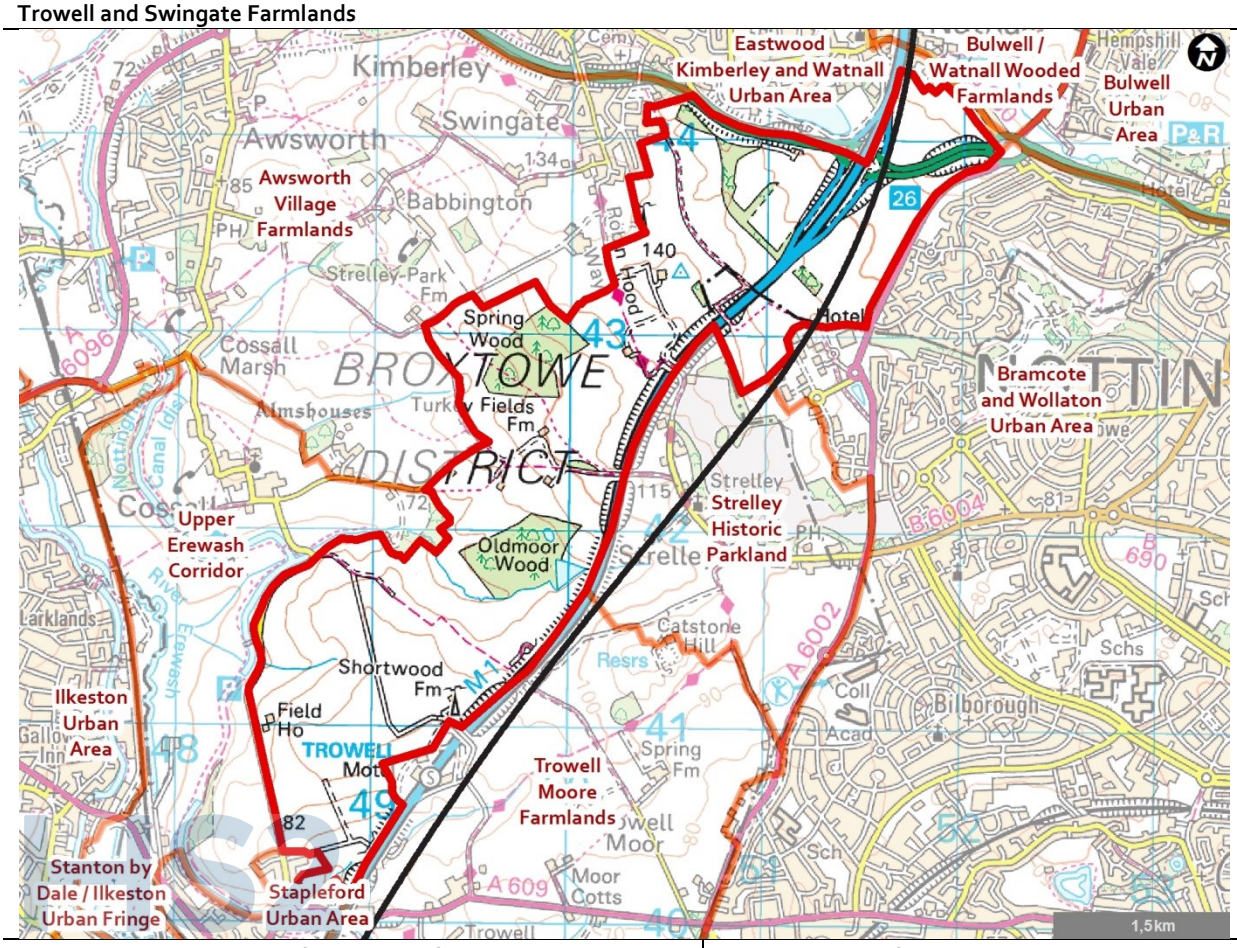
The Strelley Historic Parkland LCA is located on a local high point of approximately 115m AOD and has a rural parkland character with local historic importance. Strelley is a small village that developed in the rural landscape prior to the construction of Strelley Hall, a Grade II listed building and All Saints' Church, which is Grade I listed.

The Strelley estate and its associated historic parkland, which date to the 12th century, are designated as the Strelley Conservation Area. Changes took place to the Strelley estate in the 18th and 19th centuries; however, remnants of the medieval core survive in the scheduled moat and fish pond. The conservation area occupies most of the LCA, with just the south eastern portion of the LCA along the A6002 Woodhouse Way not included.

Beyond the hall, the rolling landscape comprises arable fields and horse grazing. Small blocks of woodland and mature trees are valued landscape characteristics, enhancing its condition, scenic qualities and perception as an historic landscape. The fields are enclosed by mature hedgerows and traditional railings associated with parkland character. Strelley estate is also located within the Greenwood Community Forest. This is a quiet area with no through traffic, where winding country lanes provide a secluded and tranquil. The M1 is located to the west of the Strelley Conservation Area, long distance view towards the M1 diminish the LCA's scenic value; however, it is not markedly audible, due to intervening vegetation and landform. Historic links to farmland are maintained over the M1 via bridges and a network of PRoW including Robin Hood Way and various bridleways.

The overall value of this LCA is high derived from the scenic and historic setting, the recreational value and the landscape condition throughout.

Trowell and Swingate Farmlands



Verge Wood visible on the left hand side of the view, beyond the rural landscape.

A rural landscape featuring Oldmoor Wood in the distance from Dead Lane in Cossall.

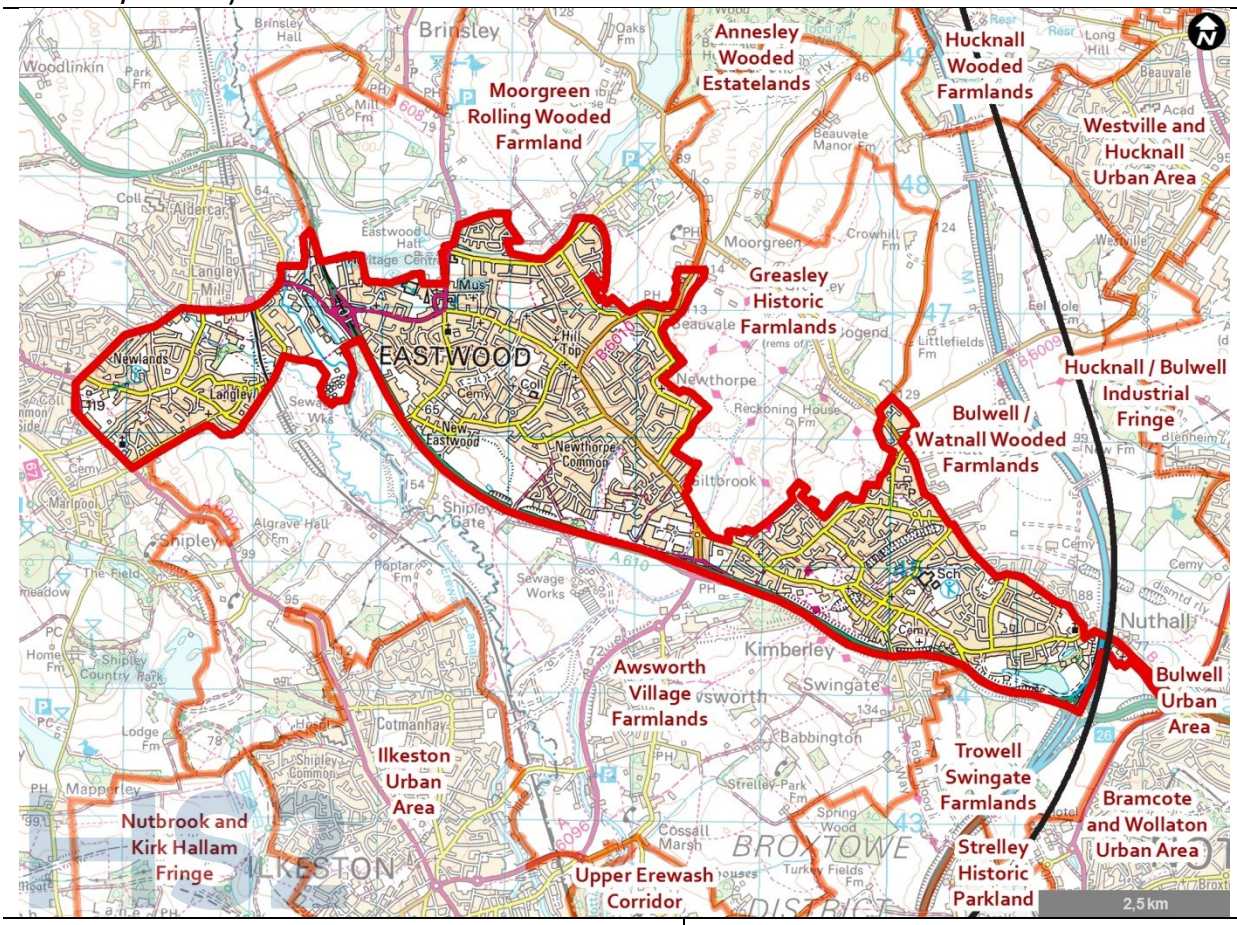
The Trowell and Swingate Farmlands LCA is a gently rolling landscape, dissected by small streams, forming part of an islanded rural landscape between the urban areas of Stapleford to the south, Kimberley to the north, Ilkeston to the west and Nottingham to the

east. It is a productive landscape with a medium to large arable field pattern, mature hedgerows and small blocks of woodland interspersed within the farmland including Oldmoor Wood and Spring Wood. There are isolated farmsteads scattered throughout the area on a network of small local roads. Transport infrastructure including the M1, its associated signage, lighting and roadside planting feature heavily to the east of the LCA leading up to junction 26 of the M1.

Traffic on the M1 is audible in parts but the dense scrubby roadside vegetation screens the route of the M1 from this LCA. The LCA is tranquil away from the M1, and provides increased seclusion, which adds value. Light spill from the urban areas and the M1 can be seen in the night skies within this LCA. This LCA is also located within the Greenwood Community Forest.

The overall value of this LCA is considered to be medium, derived from the tranquillity, varying quality and condition of the landscape.

Eastwood, Kimberley and Watnall Urban Area



The B600 Nottingham Road looking towards the overbridge of the M1

View along a residential street within Kimberley towards Swingate

The Eastwood, Kimberley and Watnall Urban Area LCA comprises an urban landscape of mixed style, density and pattern combined into a continuous extensive urban area, evolved from Eastwood, Kimberley and Watnall settlements.

Kimberley is a small town built on coal mining and hosiery manufacturing, and the former Nottingham Canal. Its centre contains streets of tightly built brick pre-war residential properties, with newer properties on estate to the west. Kimberley Conservation Area is located in the centre of the settlement; its distinct feature is a brewery which is dominant in the landscape. Victorian shop frontages within the conservation area been improved which enhances the character of the area.

Nuthall is split into two areas: Old Nuthall which lies west of the M1 between the Nuthall Island roundabout and Kimberley, and New Nuthall to the east of the M1. This LCA contains the settlement of Old Nuthall, an area developed along the Nottingham and Kimberley roads. Nuthall Conservation Area, within Old Nuthall, includes a distinctive row of stone-built terraced cottages along the A610 Nottingham Road with well-established trees along the street frontages and the original Nuthall Manor house.

Watnall is a small village linked to Old Nuthall and is the home of Hovis, the well-known bakers whose factory is prominent in the village. Eastwood is a former coal mining town, and the home of DH Lawrence, which expanded rapidly during the Industrial Revolution. 'The Buildings' is a housing estate within Eastwood, consisting of approximately 300 terraced miners' cottages and is a local landmark within this character area.

Transport infrastructure including the M1, the A610, the A6002 Woodhouse Way and the B600 Nottingham Road is a feature of the character area, linking together the various settlements. The M1 is prominent and audible in its elevated positon over the B600 Nottingham Road. In other locations the intervening urban form screens most of the M1 and passing traffic is not visible. Given the urban characteristics of this LCA there is limited tranquillity and the perception of the landscape is one of movement and development.

The overall value of this LCA is medium derived from the character of conservation areas and heritage aspects combined with areas of urban sprawl, varying in quality, and the presence of transport infrastructure.

Visual baseline

11.3.11 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA06 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[118], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.12 No protected views have been identified within the study area. Views from residential properties within the area include those from the towns of Sandiacre, Stapleford and Kimberley; and villages such as Trowell, Nuthall, Strelley and Cossall, along with numerous individual farmsteads.

11.3.13 Urban residential views are generally dominated by road and rail infrastructure and a range of housing styles. The existing Erewash Valley Line forms prominent infrastructure in the south of the study area in Stapleford and Sandiacre. Its presence ranges from near distance, including screening vegetation, to glimpsed, long distance views from residential properties within the larger settlements of Sandiacre and Stapleford. The M1 becomes dominant through Stanton Gate, with many views in the area being influenced by it and its associated infrastructure, including lighting columns and overhead gantries.

11.3.14 Views from residential properties and footpaths on the edges of settlements to the north, within Nuthall, Nuthall Conservation Area and Kimberley are typically filtered and framed by intervening hedgerows and roadside planting. Combined with the gently undulating landform, the hedgerows and road side planting restrict open views

[118] Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath

in these locations. Residents and footpath users experience views or an awareness of the M1 and associated infrastructure.

11.3.15 Views from topographically elevated PRoW and residences are located mainly within rural locations within the study area. Generally, views from these receptors are far reaching with limited views of infrastructure, including the M1, due to intervening landform and mature vegetation. For those few receptors that have open views, the M1 and associated infrastructure typically form only a small part of those views and typically do not dominate.

11.3.16 Views from the Strelley Conservation Area are predominantly rural. These views are partially restricted by the gently undulating landform, mature hedgerows and trees that frame the pasture fields and line the PRoW. The views available are generally at high points providing good, long distance views. Views from the roads and PRoW are generally short distance due to the height of the hedgerows and trees. The M1 forms a small part of the view, with the associated embankment woodland planting, signage and lighting columns being more apparent to the viewer than the road carriageway or vehicles.

11.3.17 A range of views are available for recreational users along the River Erewash valley and Erewash Canal in the south of the study area. The rural landscape to the north contains a number of PRoW. Views from the majority of PRoW in the area are within the rolling rural landscape and as such views are restricted by landform, woodland and hedgerows. Equestrian related activity, for example horse paddocks, feature in both settlement edge and rural viewpoints.

11.3.18 Users of rural roads and lanes generally experience partially restricted views, due to mature roadside hedgerows and trees, giving only glimpses of the views beyond. Users of the M1 generally have reaching views into the landscape to the east and west. However, existing road side planting and patches of woodland close to the M1 narrow the field of vision and contain views along the road corridor itself. Views from employment receptors, including those in Nottingham Business Park, are partially restricted by nearby vegetation, restricting long distance views towards the M1 over the flat landscape. Other individual employment receptors are spread out throughout the study area, with views dependant on individual locations.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in

Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2025 and the end of 2027. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[119] to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[120];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: excavation of cuttings; erection of viaducts; construction of embankments; removal of existing landscape elements including trees and hedgerows; and closure and diversion of existing public highways and PRoW. Other key changes include construction of overbridges and underbridges; auto-transformer stations; overhead power lines; utility diversions; the presence of transfer nodes and pre-cast yards; construction compound and haul routes and demolition of buildings and structures.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 28 would be significantly affected during construction of the Proposed Scheme.

[119] Supporting document: Draft Code of Construction Practice
[120] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard

Table 28: Summary description and assessment of effect on LCAs

Erewash Corridor	**Medium susceptibility and sensitivity**
Susceptibility to change: The levels of tranquillity and river valley qualities have a medium susceptibility to change arising from the Proposed Scheme. A high proportion of the LCA sits within the land required for the construction of the Proposed Scheme and would be affected by large scale construction works for the Erewash embankment (up to 6m in height) and Stanton Gate viaduct (up to 18m in height, including the portal structure) over the Erewash Canal. The landscape character would be substantially changed by the removal of trees and hedgerows to the north of the Erewash Canal; this would open up views towards construction works and create change to the landscape pattern through the presence of earthworks and stockpiles and introducing notable alterations to the existing landform. Stanton Gate main compound will be accessed via Stanton Cross and Ilkeston Road to facilitate the construction of the Stanton Gate viaduct, and would introduce an uncharacteristic feature and traffic movement into the landscape. Construction of the Proposed Scheme would therefore result in a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Upper Erewash Corridor	**Medium susceptibility and sensitivity**
Susceptibility to change: River valley characteristics, tranquillity and rural character impart a medium susceptibility to change arising from the Proposed Scheme. The southern section of the LCA would be substantially changed during the construction of the Station Gate viaduct and the realignment of the M1. The construction of new under and overbridges to realign the M1 over the Erewash Canal, River Erewash and Erewash Valley Line and modifications to existing under and overbridges would introduce substantial alterations to the existing landform within the river valley landscape. The existing M1 would then be utilised as a construction traffic route, creating change to the landscape character through additional movement of large construction vehicles. Tranquillity would be reduced by construction vehicle movements and noise. The large scale removal of trees and hedgerows alongside the existing M1 would open up views towards construction works, comprising cranes and other large construction machinery and balancing pond excavations. New uncharacteristic features would substantially alter the character of the LCA. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)

Stapleford Urban Area	**Medium-low susceptibility and medium sensitivity**
Susceptibility to change: The urban landscape with the presence of conservation areas and historic elements has a medium susceptibility to change arising from the Proposed Scheme. The character of the LCA would be substantially changed during the construction of the Stanton Gate viaduct, the realigned M1 and associated structures. Clearance of vegetation, including tree belts and hedgerows, alongside the existing M1 and into the River Erewash corridor, would open up views towards construction works and the presence of earthworks and stockpiles introducing notable alterations to the existing landform and land use. The presence of the A6007 Stapleford Road satellite compound, the Radford and Trowell Line satellite compound; and the A6007 Stapleford Road overbridge and Trowell embankment would introduce construction plant and movement of construction vehicles, resulting in a considerable change by introducing new, uncharacteristic features within the urban LCA. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Trowell Moor Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The levels of tranquillity and rural qualities within the landscape impart a medium susceptibility to change arising from the construction of the Proposed Scheme. The landscape would be substantially changed by large scale construction works during the construction of the Trowell cutting and embankment. The removal of trees and hedgerows during construction to the south of the existing M1 would open up views towards construction works and the presence of earthworks and stockpiles and would introduce notable alterations to the existing rural landform. The presence of the Trowell and A609 Nottingham Road satellite compound and Trowell and Waterloo Lane satellite compound to the north and south of Trowell Motorway Services would introduce considerable change in the landscape as a result of construction plant, movement of construction vehicles and balancing pond excavations in this character area. Large scale infrastructure elements and intensive construction activity would be highly prominent within the agricultural landscape. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Strelley Historic Parkland	**High susceptibility and sensitivity-**
Susceptibility to change: The landscape condition and historic value means it is highly sensitive to loss or erosion of character therefore imparting a high susceptibility to change arising from the Proposed Scheme. The LCA would be substantially changed by large scale construction works during the construction of the tunnel under the Strelley Conservation Area and LWS. The high scenic quality of the landscape would be reduced through the introduction of construction and operation of the Strelley tunnel south main compound and the Strelley tunnel north main compound at either end of the tunnel. Construction activities and compounds would introduce temporary earthwork stockpiles, balancing pond excavations and the removal of trees and hedgerows within the land required for the Proposed Scheme. Main Street would be used for construction access and the movement of plant and construction vehicles. Changes to character would be further affected by construction activities impacting on tranquility through the introduction of vehicles and large-scale machinery. Together these elements would introduce a high magnitude of change by virtue of localised alterations to the landform, character, and temporary severance of landscape pattern. There would therefore be an overall high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)

Eastwood, Kimberly, and Watnall Urban Area	**Low susceptibility and medium-low sensitivity**
Susceptibility to change: The urban landscape and conversation area imparts a medium susceptibility to change arising from Proposed Scheme. This character area would be directly impacted by large scale construction activities during the construction of the Proposed Scheme in an elevated position on the Nuthall embankment, which requires substantial earthworks. The presence of the Nuthall satellite compound and temporary stockpiles, construction plant and movement of construction vehicles and balancing pond excavations would introduce considerable new uncharacteristic features in the LCA. The construction of the B600 Nuthall viaduct across the B600 Nottingham Road leading to junction 26 of the M1 would introduce construction plant and movement of construction vehicles along the temporary site access route and haul route especially in the vicinity of A609 Nottingham Road and the M1. There would therefore be an overall high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Trowell and Swingate Farmlands	**Medium susceptibility and sensitivity**
Susceptibility to change: The levels of tranquillity and rural qualities within the landscape impart a medium susceptibility arising from the Proposed Scheme. The construction of the Mellors Way cutting, Lawrence Drive overbridge, A610 Broxtowe viaduct and Broxtowe embankment No.1 and No.2 would result in uncharacteristic features within this rural character area through the presence of construction plant and movement of construction vehicles. Additional vehicle movements and associated noise would reduce tranquility of the area. The presence of the Westville embankment satellite compound and intensive construction activity associated with large scale infrastructure elements would be prominent within this agricultural landscape. The removal of trees and hedgerows through the farmland, including small areas of woodland, would open up views towards construction works and the presence of earthworks and stockpiles would introduce notable alterations to the existing rural landform and agricultural land use. There would therefore be an overall high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.11 Table 29 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA06 Map Book.

Table 29: Construction phase potentially significant visual effects

View east from Cross Street and Regents Street Junction (377-03-004) (Map Number LV-03-377b)	**High Sensitivity Receptors**
Views in the near distance from this location will be unchanged from the current low level vegetation and fencing, but construction works will include the removal of the vegetation in the middle distance. This will result in the existing railway being visible along with a temporary service road. No construction compounds would be visible within the view; however large scale machinery and construction activity within the area of construction works will be prominent. There would be a noticeable change in the key characteristics of the view for residents. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant),
View west from Sandiacre Road PRoW and Residences (VP 377-03-005) (Map Number LV-03-377b)	**High Sensitivity Receptors**
The temporary effects on this view towards the river valley will include the loss of vegetation at the distant field boundary and the presence of construction machinery in the form of cranes and vehicles for the construction of the Stanton Gate viaduct. The area of construction works will extend to the back of the sub-station and the embanked edge of the paddocks in the foreground, introducing large scale machinery, cranes and construction activity. A temporary access road will be located alongside the Proposed Scheme alignment and construction vehicles and construction infrastructure will be visible. There would be a noticeable change in the key characteristics of the view through the introduction of construction activity There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View east from PRoW close to Cloud House (VP 377-03-008) (Map Number LV-03-377b)	**High Sensitivity Receptors**
This view towards a rolling landscape for footpath users and residents would be substantially changed. The area of construction works would stretch from the canal edge to the hedge boundary on the far side of Ilkeston Road. Ilkeston Road will be used as a construction access road, which would increase the frequency of larger construction related vehicles and a temporary construction access road would be visible in the foreground. The construction of the Stanton Gate viaduct and its associated large scale machinery and cranes, would be visible in the background of the view. However, the vegetation either side will screen views of the Stanton Gate main compound to the west of the view. There would be a substantial change in characteristics of the view, through and introduction of construction activity that would be highly visible There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from Erewash Canal and PRoW in Stapleford VP 378-03-001) (Map Number LV-03-378)	**High Sensitivity Receptors**
Users of the Erewash Canal and PRoW in Stapleford would experience views of rolling pasture fields and blocks of woodland and vegetation that would be dominated by construction activities associated with the Stanton Gate viaduct. A temporary access road would be located to the west of the Proposed Scheme and beyond that the Stanton Gate main compound would be visible. The construction elements would block views beyond these features resulting in a significant change introducing large scale machinery and construction activity to the view. There would be substantial change in characteristics of the view, through the introduction of construction elements that would be highly visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

View south east from Stanton Gate residences (VP 378-02-004) (Map Number LV-04-378)	**High Sensitivity Receptors**
During temporary construction works large areas of vegetation around Stanton Gate would be removed. This would open up current views of road and canal side vegetation towards construction works. The presence of earthworks and stockpiles would introduce notable alterations to the existing landform and land use. The existing road would partially merge with a temporary construction access road, therefore dominating parts of the view. The construction of the Stanton Gate viaduct with its associated large scale machinery, cranes and construction activity will dominate the west side of the view, while the Stanton Gate main compound would be visible to the east. There would be a substantial alteration in characteristics of the view, in near distance to the properties. The introduction of construction elements would be highly visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west from Moorbridge Lane PRoW (VP 378-03-005) (Map Number LV-04-378)	**High Sensitivity Receptors**
Users along Moorbridge Lane would have views along the bridge, lined with tall dense vegetation, changed to that of construction works for the Stanton Gate viaduct and the M1 Radford and Trowell Line overbridge. Views from PRoW and Pastures Lane Recreational Ground would be dominated by construction activity through the introduction of vehicles, compounds and access tracks. Vegetation will be removed on the right side of the road, and along the River Erewash. This would open up views towards construction works and the presence of earthworks would introduce notable alterations to the existing landform and land use. The temporary service road would be visible in the background of the view as it joins Stanton Gate on the far side of the existing Radford and Trowell Line. There would be a noticeable change in the in the view through the introduction of construction activity. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View east from PRoW off Dawn View (VP 378-03-006) (Map Number LV-03-378)	**High Sensitivity Receptors**
The temporary effects would occur to this view across grassland towards the M1 but screened by large area of vegetation. The area of construction works would be offset from the existing M1 alignment; this will result in the screening vegetation being removed, opening up views towards construction works and the presence of earthworks introducing notable alterations to the existing landform. The current M1 alignment would be replaced with a temporary construction access road for the construction of the Trowell embankment and related construction vehicles and machinery being visible. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from PRoW close to Trowell Garden Centre (VP 378-03-009) (Map Number LV-03-378)	**High Sensitivity Receptors**
The temporary construction effects within this view, across a rolling landscape interspersed with hedgerow and mature trees towards the M1, would include vegetation clearance extending from the far side of the realigned M1 to the fields in the distant view. The construction of the Proposed Scheme earthworks using large scale machinery would be prominent in the view altering the landform. There would be a substantial alteration in characteristics of the view, through the introduction construction activities and change in landform that would be highly visible There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

View west on Waterloo Lane (VP 379-04-002) (Map Number LV-03-379)	**Medium Sensitivity Receptors**
At this location the construction works would result in substantial changes to the landform and therefore the view across a rural landscape towards the M1. The removal of vegetation would open up views of the construction works and introducing large scale machinery and construction activity. The Trowell and A609 Nottingham Road satellite compound would be visible, located behind the line of the Proposed Scheme and a temporary construction access road. There would be a substantial alteration in characteristics of the view, through the introduction of construction activities and change land form that would be highly visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View north east from PRoW at Nottingham Business Park (VP 381-03-001) (Map Number LV-03-381)	**High Sensitivity Receptors**
The temporary construction effects at this view across a vegetated landscape will be partially screened due to existing vegetation to be retained within the view. The area of construction works extends to the field visible through the vegetation to the left of the view, and construction works, including the use of large scale machinery would be noticeable. A temporary earthworks stockpile would be visible to the far left of the view. There would be a noticeable change in the key characteristics in the view, through the introduction of construction activities in the near distance, although the change would be partially filtered by intervening vegetation. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from residences B600 Nottingham Road and Nuthall Temple Centre (VP 381-02-005) (Map Number LV-03-381)	**High Sensitivity Receptors**
Users of the Nuthall Temple Centre, the recreational ground and residents along the B600 Nottingham Road would experience views of the playing field and M1 planted embankments dominated by the construction works. The temporary construction effects would result in the loss of the playing fields to the rear of the community centre and car park. The land required for the construction of the Proposed Scheme would stretch to the car park boundary and would result in the loss of the vegetation currently screening the M1. The Proposed Scheme earthworks and temporary construction access road would run adjacent to the M1 existing alignment, meaning that construction machinery and activities would be clearly visible within this view. There would be a substantial alteration in characteristics of the view, through the introduction of construction activities and additional structures that would be highly visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View west on B600 Nottingham Road (VP 381-02-006) (Map Number LV-03-381)	**High Sensitivity Receptors**
Residents along the B600 Nottingham Road would experience views dominated by the construction works. The construction activities would include the demolition of several properties to the south of the B600 Nottingham Road resulting in the construction being highly visible. Vegetation to the north of the road would also be removed. Construction activities and associated large scale machinery for the B600 Nuthall viaduct crossing over the B600 Nottingham Road would be a prominent visual characteristic at this location. There would be a substantial alteration in the characteristics of the view, through the introduction of construction activities and additional structures that would be highly visible. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

View east from New Farm Lane near the High Wood Cemetery (VP 382-03-001) (Map Number LV-03-382)	**High Sensitivity Receptors**
The temporary construction effects within this view, across a rolling landscape interspersed with hedgerow and mature trees towards the M1, would be noticeable, as these works would result in the loss of vegetation at Bulwell Wood. Earthworks would be visible along with construction related traffic, machinery and stockpiles. To the south of the viewpoint the Westville embankment satellite compound would also be visible. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Other mitigation measures

11.4.12 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.13 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents, users of PRoW, minor roads and main roads within the study area.

11.4.14 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to five LCAs;
- moderate adverse effects in relation to two LCAs;
- major adverse effects in relation to four residential viewpoints;
- major adverse effects in relation to three recreational viewpoints;
- moderate adverse effects in relation to six recreational viewpoints; and
- major adverse effects in relation to one transport viewpoints.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2093) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing,

to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:

- woodland planting to screen the Proposed Scheme from nearby residential properties in Sandiacre, Stapleford and Kimberley; villages such as Trowell, and Nuthall; smaller villages and hamlets such as Strelley and Cossall; and numerous individual farmsteads and recreational facilities such as PRoW;
- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss of New Farm Wood ancient woodland enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments; and
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement at the River Erewash.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including:

- Stanton Gate viaduct, A610 Broxtowe viaduct, B600 Nuthall viaduct; and Erewash embankment;
- Trowell embankment, Trowell Moor embankment No.1, and Trowell Moor embankment No.2;
- Broxtowe embankment No.1, Broxtowe embankment No.2, Nuthall embankment, and Westville embankment; and
- other elements, including the presence of overhead line equipment and fencing.

Landscape assessment

11.5.4 Table 30 identifies LCAs which would be significantly affected during operation of the Proposed Scheme.

Table 30: Operational phase significant landscape effects

Erewash Corridor	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The levels of tranquillity and river valley qualities have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The presence of the Erewash embankment, up to 6m in height, and Stanton Gate viaduct, up to 18m in height (including the portal structure over the Erewash Canal) would form localised, prominent features in the landscape through the wide River Erewash valley, altering the character and landform of the low lying landscape. The Stanton Gate viaduct would change the open character and introduce additional infrastructure, including the Stanton Gate auto-transformer station. The presence of prominent structures would have a greater influence on landscape character around Pasture Lock and Stanton Gate as a result of vegetation removal. There would be a reduction in the tranquillity of the landscape, resulting from additional movement and noise from the realigned Erewash Valley Line and Proposed Scheme. Landscape mitigation woodland planting along the River Erewash to replace cleared vegetation would have little beneficial effect in year 1, as planting would not be mature enough to provide effective screening. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Maturing landscape mitigation woodland planting around the Stanton Gate viaduct would help screen views from residential and industrial properties to the south and integrate the Proposed Scheme into the wider landscape, although disruption to the established landscape pattern would remain. There would still be noticeable change, through the additional of new features, to key characteristics of the landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Upper Erewash Corridor	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: The levels of tranquillity and river valley qualities have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Stanton Gate viaduct would form a locally substantial presence within the relatively flat nature of the landscape, having a direct impact upon the character area. The realignment of the M1 to the west with its associated earthworks and infrastructure and vegetation clearance would create a large impact within the character area, through the introduction of uncharacteristic features although only a relatively small area of the LCA would be directly affected, the change in character and pattern would be realised more widely. Mitigation planting would have no beneficial effects in year 1 as it would not be mature enough to provide full screening. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: The maturing mitigation planting around the viaduct and realigned M1 would partially screen views and integrate the infrastructure into the wider landscape although disruption to the established landscape pattern would remain. There would still be noticeable change through the addition of new features, and changes to key characteristics of the landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Stapleford Urban Area	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: This is an area of change and urban development, although with historic qualities, in which large scale construction activity is not present. The susceptibility of the landscape is medium-low. **Year 1:** A small part of this character area would be directly impacted through the introduction of the Stanton Gate viaduct and Trowell embankment up to 16.5m high, alongside the M1. At year 1 of	**Level of effect:** Moderate adverse (significant)

operation the existence of the new structural viaduct and embankment would form a substantial new feature within the character area, especially in the vicinity of the A6007 Stapleford Road. Mitigation planting would have no beneficial effects in year 1. There would be change as a result of the introduction of infrastructure and alteration of key landscape characteristic. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15: Whilst the planting along the Proposed Scheme would provide some integration of structures into the landscape, by summer of year 15, the elevated nature would mean that changes to the landform and disruption to the established landscape pattern would remain. There would still be noticeable change, through the addition of new features, to key characteristics of the landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Trowell Moor Farmlands	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: The levels of tranquillity and rural qualities within the landscape have a medium susceptibility to construction of the Proposed Scheme. **Year 1:** Trowell Moor embankments No.1 and No.2 and Trowell cuttings, the realigned Waterloo Lane for the Trowell Motorway Services and the A609 Nottingham Road realignment and underpass, would have a direct impact upon this character area by reducing the scenic quality through the reduction in overall vegetation. The introduction of additional severance of the rural landscape pattern and character would intensify the landscape severance already experienced within the landscape due to the M1. The introduction of the Proposed Scheme on embankment and removal of vegetation would change the local landform and land cover pattern. The introduction of the Radford and Trowell Railway Line overbridge and the disused canal and Nottingham Canal LNR being infilled would result in locally significant effects by noticeably altering the landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: By summer of year 15, due to the establishment of landscape planting, the above landscape effects would be slightly reduced although there would remain severance created by the Proposed Scheme. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Strelley Historic Parkland	**High susceptibility and sensitivity**
Susceptibility to change: The landscape condition and historic quality means it is highly sensitive to loss or erosion due to the Proposed Scheme as its character is long established and difficult to replicate. The susceptibility of the landscape is high. **Year 1:** The Proposed Scheme would be in mined tunnel under the Strelley Conservation Area, helping to reduce the impact upon this character area and eliminating severance on the Strelley Hall buildings and parkland landscape. However, the cuttings leading up to the tunnel portals as well as the large portal structures and refuge areas would impact upon the character area. Increased movement and introducing new structures and removing vegetation would reduce the tranquillity and secluded feel of the area. The introduction of large uncharacteristic features within the high sensitivity landscape, means the aesthetic qualities of the landscape would be eroded. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: By summer of year 15, due to the establishment of landscape planting landscape effects would be slightly reduced although there would remain an impact created by the Proposed Scheme. The mitigation planting would assist in some integration of the new structures into the landscape and moderate adverse effect on the LCA. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Eastwood, Kimberly, and Watnall Urban Area	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: This urban landscape has been subject to change over time due to the introduction of infrastructure, railways and roads which imparts a low susceptibility to change arising from the Proposed Scheme. **Year 1:** The character of the LCA would be notably changed through the introduction of the Proposed Scheme in an elevated position upon the Nuthall embankment with substantial earthworks, situated alongside the M1. At year 1 of operation, the existence of the B600 Nuthall viaduct across the B600 Nottingham Road leading to M1 junction 26 would form substantial new uncharacteristic features within the character area. There would be a notable change and additional new features that will form prominent elements within the character area. Mitigation planting would have no beneficial effects in year 1 as it would not be mature enough to provide full screening. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Whilst the planting along the Proposed Scheme would provide some integration of structures into the landscape by summer of year 15, the elevated nature would mean that changes to the landform and disruption to the established landscape pattern would remain. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Trowell and Swingate Farmlands	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: The levels of tranquillity and rural qualities within the landscape have a medium susceptibility rising from the Proposed Scheme. **Year 1:** Mellors Way cutting, Lawrence Drive overbridge, and Broxtowe embankments No.1 and No.2 would create a substantial change within his character area, reducing scenic quality and introducing additional severance of rural landscape pattern and character. These elements would intensify the landscape severance already experienced within the area due to the M1. Reduced areas of woodland would impact upon the character altering the landform and cover. The Broxtowe embankments leading up the Strelley tunnel portal to the south and the tunnel portal structures would impact upon the character area by changing key characteristics. The addition of new uncharacteristic features and changes in landscape pattern will alter the character of this area. There would therefore be a high magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Whilst mitigation planting along the Proposed Scheme would provide some integration of structures into the landscape by summer of year 15, the changes to the landscape pattern and landform would remain. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.5.6 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity would be lower than those reported.

11.5.7 Table 31 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: LA06 Map Book.

Table 31: Operation phase significant visual effects

View east from junction of Cross Street and Regent Street (VP 377-03-004) (Map Number LV-04-377b)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 during both winter and summer, the view in the near distance for residents along Regent Street would be unchanged from the fencing and low level vegetation. Residents would experience a noticeable change in the middle distance as the Erewash embankment, noise barriers, overhead line equipment and the movement of trains would be visible against the skyline. The Proposed Scheme would run at ground level through the Toton trough to the right of the view, gradually rising on the Erewash embankment to the left, reaching up to 6m in height and running on to the Stanton Gate viaduct before going out of the view. The addition of these infrastructure features would be prominent and visible across the view. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer The view at year 15 would be as described above. There is no mitigation planting, however existing vegetation would have matured and would further screen views of the Proposed Scheme. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from Sandiacre Road PRoW and Residences (High sensitivity receptors) (VP 377-03-005) (Map Number LV-04-377b)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 during both winter and summer, residents at Sandiacre Road and users of the PRoW would have a clear view across the river valley of the Proposed Scheme and associated infrastructure on the Stanton Gate viaduct up to 18m in height, which would run along the existing tree line on the skyline then cross the existing Erewash Valley Line. These infrastructure features would be prominent and visible across the panorama. Residents would experience change in the middle distance as the Erewash embankment, noise barriers and overhead line equipment would be visible against the skyline. Mitigation planting would be visible in the mid-ground behind the electricity sub-station and the horse paddocks, although this would not be mature by year 1 and so would not screen the Proposed Scheme. There would be a noticeable change for these residents and users of the PRoW. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer By year 15, the structure would be as described above; however, the mitigation planting would have partially matured, to screen views for the residents and users of the PRoW, resulting in limited views of the viaduct beyond. There would still be a slight alternation, with new features being intermittently visible within the existing view. There would therefore be a reduction to the magnitude of change resulting in a minor adverse effect.	**Level of effect:** Minor adverse (not significant)
View east from PRoW close to Cloud House (VP 377-03-008) (Map Number LV-04-377b)	**High sensitivity receptors**
Year 1: – winter and summer During year 1 winter and summer of operation, footpath users would have a clear view of the Proposed Scheme across the rolling rural landscape, on the Stanton Gate viaduct, up to 18m in height, over Ilkeston Road. Footpath users would experience change in the middle distance as the Proposed Scheme with noise barriers and overhead line equipment would be visible against the skyline. The trees within the view would intermittently screen parts of the Proposed Scheme. The viaduct would be prominent in the view and would	**Level of effect:** Major adverse (significant)

not be screened by mitigation planting at this stage. The height of the viaduct would result in much of the landscape beyond being screened from view. There would be a substantial change in characteristics of the view, through the introduction of new component of the view that would be highly visible. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15 – summer By year 15 the structure would be as described for year 1 above, however mitigation planting along the Ilkeston Road boundary would be partially matured. This would screen the view of the viaduct for those on the road, however, not for recreational users at this viewpoint. There would be a still be a noticeable change in characteristics of the view. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from Erewash Canal in Stapleford (VP 378-03-001) (Map Number LV-04-378)	**High sensitivity receptors**
Year 1: – winter and summer At operation year 1 during winter and summer, canal towpath users would experience clear views of the Stanton Gate viaduct that, at up to 18m in height, would dominate the view, altering its key rural characteristics. The viaduct would obstruct views of the rising landform and vegetation at the far right and left of the view. Stanton Gate auto-transformer station would also be visible to the right of the view between the trees. There would be substantial changes in characteristics of the view, through the introduction of new components that would be highly visible through the majority of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer The structure would be as described above, there would be no mitigation planting to screen the views of the viaduct. The grass seeding would have re-established by this point and any existing vegetation would have matured. There would be a substantial change in characteristics of the view, through the introduction of new features that would be highly visible through the majority of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
View south east from Stanton Gate residences (VP 378-02-004) (Map Number LV-04-378)	High sensitivity receptors
Year 1: – winter and summer At year 1 during both winter and summer, residents at Stanton Gate would have a clear view of the Stanton Gate viaduct as a prominent feature within the view replacing the current view of road and canal side vegetation. The Proposed Scheme on the Stanton Gate viaduct would approach the viewpoint from the right and pass over the road on the left of the view. Residents would experience change in the near distance as noise barriers, overhead line equipment and the movement of trains would be visible against the skyline. There would be a substantial change in characteristics of the view, through the introduction of new features that would be highly visible. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer The view would be as described above; however, the mitigation tree planting to the right would have partially matured. The magnitude of change would decrease slightly as mitigation landscape planting matures to screen some views for the residents. There would still be noticeable alternation, with new features being intermittently visible within the view. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

View west from Moorbridge Lane (VP 378-03-005) (Map Number LV-04-378)	High sensitivity receptors
Year 1: – winter and summer For residents and footpath users during both winter and summer of year 1, the Stanton Gate viaduct would be visible on the skyline as it crosses Moorbridge Lane in the background of the view. It would cross the road, obstructing views beyond. The existing road would pass under the Proposed Scheme. Vegetation framing the view would be retained. The addition of these infrastructure features would be prominent and visible across the width of the view. There would be a noticeable change for these residents and users of the PRoW. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer: At year 15 the view would be as described above, mitigation planting would have partially matured, however this is unlikely to screen the view of the Stanton Gate viaduct to the right by this point. There would still be a noticeable change for these residents and users of the PRoW, even once mitigation planting has matured. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View east from PRoW off Dawn View (VP 378-03-006) (Map Number LV-04-378)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 during winter and summer of operation users of the footpath would experience a noticeable change in the middle distance as the Stanton Gate viaduct, noise barriers, and overhead line equipment would be visible against the skyline resulting in a change in view from current the wooded river valley. The realigned M1 would also alter the appearance of the landscape, with the removal of existing mature woodland highway planting along it. There would a noticeable change in the key characteristics of the view through the introduction of new feature There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer After 15 years the structure would be described as above, but the mitigation planting would have partially matured partially screening the views of the viaduct for the residents. However, there would still be noticeable alternation in the view, with new features being intermittently visible. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from PRoW close to Trowell Garden Centre (VP 378-03-009) (Map Number LV-04-378)	**High sensitivity receptors**
Year 1: – winter and summer Users of the footpath, during winter and summer of year 1, in this elevated positon would experience clear views of the Proposed Scheme, across the rolling rural landscape on the Trowell embankment at approximately 16m high, running alongside the M1, and then gradually peeling off towards the right of the view. The Proposed Scheme would be on embankment, transitioning to ground level when meeting the top of the hill in the background of the view. The lowering and realignment of the A609 Nottingham Road would result in changes in the landform and levels of vegetation cover. There would be a substantial change in characteristics of the view, through the introduction of new features that would be highly visible. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)

Year 15 – summer At operation year 15, the Proposed Scheme would be as described above. The mitigation planting would have matured in this time partially screening areas of the Proposed Scheme and the realigned A609 Nottingham Road. However, there would still be noticeable alternation in the view, with new features being intermittently visible. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west on Waterloo Lane (VP 379-04-002) (Map Number LV-04-379)	**Medium sensitivity receptors**
Year 1: – winter and summer In year 1 of operation during both winter and summer vehicle users on Waterloo Lane would experience some change in the view across the rural landscape towards the M1, due to the realignment of Waterloo Lane with associated embankments and earthworks. The Proposed Scheme is within the Trowell cutting and then at ground level as it travels north onto the Trowell Moor embankment No.1. The Proposed Scheme would be visible in the foreground of the M1, through the introduction of noise barriers, overhead line equipment and the movement of trains. However, it would not dominate the view. There would a noticeable change in the key characteristics of the view through the introduction of new features. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** (non-significant)
View north east from PRoW at Nottingham Business Park (VP 381-03-001) (Map Number LV-04-381)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 of operation during winter and summer, the Proposed Scheme would be clearly visible across the current view of grassland and vegetation to users of the footpath. It would cross the PRoW at ground level, run adjacent to the field boundary beyond the hedge line and gradually rise to the 7m high Broxtowe embankment No.1 in the middle distance. The existing vegetation in the foreground would screen the some of the Proposed Scheme in the field from this viewpoint. However, given the height the addition of these infrastructure features would be prominent and visible across the panorama. There would be substantial changes in characteristics of the view, through the introduction of new features that would be highly visible through the landscape. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer The Proposed Scheme earthworks and structures would be as described above at year 15; however, the vegetation to the foreground of the image and the mitigation vegetation would have matured to approximately 8m in height helping partially to screen any views of the Proposed Scheme. However, there would still be alternation in the view with the introduction of a new component of the view that would be prominent. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west from B600 Nottingham Road residences and Nuthall Temple Centre (VP 381-02-05) (Map Number LV-04-381)	**High sensitivity receptors**
Year 1: – winter and summer During winter and summer of year 1 operation, the Broxtowe embankment No.1 would be clearly visible in the middle distance to users of the recreation ground. The existing built form in the foreground would	**Level of effect:**

screen the some of the Proposed Scheme from this viewpoint, however, given the height the addition of these infrastructure features would be prominent and visible across the view in the rest of the recreation ground. There would be a substantial change in characteristics of the view, through the introduction of new features that would be highly visible. There would therefore be a high magnitude of change and a major adverse effect.	Major adverse (significant)
Year 15 – summer By year 15, the Proposed Scheme would be as described above; the mitigation planting would have matured to approximately 5m tall, partially screening the Proposed Scheme. However, there would still be alteration in the view, with new components being noticeable. Based on the above there would be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View west on B600 Nottingham (VP 381-03-006) (Map Number LV-04-381)	**High sensitivity receptors**
Year 1: – winter and summer At this location the Proposed Scheme would be situated on the B600 Nuthall viaduct and would cross the B600 Nottingham Road to the east of the M1, at approximately the same height. Residents would experience a substantial change to the current view through the M1 overbridge, with landform being altered to allow for the new structure. Noise barrier, overhead line equipment and the movement of the trains would be new components of the view that would be highly visible across the majority of the view. There would be substantial changes through the introduction of highly visible new components of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer After 15 years, residents and transport users would have an almost unchanged view from that described above. There would still be substantial changes through the introduction of highly visible new components of the view. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
View east from New Farm Lane near Cemetery (High sensitivity receptors) (VP 382-03-008) (Map Number LV-04-382)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 of operation, users of the footpath and visitors to the Cemetery would experience a change in the distant view across the rural landscape and M1. The Proposed Scheme would be behind the M1 in cutting, with minimal visibility from this viewpoint. However, the woodland behind the M1 would be partially removed for the construction of the Proposed Scheme, altering a key characteristic of the view. There would a noticeable change in the key characteristics of the view through the introduction the loss of a key characteristic. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** (non-significant)
View north east from PRoW by M1 (VP382-03-002) (Map Number LV-04-382)	**High sensitivity receptors**
Year 1: – winter and summer At year 1 operation during both winter and summer, the Proposed Scheme would be clearly visible for users of the footpath across the current rural landscape and M1. To the west of the view the earthworks for the New Farm Access Road underpass that crosses the M1 would replace the existing tree line. The Proposed Scheme would be on the 4m high Westville embankment at this location, spanning the width of the view.	**Level of effect:** Major adverse (significant)

This would obstruct views of New Farm Wood Ancient Woodland in the distance and the properties to the right of the view, therefore altering the character of the view and skyline. Mitigation planting would be visible but would not have matured by this point. There would be substantial alteration through the introduction of highly visible new component of the view blocking current views in the near distance to the residents and users of the woodland. There would therefore be a high magnitude of change and a majora adverse effect.	
Year 15 – summer At year 15, the view of the structures would be as above; the mitigation planting would have partially matured to and would therefore partially screen the Proposed Scheme. As mitigation landscape planting matures to replace that lost, the magnitude of change would decrease, however there would still be noticeable alternation in the view, resulting in a moderate adverse effect. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Other mitigation measures

11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace, including use of materials, would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.9 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse visual effects in relation to seven LCAs;
- moderate adverse visual effects at two residential viewpoint locations;
- major adverse visual effects at two recreational viewpoint locations; and
- moderate adverse visual effects at seven recreational viewpoint locations.

Monitoring

11.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Stapleford to Nuthall area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Stapleford to Nuthall area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Broxtowe Borough Council (BBC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3: Route-wide effects (Section 12).

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1 (Section 8) and the SMR[121].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

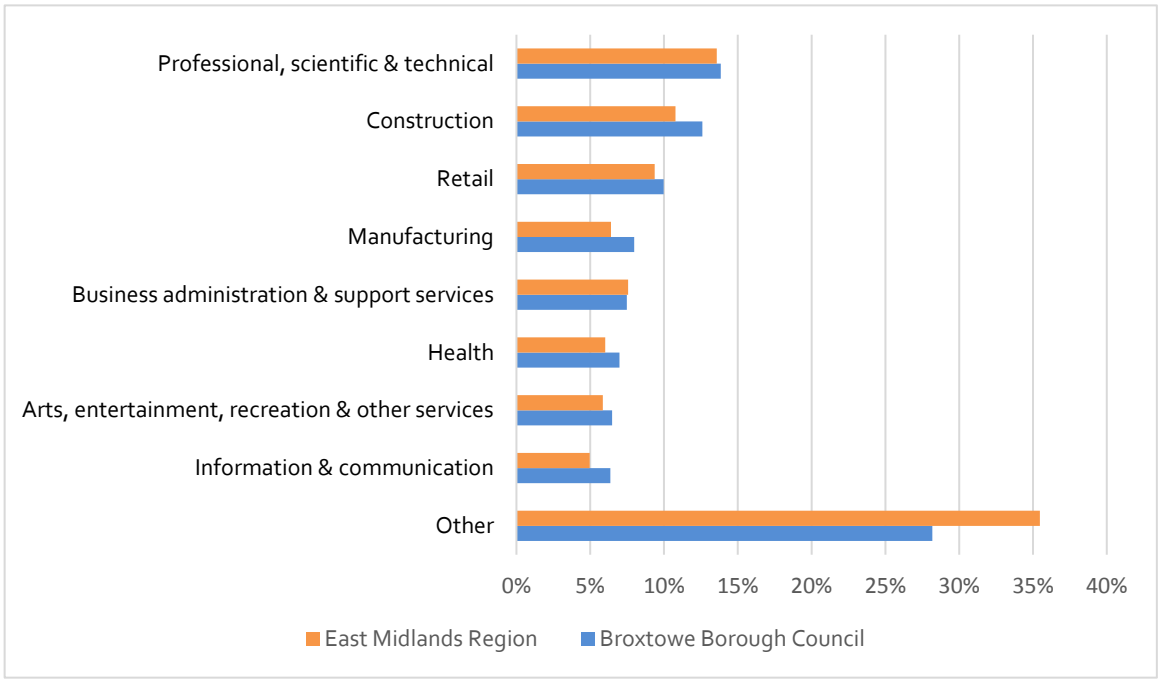
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Stapleford to Nuthall area. The Stapleford to Nuthall area lies within the administrative areas of BBC, Erewash Borough Council (EBC) and Nottingham City Council (NoCC). However as it lies predominantly within the BBC administrative area the baseline will only be reported for BBC. It also falls within the D2N2 Local Enterprise Partnership (LEP) area[122] and the East Midlands region.

[121] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[122] D2N2 Local Enterprise Partnership, (2014), *Strategic Economic Plan March 2014*

Business and labour market

12.3.2 Within the BBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (14%), with construction the second largest (13%) followed by retail (10%). This is shown in Figure 8. For comparison with the East Midlands region, the largest sectors were professional, scientific and technical (14%), followed by construction (11%) and retail (9%)[123].

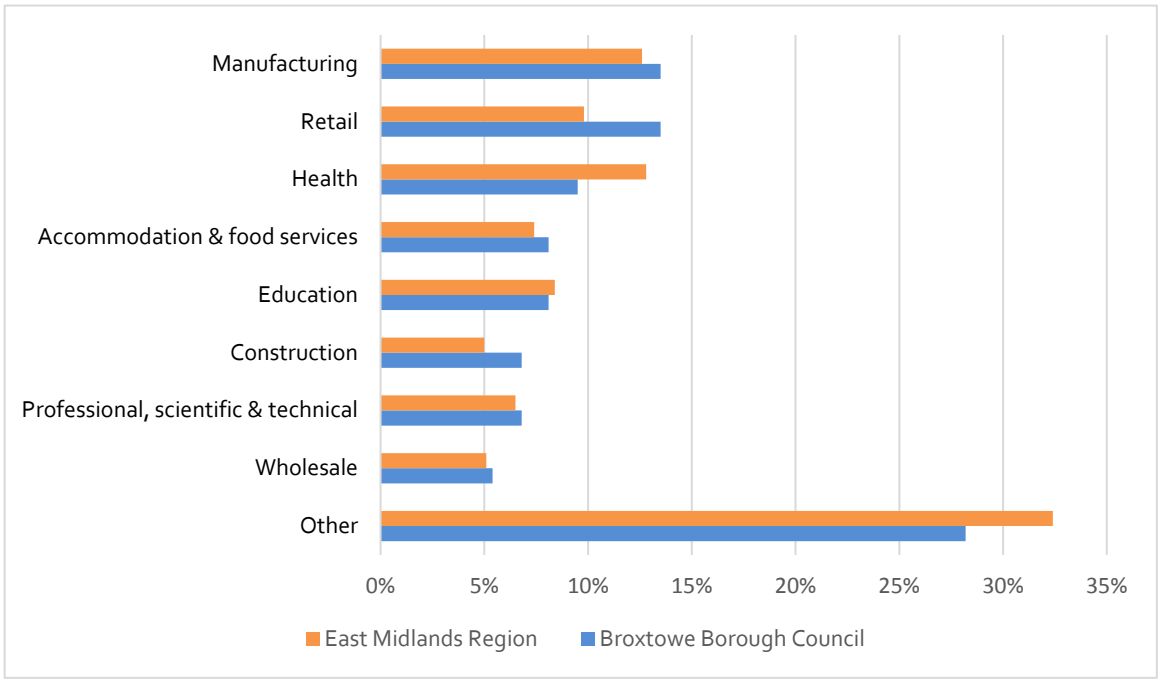
Figure 8: Business sector composition in the BBC area and the East Midlands [124]



12.3.3 In 2016[125], approximately 37,000 people worked in the BBC area. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in the BBC area were: manufacturing (14%), retail (14%), health (10%), accommodation and food services (8%), and education (8%). These compare with the top five sectors for the East Midlands region, which were: health (13%), manufacturing (13%); retail (10%), business administration & support services (9%) and education (8%).This is shown in Figure 9[126].

[123] Office for National Statistics; UK *Business count – Local Units 2016*. Available online at: https://www.nomisweb.co.uk
[124] 'Other' includes: Wholesale; Transport and Storage; Property; Motor Trades; Education; Financial and Insurance; Agriculture, Forestry and Fishing, Public Administration and Defence; Mining; Quarrying and Utilities
[125] Office for National Statistics; 2016; *Business Register and Employment Survey.* Available online at: http://www.nomisweb.co.uk., this number includes both residents and non-residents of BBC who work within its boundaries
[126] Office for National Statistics; 2016; *Business Register and Employment Survey*. Available online at: http://www.nomisweb.co.uk , this number includes both residents and non-residents of BBC who work within its boundaries

Figure 9: Employment by industrial sector in the BBC area and the East Midlands



12.3.4 According to the Annual Population Survey (2016)[127], the employment rate[128] within the BBC area was 88% (61,800 people), which is higher than that recorded for both the East Midlands (75%) and England (74%). In 2016, unemployment[129] in the BBC area was 4.8%, which was higher than the East Midlands (4.3%) and equivalent to England (5%).

12.3.5 According to the Annual Population Survey (2016)[130], 37% of BBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the East Midlands and 38% in England, while 7% of residents had no qualifications, which was lower than that recorded both for East Midlands (8%) and England (8%).

Property

12.3.6 A review of employment land in 2015 identified a need for up to 1.96ha per year to 2033 of industrial land in the BBC area and up to 2,722m² per year to 2033 in office floor space[131].

[127] Annual Population Survey, (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[128] The proportion of working age (16-64 year olds) residents that is in employment
[129] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[130] Annual Population Survey, (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[131] Nathaniel Lichfield & Partners (2015) *Employment Land Forecasting Study Nottingham Core HMA and Nottingham Outer HMA (2014)*. Figures based on total gross land requirements over the plan period 2011 to 2033. Up to 59,886 m² of office floorspace over the plan period and up to 43.21 ha industrial land over the plan period (Section 5.103)

12.3.7 The average vacancy rate for industrial and warehousing property in the BBC area has been assessed as 24.1% based on marketed space against known stock[132].

12.3.8 Based upon the latest available data from the Estates Gazette (March 2018) there is 10,820m^2 of office space available in the BBC area[133].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[134] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations; both will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

[132] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA)
[133] Based on marketed space identified from Estates Gazette data (EGi) (March 2018). Available online at: https://www.egi.co.uk/Property/Availability/
[134] Supporting document: Draft Code of Construction Practice

Temporary effects

Construction employment

12.4.3 It is currently anticipated that there would be three main compounds (Stanton Gate main compound, Strelley tunnel south main compound and Strelley tunnel north main compound, and six satellite compounds in the Stapleford to Nuthall area. These sites could result in the creation of up to 4,171 person years of construction employment opportunities[135], broadly equivalent to 417 full-time jobs[136], which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.4 Direct construction employment could lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.7 Overall, 45 resources in the study area would experience direct impacts as a result of the Proposed Scheme. These are as follows:

- seven resources on Station Road;
- eleven resources on Derby Road, Sandiacre;
- former Dyeworks Site (one resource);
- Units 1 – 3 Canalside Industrial Estate (three resources);
- Cloudside Garage (one resource);
- Erewash Valley Golf Club (one resource);
- Police Station at Trowell Motorway Services (one resource);
- Unit D1, Nottingham Business Park (one resource);

[135] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days
[136] Based on the convention that 10 employment years is equivalent to one full time equivalent job

- Unit D2 Nottingham Business Park (one resource);
- Unit C1, Nottingham Business Park (one resource);
- Unit C2 Paragon House, Orchard Place, Nottingham Business Park (one resource);
- Unit B, 2 Orchard Place, Nottingham Business Park (one resource);
- Units H1, H2-H3, H4, H5, H6, H7 Nottingham Business Park (six resources);
- Units G1, G2, G3, G4, G5, G6, G7 Nottingham Business Park (seven resources);
- John Webster House, 6 Lawrence Drive, Nottingham Business Park; Nottingham, NG8 6PZ (one resource); and
- Eric Belfield House, 8 Lawrence Drive, Nottingham, NG8 6PZ (one resource).

12.4.8 Six of the resources which experience direct impacts are subject to potentially significant effects on business activities and employment. These resources are listed in Table 32.

Table 32: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Unit D1, Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	Includes business involved in construction of domestic buildings - private house building development.
Unit C1, 8 Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	Research and experimental development on natural sciences and engineering.
Unit C2 (Paragon House), Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	Remediation activities and other waste management services, painting; sound recording and music publishing activities; and development of building projects.
Unit B, 2 Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	The provision of IT infrastructure services.
John Webster House, 6 Lawrence Drive, Nottingham Business Park, Nottingham, NG8 6PZ	Private fertility clinics.
Eric Belfield House, 8 Lawrence Drive, Nottingham, NG8 6PZ	Road operation and maintenance.

Impact magnitude

12.4.9 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.10 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;

- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.11 Taking account of the sensitivity of the resources and the magnitude of impact, it is currently anticipated that the significance of the resultant effects would be as set out in Table 33.

Table 33: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Unit D1, Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	High	Low	Moderate adverse
Unit C1, 8 Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	High	High	Major adverse
Unit C2 (Paragon House), Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	High	Low	Moderate adverse
2, Unit B Orchard Place, Nottingham Business Park, Nottingham, NG8 6PX	High	Low	Moderate adverse
John Webster House, 6 Lawrence Drive, Nottingham Business Park, Nottingham, NG8 6PZ	High	High	Major adverse
Eric Belfield House, 8 Lawrence Drive, Nottingham, NG8 6PZ	High	Medium	Major adverse

12.4.12 The construction of the Proposed Scheme would require the demolition of business units at Nottingham Business Park. All the significant effects are located in Nottingham Business Park.

12.4.13 Unit D1, Unit C2 and Unit B are standard office units that would be demolished for the construction of the Proposed Scheme. The nature of the resources results in low sensitivity. There are high numbers of employees based at each resource, leading to an overall moderate adverse impact.

12.4.14 Unit C1 is a specialised business unit making relocation difficult for the resident firm. The firm based in Unit C1 engages in research and experimental development on natural sciences and engineering. The high impact magnitude and high impact sensitivity results in a major adverse effect.

12.4.15 John Webster House features a group of private fertility clinics. This resource will have highly specialised business equipment, making the sensitivity of the resource high. The high impact magnitude results in a major adverse effect.

12.4.16 Eric Belfield House operates as the regional control centre of a road operation and maintenance organisation. This is a resource with a high level of employment. There will also be specialised equipment located at the resource essential to regional road operation. This results in a major adverse effect.

12.4.17 Across all of the employment areas reviewed, it is currently anticipated that an estimated 1,063 jobs[137] would either be displaced or possibly lost within the Stapleford to Nuthall area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the travel to work areas due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the BBC area (approximately 37,000 jobs) and the scale of economic activity and opportunity in the area. The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

12.4.18 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.19 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the route of the Proposed Scheme in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.20 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

[137] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently anticipated that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

12.5.3 In-combination effects will be assessed and reported in the formal ES.

Operational employment

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

12.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Stapleford to Nuthall area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Stapleford to Nuthall area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[138]; and
- 'non-residential receptors'[139] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[140]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[141], planning policy, planning practice guidance on noise (PPGN)[142] and EIA Regulations as described in the Scope and Methodology Report[143] (SMR).

13.1.3 Engagement has been undertaken with Broxtowe Borough Council (BBC), Erewash Borough Council (EBC), and Nottingham City Council (NoCC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Stapleford to Nuthall area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: LA06 Map Book. Map series SV-01 also presents key 'non-

[138] 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.
[139] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[2] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[141] Noise Policy Statement for England (2015) Department for Environment, Food & Rural Affairs (Defra).
[142] Planning Practice Guidance – Noise (2014) Department for Communities and Local Government (DCLG). Available online at: https://www.gov.uk/guidance/noise--2
[143] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The Stapleford to Nuthall area is characterised by a mix of urban areas and settlements in the south, and towns, villages and hamlets in a predominantly rural setting to the north. The sound environment is generally dominated by local and distant road and rail traffic with contributions from overflying aircraft associated with East Midlands Airport, local neighbourhood sources, and natural and agricultural sounds.

13.3.3 There are several main roads and railways that contribute to the sound environment within the Stapleford to Nuthall area, including the M1, A52 Brian Clough Way, A6007

Stapleford Road, A610 Nuthall Road, the Erewash Valley Line and the Radford and Trowell Line.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.

13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors would not generally be adversely affected by vibration. Further information is provided in Volume 1 (Section 8).

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[144], Roads[145] or Railways[146]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA06 Map Book) shows any noise Important Areas in the Stapleford to Nuthall area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[147]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The following assumption has also been made in relation to the construction methods specific to the Stapleford to Nuthall area.

13.4.3 At Strelley tunnel, tunnelling and support activities, including excavated material handling, support installation and tunnel fit-out, may be undertaken during the day, evening and night-time for reasons of safety or engineering practicability.

13.4.4 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

[144] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[145] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[146] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[147] Supporting document: Draft Code of Construction Practice

Avoidance and mitigation measures

13.4.5 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[148].
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities.
- contractors would be required to comply with the terms of the draft CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.6 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.7 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA.

[148] Including local businesses and quiet areas designated by the local authority

Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.8 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA06 Map Book):

- Sandiacre, arising from construction activities such as viaduct construction, underbridge construction, and road realignment/diversion;
- Stanton Gate, arising from construction activities such as viaduct construction, overbridge and underbridge construction, and road realignment/diversion;
- Stapleford, arising from construction activities such as viaduct construction, overbridge and underbridge construction, and road realignment/diversion;
- Trowell, arising from construction activities such as such as cutting and embankment formation, and overbridge construction;
- Strelley, arising from construction activities such as tunnel portal construction and tunnelling and tunnelling support activities; and
- Nuthall, arising from construction activities such as embankment formation, viaduct construction, and balancing pond construction.

13.4.9 Map Series SV-01 (Volume 2: LA06 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, none of these is likely to experience significant effects (to be confirmed in the formal ES).

13.4.10 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.11 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- the B5010 Derby Road and Bostock's Lane to the M1 junction 25;
- Ilkeston Road/Lenton Street/Town Street in Sandiacre;
- the B6003 Toton Lane;
- Stanton Gate/Moorbridge Lane; and
- the A609 Nottingham Road.

13.4.12 The magnitude and extent of effect will depend on the level of construction traffic using the road. Any residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.13 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

13.4.14 Further work is being undertaken to confirm significant construction noise and vibration effects, including temporary indirect effects from construction traffic.

13.4.15 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1 (Section 4) and as outlined below for the Stapleford to Nuthall area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to 11 trains per hour in each direction on the main lines with an operating speed of around 280kph at the southern end of the Stapleford to Nuthall area progressively increasing to around 300kph for all services at the northern end. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1 (Section 4).

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. Overall it is assumed that proven international technology would

reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[149].

13.5.6 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: LA06 Map Book) and described in Section 2.2.

13.5.7 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.8 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.9 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[150] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[151] or the maximum noise level criteria[152] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.10 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by appropriate design and construction techniques. Porous tunnel portals and tunnels (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

13.5.11 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.12 Map Series SV-01 (Volume 2: LA06 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or

[149] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[150] Following Government's National Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance
[151] Night time Noise Guidelines for Europe (2010) World Health Organization
[152] Dependent on the number of train passes

$L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

13.5.13 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

13.5.14 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.15 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.16 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.17 Mitigation, including landscape earthworks and noise fence barriers, described in Volume 1 (Section 9), Section 2.2 and presented in Map Series SV-01 (Volume 2: LA06 Map Book) and Map Series CT-06 (Volume 2: LA06 Map Book), would substantially reduce the potential airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.18 Taking account of the avoidance and mitigation measures this initial assessment has identified effects on a precautionary basis with the potential to be considered significant on a community basis due to increased airborne noise levels in line with the SMR at or around:

- Stapleford: occupants of residential properties in the vicinity of Derby Road, located closest to the Proposed Scheme, identified by LA06-C01 on Map SV-01-367b (Volume 2: LA06 Map Book);
- Sandiacre: occupants of residential properties in the vicinity of Rutland Grove and Regent Street, located closest to the Proposed Scheme, identified by LA06-C02 on Map SV-01-367b (Volume 2: LA06 Map Book);
- Sandiacre: occupants of residential properties in the vicinity of Ilkeston Road, located closest to the Proposed Scheme, identified by LA06-C03 on Map SV-01-367b (Volume 2: LA06 Map Book);
- Stanton Gate: occupants of residential properties in the vicinity of Stanton Gate and Moorbridge Lane, located closest to the Proposed Scheme, identified by LA06-C04 on Map SV-01-368 (Volume 2: LA06 Map Book); and
- Trowell: occupants of residential properties in the vicinity of Trowell Park Drive, located closest to the Proposed Scheme, identified by LA06-C05 on Map SV-01-368 (Volume 2: LA06 Map Book).

13.5.19 The initial assessment indicates that, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme in the vicinity of West End Street, Sandiacre (identified on Map SV-01-367b in Volume 2: LA06 Map Book).

13.5.20 The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this community area as a result of operational noise.

13.5.21 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.22 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

13.5.23 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.24 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed

positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.25 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Stapleford to Nuthall area.

14.1.2 Engagement with Highways England, Nottinghamshire County Council (NCC), Nottingham City Council (NoCC), Derbyshire County Council (DCC) and East Midlands Councils (EMC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[153].

14.2.2 The study area for traffic and transport includes Stapleford, Sandiacre, Stanton-by-Dale, Trowell, Strelley and Nuthall.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including the strategic road the M1 between junctions 25 and 26. Local roads include the A609 Nottingham Road; the A610 between the A610/A6002/B600 roundabout and the M1 junction 26; the A6002 Woodhouse Way/Coventry Lane/Bilborough Road/Woodhouse Way/Hucknall Lane/Sanhurst Road/Camberley Road/Low Wood Road; the A6007 Stapleford Road; the B600 Nottingham Road/Main Road; the B5010 Derby Road/Station Road; the B6003 Toton Lane; the B6009 Long Lane; Stanton Gate; Moorbridge Lane; Ilkeston Road, Lenton Street and Town Street through Sandiacre; Main Street in Strelley; Lawrence Drive and Waterloo Lane.

14.2.4 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

[153]Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, NCC, NoCC and DCC (including provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from Highways England, NCC, and DCC. Assessment of these data indicates that the peak hours in the area are 08:00-09:00 and 17:00-18:00, which correspond to the HS2 assessment hours.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The only strategic route that passes through the area is the M1 between junctions 25 and 26. The strategic road network in and around the M1 and junction 25 is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A609 Nottingham Road; the A610 between the A610/A6002/B600 roundabout and the M1 junction 26; the A6002 Woodhouse Way/Coventry Lane/Bilborough Road/Woodhouse Way/Hucknall Lane/Sandhurst Road/Camberley Road/Low Wood Road; the A6007 Stapleford Road; the B600 Nottingham Road/Main Road; the B5010 Derby Road/Station Road; the B6003 Toton Lane; Stanton Gate; Ilkeston Road, Lenton Street and Town Street through Sandiacre; Waterloo Lane and Lawrence Drive. The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport[154]. Data for the three year period (January 2014 to December 2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

[154] Department for Transport; Crashmap.co.uk. Available online at: www.crashmap.co.uk. CrashMap provides accident data for the UK.

14.3.7 Six accident clusters were identified within the Stapleford to Nuthall area:

- the M1 between junctions 25 and 26 (15 accidents including two with serious casualties);
- the M1 junction 26 (39 accidents including one with fatal and three with serious casualties);
- along the M1 between junction 26 and the boundary with the Hucknall area (12 accidents but none with serious or fatal casualties);
- the A609 Nottingham Road at the A609 Nottingham Road/Trowell Road/A6002 Coventry Lane/Bilborough Road junction (12 accidents including four with serious casualties);
- the A610 at the A610/A6002 Woodhouse Way/B600 Nottingham Road junction (22 accidents including two with serious casualties); and
- the B5010 Derby Road between the B5010 Derby Road/Brookhill Street junction and the B6003 Toton Lane/the B6003 Church Street/the B5010 Nottingham Road/the B5010 Derby Road junction (nine accidents including three with serious casualties).

14.3.8 The route of the Proposed Scheme would cross seven roads with footways within the Stapleford to Nuthall area. These are: the A609 Nottingham Road; the A610 between the A610/A6002 Woodhouse Way/B600 Nottingham Road roundabout and the M1 junction 26; the A6007 Stapleford Road; the B600 Nottingham Road; the B5010 Derby Road; Stanton Gate; and Waterloo Lane.

Parking and loading

14.3.9 There is no parking or loading identified in the Stapleford to Nuthall area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

14.3.10 Nine bus routes operate on five roads that are crossed by the route of the Proposed Scheme in the Stapleford to Nuthall area. There are also bus stops primarily located to serve the built up area. The bus routes that could be affected by the Proposed Scheme include:

- the A609 Nottingham Road: 'the two' service (Cotmanhay Farm - Ilkeston - Nottingham);
- the A6007 Stapleford Road: service 20 (Heanor - Ilkeston - Stapleford - Beeston - Nottingham); service 21 (Ilkeston - Kirk Hallam - Trowell - Nottingham); service 111 (Ilkeston - Friesland School); and service my15 (Ilkeston - Sandiacre - Long Eaton - Old Sawley);
- the B600 Nottingham Road: service Rainbow One (Nottingham - Eastwood - Alfreton - Ripley); and service 528 (Selston - Moor Green - Phoenix Park - Bestwood);

- the B5010 Derby Road: service i4 (Derby - Sandiacre - Nottingham); service 111 (Ilkeston - Friesland School); and service my15 (Ilkeston - Sandiacre - Long Eaton - Old Sawley); and
- the B6009 Long Lane: service Amberline (Derby - Eastwood - Hucknall).

14.3.11 National and local rail services are accessible via Bulwell station located approximately 2km north-east of the Stapleford to Nuthall area. Bulwell station provides access to local services on the Robin Hood Line (Nottingham to Worksop) and is also on the Hucknall branch of the Nottingham Express Transit (NET). Both Hucknall and Phoenix Park park-and-ride NET stops provide access to tram services to Clifton South via Nottingham city centre and to national services at Nottingham railway station.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Stapleford, Sandiacre, Stanton-by-Dale, Trowell, Strelley and Nuthall. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.13 The route of the Proposed Scheme would cross the route of 16 PRoW within the Stapleford and Nuthall area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades, including for maintenance access to the Proposed Scheme. The survey undertaken to inform the assessment showed that there were fewer than 10 people a day recorded during the survey day on three of the PRoW. The routes with the greatest usage recorded during the survey day were Stanton-by-Dale Footpath 21 (part of the Erewash Valley Trail and Nutbrook Trail) which was used by 678 pedestrians and 400 cyclists during the survey day; Trowell Footpath 23 which was used by 173 pedestrians and 70 cyclists; and Trowell Bridleway 14 which was used by 146 pedestrians and 52 cyclists.

14.3.14 In the Stapleford to Nuthall area several cycle routes pass through the area including:

- National Cycle Network Route 67 along the Erewash Canal, between Long Eaton and Heanor;
- Nuthall Cycleway (part of the Nuthall Railway Multi-User Access Route); and
- NCC Cycleway (follows the same route as the Nuthall Railway Multi-User Access Route).

Waterways and canals

14.3.15 There is one navigable waterway in the Stapleford to Nuthall area; the Erewash Canal is located in Sandiacre, passing under the B5010 Derby Road, Stanton Gate and the M1, running alongside the Erewash Valley Line.

Air transport

14.3.16 There is no relevant air transport in the Stapleford to Nuthall area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[155] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

[155] Supporting document: Draft Code of Construction Practice

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[156] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Stapleford to Nuthall area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;

[156] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Stapleford to Nuthall area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA06 Map Book.

Strategic and local highway network

14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the M1 junction 25 and junction 26;
- the A609 Nottingham Road between the A6007 Stapleford Road and the A6002 Coventry Lane;
- the A610 east of M1 junction 26 to the roundabout with the A6002;
- the A6002 Woodhouse Way and Main Street;
- the A6007 Stapleford Road;
- the B5010 Derby Road from the B6003 Toton Lane to Bostock's Lane;
- the B600 Nottingham Road;
- the B6003 Toton Lane from A52 to the B5010 Derby Road;
- Bostock's Lane from the B5010 Derby Road to the M1 junction 25;
- Stanton Gate;
- Moorbridge Lane;
- Ilkeston Road;
- Lenton Street; and
- Town Street.

14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could result in disruption to highway users. In the Stapleford to Nuthall area, all temporary diversions are required as part of a permanent diversion.

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Public transport network

14.4.18 It is expected that construction of the Proposed Scheme would require temporary bus route diversions, including bus routes 'the two', i4, 111 and my15. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.19 There are interfaces with the existing rail network in this area, in particular on the operation of the Erewash Valley Line and its rail freight services, and on the Radford and Trowell Line. Rail possessions would be required to undertake localised works, including realignment of sections of the route and the construction of a new overbridge to carry a length of the realigned M1 in the vicinity of the towns of Stapleford and Trowell. This could result in disruption to services, although many of the interventions would be combined to reduce the frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

14.4.20 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.21 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. It is currently expected that the following PRoW would be temporarily diverted/realigned or closed:

- Sandiacre Footpath 19 running along the east bank of the Erewash Canal to the east of Ilkeston Road;

- Sandiacre Footpath 7 running along the west bank of the Erewash Canal to the east of Ilkeston Road;
- Sandiacre Footpath 5 between Ilkeston road and the Erewash Canal;
- Sandiacre Footpath 24 between Ilkeston road and the Erewash Canal;
- Sandiacre Footpath 6 between Ilkeston road and the Erewash Canal; and
- Stanton-by-Dale Footpath 21 north of Stanton Gate.

14.4.22 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.23 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.24 It is currently expected that the construction of the Proposed Scheme could have an effect upon the Erewash Canal, both its waterway and towpath, in the Stapleford to Nuthall area where the proposed route would pass over and alongside the canal creating a short tunnel section. The assessment will be reported in the formal ES.

Permanent effects

14.4.25 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.26 The implementation of the measures in the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.27 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.28 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including: the M1 junctions 25 and 26; the A609 Nottingham Road between the A6007 Stapleford Road and the A6002 Coventry Lane; the A610 east of M1 junction 26; the A6002 Woodhouse Way and Main Street; the A6007 Stapleford Road; the B5010 Derby Road and Bostock's Lane to the M1 junction 25; the B600 Nottingham Road; the B6003 Toton Lane; Stanton Gate/Moorbridge Lane; and Ilkeston Road/Lenton Street/Town Street in Sandiacre. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in a change in accident risk.

14.4.29 Construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments required as part of the permanent scheme. These are expected to include: the M1, which would be subject to temporary traffic management measures, the B5010 Derby Road and Lawrence Drive.

14.4.30 Bus services 'the two' along the A609 Nottingham Road, i4, 111 and my15 along the B5010 Derby Road would be affected by temporary diversions.

14.4.31 Rail possessions will be required on the Erewash Valley Line and on the Radford and Trowell Line to undertake localised works.

14.4.32 The following PRoW would be temporarily diverted: Sandiacre Footpath 19, Sandiacre Footpath 7, Sandiacre Footpath 5, Sandiacre Footpath 24, Sandiacre Footpath 6 and Stanton-by-Dale Footpath 21.

14.4.33 Construction of the Proposed Scheme could have an effect upon the Erewash Canal, both on users of the waterway and towpath.

14.4.34 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- changes to the highway and public transport network to accommodate users of the HS2 services at East Midlands Hub station in the adjacent Ratcliffe-on-Soar to Long Eaton area to the south;
- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

14.5.2 A station travel plan for the East Midlands Hub High Speed station, located in the adjacent Ratcliffe-on-Soar to Long Eaton area, would include measures that aim to reduce the impacts and effects of traffic and transport movements.

Assessment of impacts and effects

14.5.3 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.4 The Proposed Scheme would generate significant benefits for rail passengers in the Stapleford to Nuthall area due to the construction of the East Midlands Hub station in the adjacent Ratcliffe-on-Soar area. This would include improved journey times to major cities in the North, Midlands and to London and the South of England, increases

in rail capacity in the wider area and easing of passenger crowding on the existing network.

14.5.5 The operation of the Proposed Scheme could result in impacts within this area due to increased traffic associated with the East Midlands Hub station. However, the maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.6 The operational impacts are therefore primarily related to the introduction of the East Midlands Hub station, permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.7 The Proposed Scheme would result in a number of permanent highway changes. These include:

- realignment of the M1 would be required in Sandiacre to accommodate the route of the Proposed Scheme and would be subject to temporary traffic management measures;
- realignment of the A609 Nottingham Road to the east of Trowell along a revised vertical alignment in the vicinity of the Proposed Scheme overbridge;
- realignment of Waterloo Lane along a new alignment across the route of the Proposed Scheme in the vicinity of the Trowell Motorway Services;
- realignment of Lawrence Drive in the Nottingham Business Park due to the Strelley tunnel north portal; and
- the B5010 Derby Road where it crosses over the Erewash Valley Line.

14.5.8 The permanent highway changes are not expected to result in significant changes in travel distances.

14.5.9 Operation of the Proposed Scheme would result in changes in traffic flows due to passengers and staff accessing the East Midlands Hub station in the adjacent Ratcliffe-on-Soar to Long Eaton area. This could result in changes to traffic movements in the Stapleford to Nuthall area and affect, in particular, the B5010 Derby Road and B6003 Toton Lane.

14.5.10 The effects of these changes, including on non-motorised users, will be reported in the formal ES.

Accidents and safety

14.5.11 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Public transport network

14.5.12 It is expected that the Proposed Scheme would generate significant major beneficial effects for rail passengers, as a result of:

- the increase in rail capacity at East Midlands Hub station in the adjacent Ratcliffe-on-Soar to Long Eaton area and from the introduction of HS2 services and improvements to local services; and
- significantly improved journey times between the East Midlands, the north of England, the West Midlands and the south of England.

14.5.13 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Stapleford to Nuthall area, although increased traffic associated with the new station may increase journey times on bus services.

Non-motorised users

14.5.14 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Stapleford Footpath 13 between Mill Lane and Sandiacre Road would be realigned to run under the route of the Proposed Scheme;
- Trowell Footpath 5 to the east of the River Erewash near the M1 and M1 underbridge, would be realigned 70m north-west of its current alignment, crossing the route of the Proposed Scheme on the M1 River Erewash underbridge;
- Trowell Footpath 6 from Derbyshire Avenue under the M1 to Robin Hood Way, would be realigned to 30m south of its current alignment, crossing the route of the Proposed Scheme through the Trowell Footpath 6 accommodation underbridge;
- Trowell Footpath 23 to the south of the A609 Nottingham Road, would be closed where it crosses the route of the Proposed Scheme along the former Nottingham Canal. Users would be diverted along the A609 Nottingham Road and along Trowell Footpath 10 and Trowell Footpath 11;
- Trowell Footpath 24 to the south of the A609 Nottingham Road, would be closed where it crosses the route of the Proposed Scheme along the former Nottingham Canal. Users would be diverted along the A609 Nottingham Road and along Trowell Footpath 10 and Trowell Footpath 11;
- Trowell Footpath 10 to the south of the A609 Nottingham Road, would be closed along part of its existing alignment along the former Nottingham Canal where it would cross the route of the Proposed Scheme. Users would be diverted along the A609 Nottingham Road and along Trowell Footpath 11 before re-joining the existing Trowell Footpath 10 to the east of the Proposed Scheme;
- Trowell Bridleway 13 to tie into the realignment of Waterloo Lane;

- Trowell Bridleway 14 from Cossall to Trowell Moor, would be realigned to cross the route of the Proposed Scheme on the Trowell Bridleway 14 overbridge and would re-join its existing alignment between the M1 and the route of the Proposed Scheme, before crossing underneath the M1;
- Nuthall Footpath 8 north of Nottingham Business Park, would be realigned and would cross the route of the Proposed Scheme on the Nuthall Footpath 8 footbridge; and
- Greasley Footpath 18 from New Nuthall to Bulwell Wood, would be diverted 45m east of its current alignment, crossing the route of the Proposed Scheme at the Greasley Footpath 18 underbridge.

14.5.15 No PRoW diversion/realignment is expected to result in additional travel distance in excess of 500m.

14.5.16 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. The assessment of these changes will be reported in the formal ES.

Waterways and canals

14.5.17 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Stapleford to Nuthall area.

Other mitigation measures

14.5.18 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.19 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.20 The Proposed Scheme would generate significant benefits for rail passengers in the Stapleford to Nuthall area. This would include improved journey times via East Midlands Hub station to major cities in the north of England, the Midlands and the south of England as well as increases in rail capacity.

14.5.21 Operation of the Proposed Scheme would require the permanent diversion or realignment of: the M1; the A609 Nottingham Road to the east of Trowell; Waterloo Lane in the vicinity of the Trowell Motorway Services; Lawrence Drive in Broxtowe and B5010 Derby Road where it crosses over the railway line. These diversions or realignments are unlikely to result in permanent significant effects. Increases in traffic, including from the East Midlands Hub station, could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in a change in accident risk.

14.5.22 A number of PRoW would be either permanently diverted or realigned: Stapleford Footpath 13, Trowell Footpath 5, Trowell Footpath 6, Trowell Footpath 23, Trowell Footpath 24, Trowell Footpath 10, Trowell Bridleway 13, Trowell Bridleway 14, Nuthall Footpath 8 and Greasley Footpath 18.

14.5.23 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

14.5.24 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

14.5.25 A station travel plan will detail monitoring of travel associated with operation of the East Midlands Hub station.

14.5.26 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Stapleford to Nuthall area.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Stapleford to Nuthall area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Canal & River Trust (CRT), Nottinghamshire County Council (NCC), Nottingham City Council (NoCC) and Derbyshire County Council (DCC), which are the Lead Local Flood Authorities (LLFA), and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA06 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[157].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[158].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km

[157] National Planning Policy Framework, DCLG, 2015
[158] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of the River Erewash, Nut Brook and Boundary Brook.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Trent Lower and Erewash management catchment of the Humber river basin district (RBD).

15.3.2 The river basin management plan[159] identifies the chemical[160] and ecological[161] status of surface water bodies, and the quantitative[162] and chemical[163] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of

[159] Environment Agency (2015), *Water for life and livelihoods Part 1: Humber river basin district: River basin management plan*
[160] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[161] The ecological status of surface waters is determined based on the following elements:
- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in the ecology and biodiversity section;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.

[162] The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance
[163] The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present

good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 34. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 34: Surface water body receptors

Water body name and location[164]	Designation	Q95 value (m^3/s)[165]	Receptor value	Parent WFD water body name and identification number[166]	Current WFD status/Objective[167]
River Erewash WR-01-357b H7	Main river	0.5	High	Erewash from Gilt Brook to Trent GB104028052480	Poor/Moderate by 2027
Erewash Canal WR-01-357b I7	Inland waterway	N/A	Very high		
Tributary of the Erewash Canal (1) WR-01-357b I7	Drain	0	Moderate		
Tributary of the Erewash Canal (2) WR-01-357b H7	Ordinary watercourse	0.002	High		
Tributary of the Erewash Canal (3) WR-01-357b G8	Drain	0	Moderate		
Bishops Dyke WR-01-357b F7	Ordinary watercourse	0.002	High		
Hempshill Brook WR-01-358a H5	Ordinary watercourse	0.008	High	Leen from Source to Day Brook GB104028052880	Moderate/Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There are no licensed surface water abstractions in the study area.

[164] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA06 Map Book figures (in this case WR-01)
[165] This is the flow within the watercourse that is exceeded for 95% of the time
[166] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[167] Status and objectives are based on those set out in the 2015 River basin management plan

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m^3 per day, have been requested from the local authorities. Responses are being sought. As there is no obligation to register private water supplies, unregistered private groundwater supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 18[168] consented discharges to surface waters within the study area, four of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 35. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 35 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 35: Summary of geology and hydrogeology in the study area

Geology[169]	**Distribution**	**Formation description**	**Aquifer classification**	**WFD body (ID) and current overall status[170]**	**WFD status objective[171]**	**Receptor value**
Superficial deposits						
Head	Located east of Nuthall	Dependent on source, but typically gravel, sand and clay. Can include peat and organic material	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Alluvium	Along the River Erewash and tributaries, and east of Nuthall	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River Terrace Deposits - Holme Pierrepont Sand and	Along the Erewash canal	Sand and gravel	Secondary A			

[168] The number of consents quoted is different to the number quoted in Section 10, Land quality because the water resources and flood risk study area considers surface water and groundwater features within 1km of the centreline of the Proposed Scheme The land quality study area considers an area extending 250m from the land required for the construction of the Proposed Scheme.
[169] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s, While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[170] As stated in the 2015 River basin management plan
[171] As stated in the 2015 River basin management plan

Geology[169]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[170]	WFD status objective[171]	Receptor value
Gravel Member						
Glacial till	Patchy, in the areas of Trowell Moor, Catstone, Strelley and Nuthall	Variable deposit typically comprising sandy, silty clay with pebbles	Secondary (undifferentiated)			
Bedrock						
Mercia Mudstone Group – Sidmouth Mudstone Formation	Outcrops in the southern part of the study area in the Sandiacre area	Mudstone and siltstone with thin beds of dolomitic siltstone and sandstone	Secondary B	Trent Lower Erewash - Secondary Combined GB40402G990300 Poor	Good by 2027	Moderate
Mercia Mudstone Group – Tarporley Siltstone Formation	Outcrops in the south, in Sandiacre and Stapleford areas	Sandstone, mudstone and siltstone	Secondary A (where sandstone) Secondary B (where mudstone and siltstone)	Trent Lower Erewash - Secondary Combined GB40402G990300 Poor	Good by 2027	Moderate
Sherwood Sandstone Group – Chester Formation	Outcrops in the southern part of the study area in the Sandiacre area	Conglomerates and reddish brown, cross-bedded, pebbly sandstones	Principal	Lower Trent Erewash - PT Sandstone Wollaton GB40401G301400 Poor	Poor by 2015	High
Lenton Sandstone Formation	Outcrops mainly within the Strelley area and to the north of Nuthall with an isolated outcrop north of Sandiacre	Sandstone with mudstone and conglomerate	Principal	Lower Trent Erewash - Magnesian Limestone GB40401G301800 Good	Good by 2015	High
Zechstein Group Edlington Formation	Outcrops in the Strelley and Nuthall areas overlying the Cadeby Formation and beneath the	Mudstone with siltstone and sandstone. Dolostone and gypsum/anhydrite are also locally encountered	Secondary B	Trent Lower Erewash - Magnesian Limestone GB40401G301800	Good by 2015	Moderate

Geology[169]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[170]	WFD status objective[171]	Receptor value
	Lenton Sandstone Formation			Good		
Zechstein Group Cadeby Formation	Outcrops from the Strelley area up to the northern extent of the study area	Dolostone with mudstone, dolomitic siltstone and sandstone	Principal	Trent Lower Erewash - Magnesian Limestone GB40401G301800 Good	Good by 2015	High
Pennine Coal Measures Group Pennine Middle Coal Measures Formation	Outcrops from Trowell to Strelley in a north-west to south-east orientation	Mudstones, siltstone sandstone and occasional coal seams.	Secondary A	Trent Lower Erewash - Coal Measures GB40402G303200 Good	Good by 2015	Moderate
Pennine Coal Measures Group Pennine Lower Coal Measures Formation	Outcrops from Stapleford to Trowell in a north-west to south-east orientation	Interbedded fossiliferous mudstone siltstone and sandstone, with coal seams.	Secondary A	Trent Lower Erewash - Coal Measures GB40402G303200 Good	Good by 2015	Moderate

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 35, is outlined briefly as follows:

- alluvium and river terrace deposits are classified as Secondary A aquifers. These comprise permeable layers that may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified moderate value receptors; and
- glacial till deposits are classified as Secondary undifferentiated aquifers, which may supply baseflow to watercourses or store and yield limited amounts of groundwater. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 35, is outlined briefly as follows:

- bedrock geology of the Stapleford to Nuthall area consists mainly of the Lower Cadeby Formation to the north and Pennine Coal Measures to the south. The Cadeby Formation has been classified as a Principal aquifer by the Environment Agency and is therefore a receptor of high value;

- the Chester Formation and the Lenton Sandstone Formation outcrop at the south of the area near Sandiacre and to the north of the area near Strelley and Nuthall. These formations have been classified as a Principal aquifer by the Environment Agency. They can also provide an important component of baseflow to rivers, and have therefore been assessed as high value receptors;
- Pennine Coal Measures are classified as Secondary A aquifers and consist of sequences of mudstone, siltstone, sandstone, seat earth and coals, which form a complex multi layered aquifer where groundwater flow occurs mainly within the fractures in the sandstones. These aquifers have been classified as moderate receptors;
- the Mercia Mudstone Group, including the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation, outcrops at the southern end of the area near Sandiacre. It has traditionally been regarded as predominantly impermeable. However it contains permeable layers which can occasionally yield limited quantities of groundwater suitable for domestic or agricultural use. The Environment Agency classifies it as both a Secondary A aquifer where sandstone is present in the Tarporley Siltstone Formation and a Secondary B aquifer in the remainder of the Tarporley Siltstone Formation and the entire Sidmouth Mudstone Formation. Therefore, it has been classified as a moderate value receptor; and
- the Edlington Formation, which is also located between the Cadeby Formation and the Lenton Sandstone Formation, is also classified by the Environment Agency as a Secondary B aquifer. This has therefore been classified as a moderate value receptor.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 35. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licensed for public water supply within the study area. The southern extent of the Proposed Scheme in this area lies within a total catchment (Zone 3)[172] groundwater source protection zone (SPZ) between Sandiacre and Stanton Gate. This is associated with abstractions located approximately 5.1km east of the Proposed Scheme. Another SPZ3 area is located approximately 300m east of the Proposed Scheme, north of Nuthall.

[172] Defined by the Environment Agency as the area around a source within which all groundwater recharge is presumed to be discharged at the source

15.3.15 There is one private groundwater abstraction licence registered in the study area as shown on Map WR-02-201. The abstraction borehole is 950m west of the New Farm Wood cutting, and is held for industrial use.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m3 per day, have been requested from the local authorities. Responses are being sought. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are no consented discharges to groundwater within the study area.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified six features within the study area that had potential to be springs. Access was not possible to inspect any of these features at this stage.

15.3.19 The six potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis.

15.3.20 There are 11 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.21 Bulwell Wood Site of Special Scientific Interest (SSSI) is a nature conservation site located within the study area, which is potentially groundwater dependent. It is located adjacent to the land required for the Proposed Scheme south of Hucknall Airfield and is designated, in part, for its unpolluted open water habitats which could be groundwater dependent;

15.3.22 The following nature conservation sites are potentially dependent on surface water flows, for example periodic flooding from a watercourse:

- Bulwell Wood SSSI has the potential to be surface water dependent in relation to its designation for its unpolluted open water habitats;
- Nottingham Canal Local Nature Reserve (LNR) is a disused canal in the Erewash Valley and includes wetland habitats which are connected to surface water flows and drainage;
- Blenheim Farm Local Wildlife Site (LWS) is located approximately 500m from the land required for the Proposed Scheme at Bulwell. The site supports standing water habitat, is dependent on surface water flows and has the potential to be affected by the Proposed Scheme; and
- Blenheim Lane Ponds (LWS) is located 140m east of the land required for the Proposed Scheme east of Bulwell Wood. The site supports standing water habitat,

is dependent on surface water flows and has the potential to be affected by the Proposed Scheme.

15.3.23 Further details of the ecology of these sites, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.24 The Environment Agency's Flood map for planning (rivers and sea)[173] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.25 The updated Flood map for surface water[174] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[175]. The British Geological Survey's (BGS) Groundwater flooding susceptibility dataset[176], has been used to assess the future risk of groundwater flooding.

15.3.26 The following reports were used to help determine the baseline flood risk within the study area:

- NCC Local Flood Risk Management Strategy (LFRMS)[177];
- Nottinghamshire and Nottingham Level 1 Strategic Flood Risk Assessment (SFRA) Minerals and Waste[178];
- Greater Nottingham SFRA Addendum[179] ; and
- DCC and Derby City Council SFRA[180].

River flooding

15.3.27 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Erewash, and its tributaries the Nut Brook and Boundary Brook, in Sandiacre and Stapleford. Table 36 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

[173] GOV.UK Flood map for planning (2018). Available online at: https://flood-map-for-planning.service.gov.uk/
[174] GOV.UK Updated Flood map for surface water (2018). Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk Accessed November 2017
[175] GOV.UK Risks of Flooding from Reservoirs (2018).Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk Accessed November 2017
[176] BGS Susceptibility to Groundwater Flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html Accessed November 2017
[177] Nottinghamshire County Council, (2016), Nottinghamshire County Council Local Flood Risk Management Strategy (LFRMS)
[178] Scott Wilson and URS, (2011), Nottinghamshire and Nottingham Level 1 Strategic Flood Risk Assessment
[179] AECOM, (2017), Greater Nottingham Strategic Flood Risk Assessment Addendum (SFRA)
[180] Derbyshire County Council and Derby City Council, (2017), Derbyshire County Council and Derby City Council Strategic Flood Risk Assessment (SFRA)

Table 36: River flood risk sources and receptors

Source	Location description and figure/coordinate[181]	Receptor potentially affected	Receptor value/sensitivity to flooding
River Erewash (and its tributary Nut Brook)	Sandiacre WR-01-357b G8	Existing railway line	Very high
	Sandiacre and Stapleford WR-01-357b H7, I7, J7	Commercial properties	Moderate
		Residential properties	High
	Stapleford WR-01-357b G8, G7, H7, I7	Agricultural land	Moderate

Surface water flooding

15.3.28 There are some areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 37. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 37: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[182]	Receptor potentially affected	Receptor value
Surface water flow path that drains along A609 Nottingham Road	Trowell WR-01-357b F7	A609 Nottingham Road	Moderate
		Residential properties along A609 Nottingham Road	High

Artificial water bodies

15.3.29 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam. Artificial water bodies with potential implications for flood risk within the study area include the Erewash Canal, Catstone Hill Reservoir and The Lake (also known as Temple Lake) in New Nuthall. The covered reservoir at Catstone Hill, which is located 570m south-west of Strelley, and The Lake, which is located 100m south of Edward Road, New Nuthall, have the potential to affect flood risk to the Proposed Scheme. However, as these are large raised reservoirs, subject to the requirements of reservoir safety legislation[183], the inundation risk posed by them is considered negligible.

Groundwater flooding

15.3.30 Information related to historical incidents of groundwater flooding in the Stapleford to Nuthall area is provided within the Nottinghamshire and Nottingham Level 1 SFRA, Greater Nottingham SFRA, and the DCC and Derby City Council SFRA. There is no

[181] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA06 Map Book figure (in this case WR-01)
[182] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA06 Map Book figure (in this case WR-01-357b)
[183] GOV UK; Reservoirs: owner and operator requirements: How to register a reservoir, appoint a panel engineer, produce a flood plan and report an incident; https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements

specific information in these documents regarding the history of groundwater flooding within the study area.

15.3.31 The BGS Groundwater flooding susceptibility dataset indicates that there is some potential for groundwater flooding to occur towards the southern end of the study area in the River Erewash floodplain and also where the Proposed Scheme is underlain by alluvial deposits.

Land drainage

15.3.32 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[184] includes a range of mitigation measures that aim to reduce construction impacts insofar as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would avoid passing along river or stream valleys, such as that of the River Erewash and its associated floodplains. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

[184] Supporting document: Draft Code of Construction Practice

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: LA06 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed at the following locations: the River Erewash near the M1 west of Trowell, and the Bishops Dyke north of Trowell. The aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme would also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such watercourses are natural channels, the design principle will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[185].

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, insofar as is reasonably practicable.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;

[185] 'Hydromorphological condition' reflects the extent to which water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats departs from that expected of a natural river or stream system

- measures to prevent silt-laden runoff and other pollutants entering the water environment; and
- restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Permanent culverts proposed on smaller watercourse crossings within this study area include a culvert under the Waterloo Road realignment and under the route of the Proposed Scheme near Trowell Motorway Services, both on Bishops Dyke. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced insofar as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.12 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points would be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors would follow the latest good practices. This principle would also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.14 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings insofar as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[186] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;

[186] Impermeable barrier preventing water flow

- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.15 The exact requirements would be refined and method of mitigation would be designed following ground investigation at foundations, tunnels or cutting locations.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy would ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the viaducts and the realignment of the M1 embankment, which will be located in the River Erewash floodplain. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and highway realignment;
- the temporary works shown in the Volume 2: LA06 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This would be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[187];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there would be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;

[187] Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk insofar as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts

on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The proposed cuttings in the study area (Toton trough, Trowell cutting, Trowell Moor cutting No.1, Trowell Moor cutting No.2, Mellors Way cutting No.1, New Farm Wood cutting and the Strelley tunnel would intersect the Cadeby Formation Lower Magnesian Limestone Principal aquifer, the Pennine Middle Coal Measures Group Secondary A aquifer, the Pennine Lower Coal Measures Secondary A aquifer, and the Alluvium deposits Secondary A aquifer. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 There is one licensed private groundwater abstraction near Watnall. The abstraction borehole is located approximately 950m west of New Farm Wood. The licence is held for industrial use. It is not currently anticipated that the Proposed Scheme would result in a significant effect relating to this abstraction as it lies outside of the zone of influence of any cutting.

Groundwater - surface water interactions

15.4.24 There is the potential for the dewatering required for the construction of the Toton trough in the Ratcliffe-on-Soar to Long Eaton area to have local moderate impacts on baseflows to the River Erewash within the Sandiacre area. This impact is reported in Volume 2: LA05, Ratcliffe-on-Soar to Long Eaton.

Water dependent habitats

15.4.25 The Westville embankment would be located approximately 40m west of Bulwell Wood SSSI. There is potential for temporary impact on the quality and quantity of groundwater and surface water flows feeding the open water habitat as a result of upstream construction works affecting the connected Bulwell Wood and Pond LWS (impacts on which are considered separately in the assessment for the Hucknall to Selston area within Volume 2 LA07, Hucknall to Selston). Measures included in the

draft CoCP would minimise the impact on water quality and hydrology of the ponds to negligible.

15.4.26 Construction works would be required within boundary of the Blenheim Farm LWS and Blenheim Lane Ponds LWS, with the potential for impacts on the quality and quantity of surface water flows to the ponds. Measures included in the draft CoCP would minimise the impact on water quality of the ponds to negligible. Temporary changes in flow volume could result in a minor impact on water levels.

15.4.27 The effects of water impacts to habitats are assessed in Section 7, Ecology and biodiversity.

Temporary effects - flood risk and land drainage

15.4.28 Construction of the M1 realignment, the Toton trough and Stanton Gate viaduct over the River Erewash and Erewash Canal and the associated flood mitigation measures would require temporary working within flood zones. Temporary access roads and construction compounds would cross ordinary watercourses and land drainage routes, including the Stanton Gate viaduct main compound, located across an ordinary watercourse draining to the Erewash Canal.

15.4.29 Construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works will be undertaken would be produced by the nominated undertaker in consultation with the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – water resources and WFD

15.4.30 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.31 The realignment of the River Erewash north of the realigned M1, and through the realigned M1 has the potential to cause a minor impact on the hydromorphology of this watercourse. This would potentially result in a moderate adverse effect, which is significant.

15.4.32 The location of the piers of the Stanton Gate viaduct would be considered to maximise their distance from watercourses, but could result in a moderate impact on the hydromorphology of the River Erewash such that there would be a moderate adverse effect, which would be significant. The impact of shading resulting from the viaduct has been assessed in Section 7, Ecology and biodiversity.

Groundwater

Aquifers

15.4.33 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could

affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

15.4.34 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.35 The assessment has not identified any permanent significant effects on springs or other groundwater/surface water interactions in the study area.

Water dependent habitats

15.4.36 The Westville embankment would be located approximately 40m west of Bulwell Wood SSSI. There is potential to impact the clean water pond within Bulwell Wood SSSI through permanent loss or alteration to surface flows to the pond resulting in a minor impact on water levels.

15.4.37 Construction of the Trowell embankment has the potential to result in changes to the flow of surface water to the wetland habitat within the Nottingham Canal LNR through reduction in connectivity of the surface water drainage catchment to the habitat. This would result in a negligible impact on water levels.

15.4.38 Through embedded land drainage measures, permanent impacts on surface water flows and water levels of the ponds within the Blenheim Farm LWS and Blenheim Lane Ponds LWS are anticipated to be negligible.

15.4.39 The effects of water impacts to habitats are assessed in Section 7, Ecology and biodiversity.

Permanent effects - flood risk and land drainage

15.4.40 Hydraulic modelling analysis indicates a potential for increases in peak flood level and extent of flooding within the River Erewash floodplain north of the M1 associated with the M1 realignment (see Volume 2: Map CT-06-435b, E1 to Volume 2: Map CT-06-436, F4). These changes would not affect any residential properties, but would affect the existing railway line to the north of B5010 Derby Road and the Erewash Valley Line, which is a very high value receptor. This would therefore result in a major adverse effect, which is significant.

15.4.41 Hydraulic modelling, which is currently being finalised, indicates the potential for an increase in peak flood level and flood extent to residential and commercial receptors in Sandiacre and Stapleford north of the B5010 Derby Road, associated with the M1 realignment, Stanton Gate viaduct, Toton trough and East Midlands Hub station. The commercial properties are moderate value receptors, and the impact is therefore assessed as having a minor adverse effect, which is not significant effect. The residential properties are high value receptors, and the impact is therefore assessed as having a major adverse effect, which would be significant.

Other mitigation measures

15.4.42 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.43 The positioning of piers for the Stanton Gate viaduct will be carefully managed to maximise the distance between the watercourse banks and the pier, and where necessary, scour protection mitigation will be developed to manage erosion. Hydromorphological mitigation will be considered up and downstream of the pier locations to enable erosion patterns to re-stabilise as a result of any scour protection.

Flood risk and land drainage

15.4.44 Mitigation measures for the increase in flood risk associated with the Proposed Scheme for the River Erewash floodplain are subject to further hydraulic modelling. Options being considered include flood storage, raising flood defences and relocating existing flood defences to increase floodplain storage.

Summary of likely residual significant effects

15.4.45 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a moderate adverse effect relating to the realignment of the River Erewash for the M1 realignment, which is significant;
- a moderate adverse effect on the hydromorphology of the River Erewash relating to the location of Stanton Gate viaduct piers;
- a moderate adverse effect on the Bishops Dyke relating to the two realignments, which is significant;
- a moderate adverse effect on Bishops Dyke relating to the proposed culvert, which is significant;
- a major adverse effect on flood risk on the River Erewash floodplain north of the M1 realignment affecting existing Erewash Valley Line, which is significant; and
- a major adverse effect on flood risk on the River Erewash floodplain north of the B5010 Derby Road associated with the M1 realignment, Stanton Gate viaduct, Toton trough and East Midlands Hub station affecting residential property in Sandiacre and Stapleford, which is significant.

15.4.46 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects, where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase would have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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