HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA05: Ratcliffe-on-Soar to Long Eaton

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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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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.

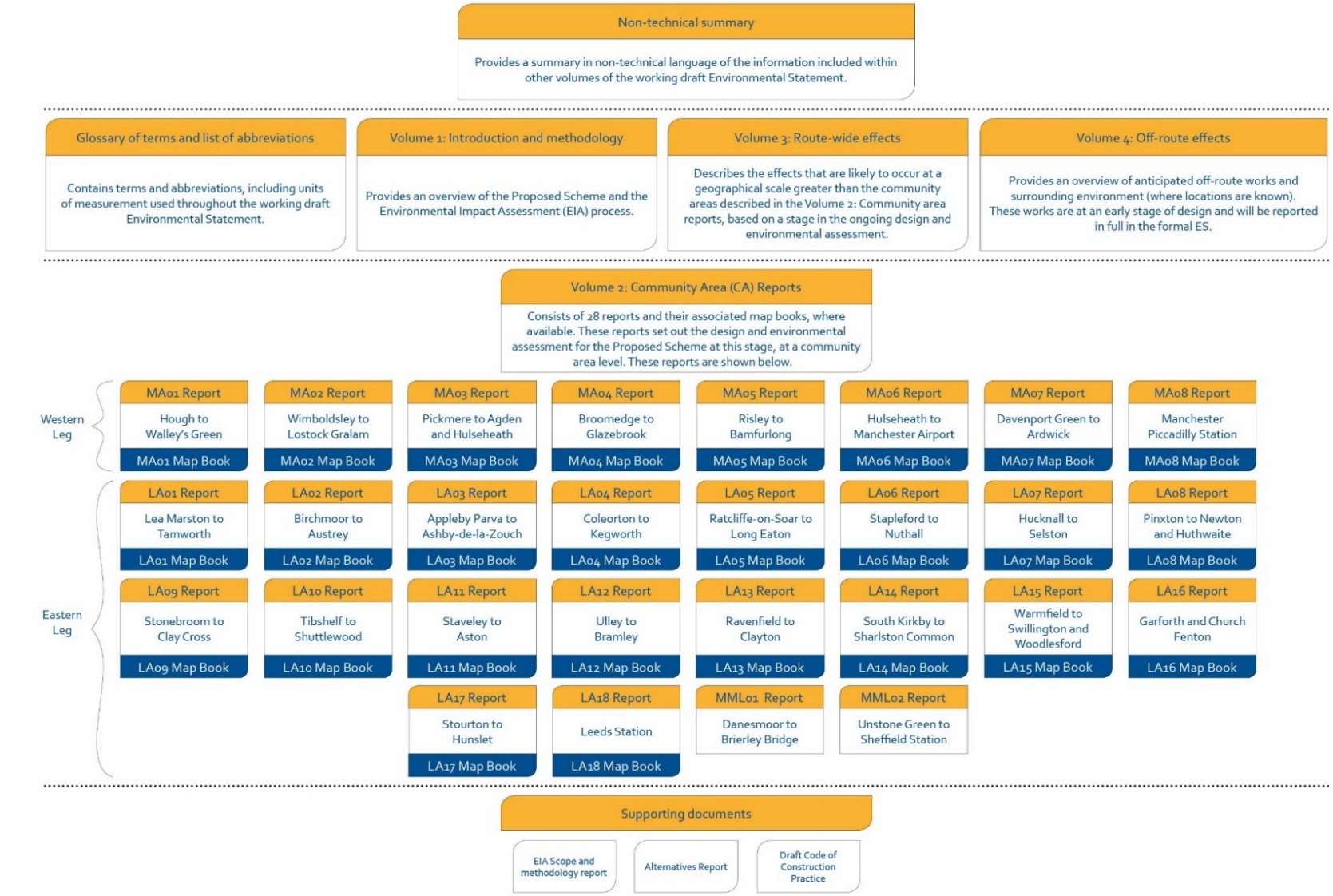
Volume 4: Off-route effects

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.

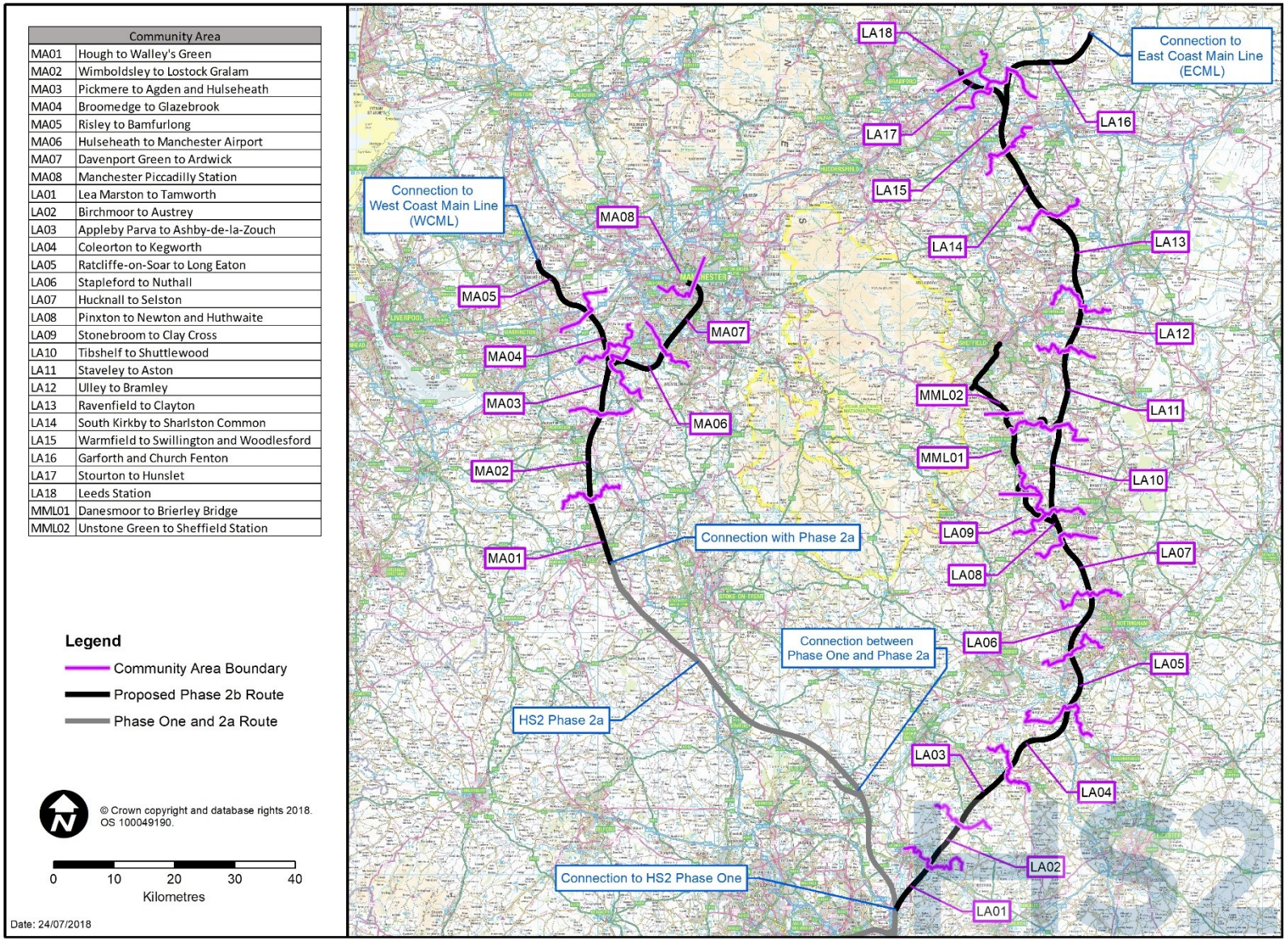
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Ratcliffe-on-Soar to Long Eaton area (CA number LA05) which is located on the eastern leg of the Proposed Scheme.

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



1.2 Purpose and status 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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton area are provided in a separate corresponding document entitled Volume 2, LA05 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, LA05 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

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

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 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 Ratcliffe-on-Soar to Long Eaton area covers an approximately 9.2km section of the Proposed Scheme, passing through the parishes of Kegworth, Lockington-Hemington, Ratcliffe-on-Soar, Thrumpton and Sandiacre. This area lies within the local authority areas of Leicestershire County Council (LeCC), Derbyshire County Council (DCC), Nottinghamshire County Council (NCC), North West Leicestershire District Council (NWLDC), Rushcliffe Borough Council (RBC), Erewash Borough Council (EBC) and Broxtowe Borough Council (BBC).

2.1.2 Land between the A453 Remembrance Way and the A6 Derby Road to the east of the M1 forms the southern boundary of this section. The B5010 Derby Road in Sandiacre forms the northern boundary of this section.

2.1.3 As shown in Figure 3, the Coleorton to Kegworth area (LA04) lies to the south and the Stapleford to Nuthall area (LA06) lies to the north.

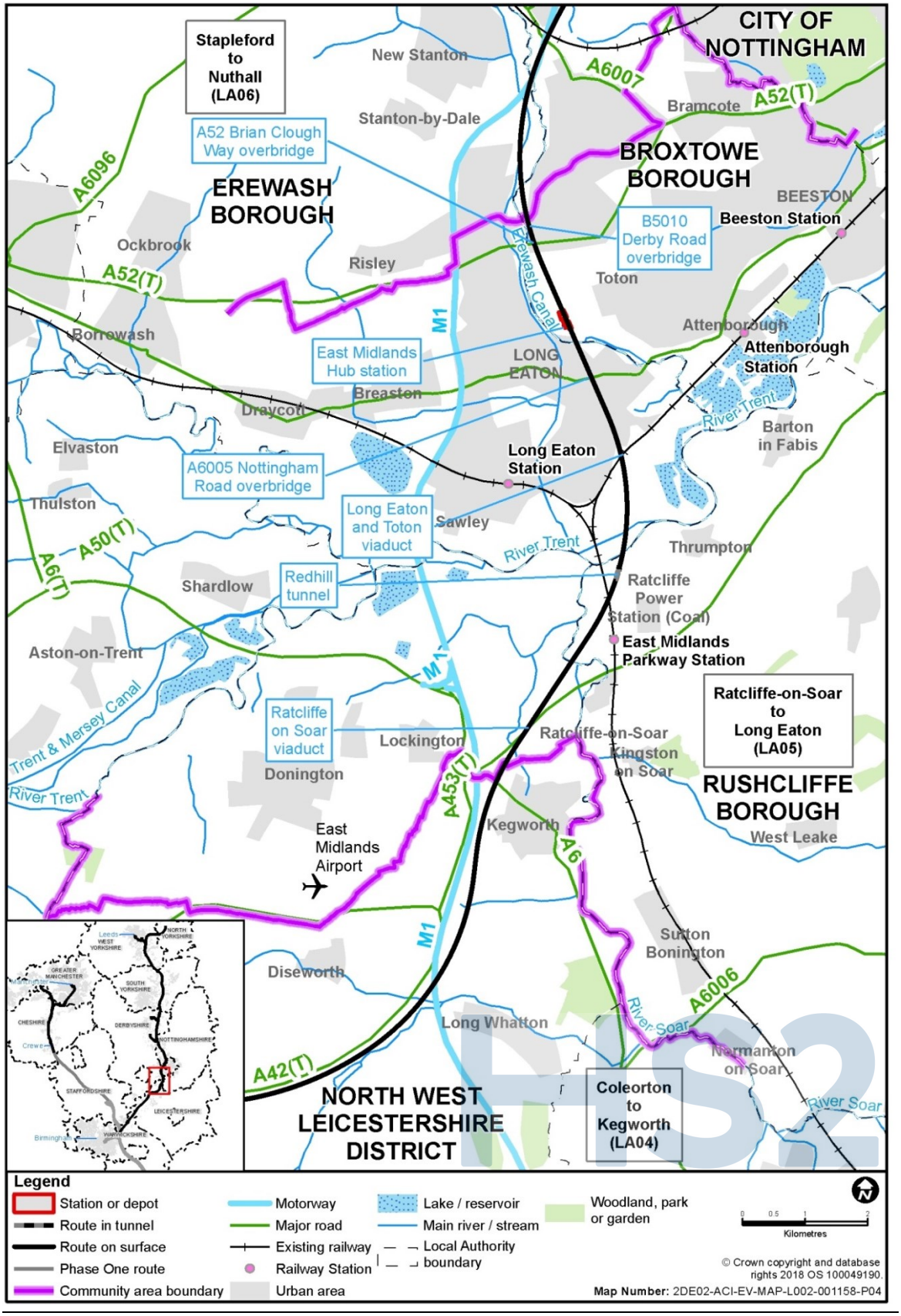
Settlement, land use and topography

2.1.4 The southern section of the Ratcliffe-on-Soar to Long Eaton area is predominantly rural in landscape character, with agriculture and recreation being the main land uses. This section includes villages such as Ratcliffe-on-Soar and Thrumpton, areas of woodland, farms, the Redhill Marina on the River Soar, the River Trent and industrial activities associated with Ratcliffe-on-Soar Power Station. The Ratcliffe-on-Soar Power Station is a dominant feature in the landscape and forms a landmark and focal point in the area.

2.1.5 Topography within the River Trent and River Soar valleys is predominantly flat with occasional raised areas within the landscape. The main topographic feature in the Ratcliffe-on-Soar to Long Eaton area is the broad valley of the River Trent, at an altitude of approximately 25-30m above Ordnance Datum (AOD). A notable exception is the escarpment at Red Hill, rising up to 60m above AOD, immediately south of the River Trent. This forms a prominent ridgeline in an otherwise flat landscape.

2.1.6 The northern section of the Ratcliffe-on-Soar to Long Eaton area is more urban from the point where the route of the Proposed Scheme enters the town of Long Eaton and continues towards Toton. Land uses include residential, commercial, light industrial and recreational uses associated with Long Eaton and the River Erewash. Light industrial and commercial land uses are largely concentrated between Meadow Brook Business Park and the A52 Brian Clough Way.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The M1 passes to the west of the Ratcliffe-on-Soar to Long Eaton area, connecting Kegworth to the south with Long Eaton in the north and provides connections to London and Leeds. The A453 Remembrance Way passes to the south of the area connecting Nottingham and Wilford with the M1 at junction 24. The A52 Brian Clough Way is the principal east-west route through the areas of Long Eaton and Toton, connecting Derby and Nottingham with the M1 at junction 25.

2.1.8 Local roads include the B6003 High Road/ Stapleford Lane / Toton Lane, which connects the A52 Brian Clough Way to the settlement of Stapleford in the north of the Ratcliffe-on-Soar to Long Eaton area; and connects the A6005 Nottingham Road to the settlements of Long Eaton and Chilwell in the south of the Ratcliffe-on-Soar to Long Eaton area. The B5010 Derby Road connects local settlements such as Borrowash, Risley, Stapleford and Bramcote in an east-west direction.

2.1.9 Existing railway infrastructure includes the Midland Main Line (MML) running in a south to north direction through the Ratcliffe-on-Soar to Long Eaton area. The route of the Proposed Scheme would cross the MML at Redhill, adjacent to the Ratcliffe-on-Soar Power Station. A number of conventional lines converge at Trent Junction, to the south-east of Long Eaton, including the MML and the Nottingham to Trent Junction Line. The route of the Proposed Scheme would cross the Nottingham to Trent Junction Line as it enters Long Eaton, passing over Newbery Avenue and Trent Lane. To the north-east of Trent Junction, the Long Eaton High Level Line and the Long Eaton Low Level Line, which together form the Erewash Valley Line, run through Long Eaton towards Toton Yard. The route of the Proposed Scheme would cross over the Long Eaton High Level Line and the Long Eaton Low Level Line.

2.1.10 Several public rights of way (PRoW) including local access roads, bridleways and public footpaths, provide important links between scattered dwellings and surrounding villages. The Trent Valley Way, Erewash Valley Trail and Nutbrook Trail, all promoted walking routes[4], pass through Long Eaton, Toton and Sandiacre. The Midshires Way promoted route passes through the south of the Ratcliffe-on-Soar to Long Eaton area through the River Trent and River Soar valleys and continues northward to the west of Long Eaton.

2.1.11 National Cycle Network (NCN) Route 6 and NCN Route 67 passes through the Ratcliffe-on-Soar to Long Eaton area along the canal towpath of the Erewash Canal.

Socio-economic profile

2.1.12 Within the EBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The construction sector accounts for the largest proportion of businesses (14%), with professional, scientific and technical (12%) as the second largest, followed by manufacturing (10%)[5].

[4] Promoted PRoW refers to those PRoW which are "promoted" destinations in their own right as a recreational resource.
[5] Office for National Statistics; UK Business count – Local Units 2016; Available online at: https://www.nomisweb.co.uk

2.1.13 According to the Annual Population Survey (2016)[6], the employment rate[7] within the EBC area was 87% (61,800 people), and unemployment in the EBC area was 3%.

2.1.14 The survey also records that 28% of EBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 4% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentrations of community facilities are in the towns of Long Eaton and Toton, with a small number of local services provided in rural settlements.

2.1.16 Ratcliffe-on-Soar is a village located towards the south of the Ratcliffe-on-Soar to Long Eaton area, to the south of the A453 Remembrance Way. Notable community facilities include Holy Trinity Church.

2.1.17 Thrumpton village is located in Rushcliffe, towards the south of the Ratcliffe-on-Soar to Long Eaton area. Notable community facilities in this area include All Saints' Church[8], Thrumpton Cricket Club and Thrumpton Hall, a wedding and events venue. The River Trent is located immediately to the north of Thrumpton.

2.1.18 Long Eaton is a town located towards the north of the Ratcliffe-on-Soar to Long Eaton area. Notable community facilities include places of worship, educational facilities, healthcare centres, pharmacies, social centres, public houses, nightclubs, youth centres, the Long Eaton Library and numerous sports clubs. West Lake and East Lake, which are used by the Trent Windsurfing Club, are located to the south of Long Eaton.

2.1.19 Notable community facilities in Toton include places of worship, educational facilities, the Greenwood Community Centre and two scout groups.

Recreation, leisure and open space

2.1.20 There are a number of recreational facilities in the Ratcliffe-on-Soar to Long Eaton area.

2.1.21 At Ratcliffe-on-Soar, the Redhill Marina along the River Soar includes riverside marina mooring, storage and boat hire, as well as a camping and caravan site. Recreational facilities in the Trent Valley include the Cranfleet Canal, River Trent, Ratcliffe-on-Soar Power Station Golf Course and water bodies associated with the Trent Windsurfing Club. Midshires Way promoted walking route passes the village from Kegworth Shooting Ground to the west.

2.1.22 The River Erewash and the Erewash Canal pass through Long Eaton and facilitate a number of recreational activities, including walking and cycling along the Erewash Canal towpath, which forms part of the Erewash Valley Trail and Trent Valley Way promoted routes. Nottingham Yacht Club is located on the Cranfleet Canal to the

[6] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[7] The proportion of working age (16-64 year olds) residents that are in employment.
[8] This is also referred to as the 'Church of All Saints' in Section 9, Historic Environment

south-east of Long Eaton. Local open spaces in Long Eaton include the Norfolk Road Recreation Ground and the River Erewash floodplain, Long Eaton Local Wildlife Site.

2.1.23 There are also a number of open spaces in proximity to Toton including Toton Fields Local Nature Reserve (LNR), Manor Farm LNR, Manor Farm Recreation Ground, which comprises a range of sports pitches and tennis courts, and Banks Road open space, which includes a small park and children's play area.

Policy and planning context

Planning framework

2.1.24 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.

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

- the adopted (saved) policies of the Broxtowe Local Plan (2004)[9] and the Greater Nottingham (Broxtowe Borough, Gedling Borough and Nottingham City) Aligned Core Strategy Part One Local Plan (2014)[10];
- the adopted (saved) policies of the Nottingham City Local Plan (2005)[11] and the Greater Nottingham (Broxtowe Borough, Gedling Borough and Nottingham City) Aligned Core Strategy Part One Local Plan (2014)[12];
- the adopted (saved) policies of the Erewash Borough Local Plan (2005)[13] and the Erewash Core Strategy (2014)[14];
- the adopted (saved) policies of the Rushcliffe Borough Local Plan (1996)[15] and the Rushcliffe Local Plan Part 1: Core Strategy (2014)[16];
- the North West Leicestershire Local Plan (2017)[17];
- the Nottinghamshire Minerals Local Plan (2005)[18] and the Derby and

[9] Broxtowe Borough Council, (2004), *The Broxtowe Local Plan*. Available online at: https://www.broxtowe.gov.uk/for-you/planning/planning-policy/local-plan/2004-broxtowe-local-plan/
[10] Broxtowe Borough Council, (2014), *The Greater Nottingham (Broxtowe) Aligned Core Strategy Part One Local Plan*. Available online at: https://www.broxtowe.gov.uk/for-you/planning/planning-policy/local-plan/part-1-local-plan-core-strategy/
[11] Nottingham City Council, (2005), *The Nottingham City Local Plan*. Available online at: http://www.nottinghamcity.gov.uk/planning-and-building-control/planning-policy/the-local-plan-and-planning-policy/
[12] Nottinghamshire City Council, (2014), *The Greater Nottingham (Nottingham) Aligned Core Strategy Part One Local Plan*. Available online at: http://www.nottinghamcity.gov.uk/planning-and-building-control/planning-policy/the-local-plan-and-planning-policy/
[13] Erewash Borough Council, (2014), *Erewash Borough Local Plan Saved Policies 2005 (Amended 2014)*. Available online at: https://www.erewash.gov.uk/local-development-framework/saved-policies-document.html
[14] Erewash Borough Council, (2014), *The Erewash Core Strategy*. Available online at: https://www.erewash.gov.uk/local-development-framework/adopted-erewash-core-strategy.html
[15] Rushcliffe Borough Council, (1996), *The Rushcliffe Borough Local Plan*. Available online at: http://www.rushcliffe.gov.uk/planningpolicy/1996andnon-statutorylocalplans/
[16] Rushcliffe Borough Council, (2014), *The Rushcliffe Local Plan Part 1: Core Strategy* , available online at: http://www.rushcliffe.gov.uk/planningpolicy/localplan/localplanpart1corestrategy/#d.en.27398
[17] North West Leicestershire District Council, (2017), *The North West Leicestershire Local Plan*. Available online at: https://www.nwleics.gov.uk/pages/local_plan
[18] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan*. Available online at: http://www.nottinghamshire.gov.uk/media/110638/mineral-local-plan.pdf

Derbyshire Minerals Local Plan (2000)[19];

- the Nottinghamshire and Nottingham Waste Core Strategy[20] (2013) and the saved policies of the Nottinghamshire and Nottingham Waste Local Plan[21] (2007) and the Derby and Derbyshire Waste Local Plan[22] (2005); and
- the Nottinghamshire Local Transport Plan 2011 – 2026 (2011)[23], the Nottingham Local Transport Plan Strategy 2011 – 2026 (2011)[24], the Derbyshire Local Transport Plan 2011 -2026 (2011)[25] and the Leicestershire Local Transport Plan 3 2011-2026 (2011)[26].

2.1.26 Emerging policies are not considered as part of this assessment unless a development plan has been submitted to the Secretary of State for examination. The Leicestershire Minerals and Waste Local Plan (2016)[27] was submitted to the Secretary of State for examination in February 2018. The Nottingham City Council Land and Planning - Local Plan Part 2 LAPP (2018)[28] was submitted to the Secretary of State for examination on 23 April 2018. These have been taken into consideration in the assessment in this report.

Committed development

2.1.27 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. Allocations in the submission draft of the Leicestershire Minerals and Waste Local Plan and the Nottingham City Council Land and Planning Local Plan Part 2 have also been included as committed developments.

2.1.28 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.

2.1.29 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

[19] 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
[20] 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
[21] Nottinghamshire County Council and Nottingham City Council,(2002), *Nottinghamshire and Nottingham Waste Local Plan*. Available online at: http://www.nottinghamshire.gov.uk/media/109140/wastelocalplan.pdf
[22] Derbyshire County Council and Derby City Council, (2005), *Derby and Derbyshire Waste Local Plan*. Available online at: https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/planning/planning-policy/minerals-waste-development-framework/derby-and-derbyshire-waste-local-plan.pdf
[23] 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
[24] 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/
[25] Derbyshire County Council, (2011), *Derbyshire Local Transport Plan 2011-2026*. Available online at: https://www.derbyshire.gov.uk/images/LTP3%202011_tcm44-161132.pdf
[26] Leicestershire County Council, (2011), *Local Transport Plan 3 2011-2023*. Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2017/1/9/Local_transport_plan.pdf
[27] Leicestershire County Council, (2016), *Leicestershire Minerals and waste Local Plan up to 2031, (2016 – pre-submission draft)*. Available online at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2016/10/4/minerals_and_waste_local_plan_pre-submission_2016.pdf
[28] Nottingham City Council, (2017), *Land and Planning Policies – Local Plan Part 2 (Submission Version March 2018)*. Available online at: https://www.nottinghamcity.gov.uk/submission

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.

2.1.30 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.

Interface with conventional railway network

2.1.31 The Proposed Scheme would require the realignment of the conventional Long Eaton High Level Line and Long Eaton Low Level Line (which together form the Erewash Valley Line) within the Ratcliffe-on-Soar to Long Eaton area. The Proposed Scheme would interface with these conventional lines through Long Eaton at the East Midlands Hub station. This is further described within Section 2.2.

2.1.32 The design of the conventional line realignments are under development and will be subject to ongoing design development through consultation with Network Rail and other relevant stakeholders.

Ongoing design development

2.1.33 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:

- refinement of the layout and configuration of East Midlands Hub station, including its access routes;
- ongoing Network Rail design, which may result in changes to the modifications of the existing Erewash Valley Line;
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of auto-transformer station and auto-transformer feeder station locations and access arrangements which form part of the electrical infrastructure to power the Proposed Scheme;
- refinement of construction compound locations and site haul routes;
- temporary and permanent utility diversions;
- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects; and

- accommodation works and crossings of the route for private means of access.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton 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: Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: Map Series CT-05.

Overview

2.2.3 The route of the Proposed Scheme through the Ratcliffe-on-Soar to Long Eaton area would be approximately 9.2km long and lies within the local authority areas of LeCC, DCC, NCC, NWLDC, RBC, EBC and BBC areas. The route would extend from the north-west of Kegworth in the south of the area and travel north through Redhill, Long Eaton and Toton, up to the B5010 Derby Road overbridge.

2.2.4 This section of route is illustrated on maps CT-06-428b to CT-06-434a in the Volume 2: LA05 Map Book.

2.2.5 The Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area has three main components:

- the route of the Proposed Scheme, continuing from the Coleorton to Kegworth area (LA04) north-east towards the Stapleford to Nuthall area (LA06);
- East Midlands Hub station: an integrated station for the route of the Proposed Scheme and conventional lines; and
- modifications to the existing conventional lines to accommodate the Proposed Scheme and service the East Midlands Hub station.

2.2.6 In general, features are described along the route of the Proposed Scheme from south to north along the route, and from west and east for features that cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA05 Map Book.

2.2.7 In the Ratcliffe-on-Soar to Long Eaton area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 7.2km (Ratcliffe-on-Soar, Long Eaton and Toton viaducts);
- cuttings for a total length of 230m (Ratcliffe-on-Soar cutting and Redhill north cutting);
- cutting for a total length of 700m (Toton trough);
- embankment for a total length of 800m (Toton embankment); and

- tunnel for a total length of 200m (Redhill tunnel).

2.2.8 All dimensions in the sections below are approximate.

2.2.9 The route of the Proposed Scheme is described in four separate sections below.

2.2.10 In general, features are described along the route of the Proposed Scheme from south to north, and west to east as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA05 Map Book.

A453 Remembrance Way to Redhill tunnel

2.2.11 The route of the Proposed Scheme would continue from the Coleorton to Kegworth area, heading north-east towards Long Eaton and Toton. The route through this area would be carried on the Ratcliffe-on-Soar viaduct crossing over the A453 Remembrance Way, the River Soar and the MML.

2.2.12 This section of the Proposed Scheme is illustrated on maps CT-06-428b to CT-06-431 in the Volume 2: LA05 Map Book.

2.2.13 Key features of this 3.4km section would include:

- Ratcliffe-on-Soar viaduct, 3.2km in length and up to 14m in height, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. The Ratcliffe-on-Soar viaduct crosses the A453 Remembrance Way on the A453 Remembrance Way crossing (see Volume 2: Map CT-06-428b, J6 to Map CT-06-430, I6);
- Kegworth auto-transformer feeder station, on the western side of the route of the Proposed Scheme and to the east of the A453 Remembrance Way and M1 junction 24, within an area of landscape mitigation planting. Access would be provided via an access road from the A6 Derby Road to the south (see Volume 2: Map CT-06-428b, I4 to I5);
- an area of woodland habitat creation along the western side of the Proposed Scheme and the A453 Remembrance Way, to provide replacement habitat (see Volume 2: Map CT-06-429b, A3 to F5);
- a balancing pond and pumping station for railway drainage to the west of the route of the Proposed Scheme, with an access road provided from the diversion of Long Lane (see Volume 2: Map CT-06-429b, G5);
- diversion of Long Lane, 35m east of its current alignment, from the point it crosses the A453 Remembrance Way to connect with Ratcliffe Lane on the western side of the route of the Proposed Scheme. The diversion of Long Lane would be 500m in length (see Volume 2: Map CT-06- 429b, G6 to I6);
- extension of Leicestershire Footpath 60, 185m north of its current alignment for 300m, crossing under the route of the Proposed Scheme to meet the diversion of Long Lane to the east of the route of the Proposed Scheme (see Volume 2: Map CT-06-429b, H6);
- an area of grassland habitat creation to the east and west of the Proposed

Scheme, adjacent to the Ratcliffe-on-Soar viaduct to provide replacement habitat (see Volume 2: Map CT-06-430, B5 to B6);

- an area of woodland habitat creation to the west of the Proposed Scheme, adjacent to the River Soar to provide replacement habitat (see Volume 2: Map CT-06-430, B5 to B6);
- a grid supply point to supply electrical power to the Kegworth auto-transformer feeder station, located south of Ratcliffe-on-Soar Power Station and the A453 Remembrance Way with access from Kegworth Road. A 2.6km underground cable, which would supply power for the auto-transformer feeder station, would connect the grid supply point to the Kegworth auto-transformer feeder station (see Volume 2: Map CT-06-430-R1, C5);
- two areas of woodland habitat creation to the east and west of the Ratcliffe-on-Soar viaduct, adjacent to the River Soar (see Volume 2: Map CT-06-430, E5 to E6);
- an area of woodland habitat creation to the east and west of the Proposed Scheme, adjacent to the Ratcliffe-on-Soar viaduct immediately to the south of the Ratcliffe-on-Soar cutting (see Volume 2: Map CT-06-430, I7 to J5); and
- Ratcliffe-on-Soar cutting, 200m in length, 80m in width and 9m in depth (see Volume 2: Map CT-06-430, I6 to J6).

2.2.14 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.

2.2.15 Construction of this section would be managed from the Ashby Road main compound in the Coleorton to Kegworth area (LA04), A6 Derby Road and A453 Remembrance Way satellite compound, River Soar satellite compound, River Soar main compound and Redhill main compound, which are described in Section 2.3, and shown on maps CT-05-428b, CT-05-429b, CT-05-430 and CT-05-431 in the Volume 2: LA05 Map Book.

Redhill tunnel to Trent Junction

2.2.16 The route of the Proposed Scheme would continue through Wood Hill via Redhill tunnel before passing onto the Long Eaton and Toton viaduct, and continuing to Trent Junction, where a number of conventional lines converge, to the south-east of Long Eaton.

2.2.17 This section of the Proposed Scheme is illustrated on maps CT-06-431 and CT-06-432 in the Volume 2: LA05 Map Book.

2.2.18 Key features of this 2km section would include:

- Redhill tunnel, a green tunnel[29], approximately 200m in length and up to 25m

[29] A cut-and-cover tunnel with soil spread on top to integrate it into the landscape, thus reducing visual impacts and making the presence of a railway less noticeable. Access tracks and vegetation can be placed on the surface above the tunnel and it can be used for amenity, parkland and agricultural uses etc.

in depth, passing under Wood Hill. The top of the tunnel would be up to 13m below existing ground level and track level would be up to 23m below existing ground level. An area of woodland and grassland habitat creation would be located above Redhill tunnel, to provide replacement habitat (see Volume 2: Map CT-06-431, B6 to C6);

- Redhill north cutting 30m in length, 70m in width and up to 9m in depth (see Volume 2: Map CT-06-431, C6 to C7);
- a section of Long Eaton and Toton viaduct, 1.7km in length and up to 16m in height, from the northern end of the Redhill north cutting to Trent Junction with two piers located in the River Trent. An area of woodland habitat creation to the east and west of the Proposed Scheme, adjacent to the Cranfleet Canal to provide replacement habitat (see Volume 2: Map CT-06-431, C6 to Map CT-06-432, B6);
- an area of grassland habitat creation to the east and west of the Proposed Scheme, adjacent to West Lake to provide replacement habitat (see Volume 2: Map CT-06-431, G7 to I6); and
- West Lake causeway, comprising two sections of embankment extending into the lake from the northern and southern sides, with an open channel between the two embankments to maintain connectivity between the east and west sides of the lake. The West Lake causeway would allow the Long Eaton and Toton viaduct to cross the lake from south to north (see Volume 2: Map CT-06-431, G7 to I6).

2.2.19 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.

2.2.20 Construction of this section would be managed from the Redhill main compound, Long Eaton satellite compound No. 1 and Long Eaton satellite compound No.2 which are described in Section 2.3, and shown on map CT-05-431 in the Volume 2: LA05 Map Book.

Trent Junction to the A6005 Nottingham Road

2.2.21 The route of the Proposed Scheme would continue north on the Long Eaton and Toton viaduct, passing over Meadow Brook Business Park and the town of Long Eaton towards the A6005 Nottingham Road.

2.2.22 This section of Proposed Scheme is illustrated on map CT-06-432 in the Volume 2: LA05 Map Book.

2.2.23 Key features of this 1.5km section would include:

- continuation of the Long Eaton and Toton viaduct for 1.5km, between 15m and 19m in height above ground level. Noise fence barriers would be included on this section of the viaduct on both sides of the route to provide acoustic screening for properties in Long Eaton: these would be 4m in height for those

parts of the viaduct closest to residential properties and 2m or 3m in height elsewhere (see Volume 2: Map CT-06-432, A6 to I5);

- an area of landscape mitigation planting to the east and west of the Proposed Scheme between the Long Eaton High Level Line and the Long Eaton Low Level Line, to provide visual screening to residents of Long Eaton along Meadow Lane, Trent Lane and Newbery Avenue (see Volume 2: Map CT-06-432, C5 to D6);
- Trent Junction auto-transformer station, on the western side of the route of the Proposed Scheme, and to the east of the Long Eaton Low Level Line. Access would be provided via an access road from Meadow Lane (see Volume 2: Map CT-06-432, C6);
- a balancing pond for railway drainage to the east of the route of the Proposed Scheme, with road access provided via a junction with Meadow Lane (see Volume 2: Map CT-06-432, C6);
- diversion of Long Eaton Footpath 72, west of its current alignment for 530m, running adjacent to the west of the route of the Proposed Scheme (see Volume 2: Map CT-06-432, F6 to H5); and
- areas of woodland habitat creation and grassland habitat creation to the east and west of the Proposed Scheme to provide habitat connectivity and help integrate the Proposed Scheme into the existing landscape (see Volume 2: Map CT-06-432, C5 to J5).

2.2.24 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.

2.2.25 Construction of this section would be managed from the Long Eaton main compound, which is described in Section 2.3, and shown on map CT-05-432 in the Volume 2: LA05 Map Book.

A6005 Nottingham Road to the B5010 Derby Road

2.2.26 The Proposed Scheme would continue on the Long Eaton and Toton viaduct to the East Midlands Hub station. The Proposed Scheme would continue north adjacent to the Erewash Valley Line, before passing over the River Erewash and under the A52 Brian Clough Way, up to the B5010 Derby Road, which forms the northern boundary of the Ratcliffe-on-Soar to Long Eaton area.

2.2.27 This section of the Proposed Scheme is illustrated on maps CT-06-432 to CT-06-434a in the Volume 2: LA05 Map Book.

2.2.28 Key features of this 2.3km section would include:

- continuation of the Long Eaton and Toton viaduct, 800m in length in this section and up to 15m in height. Noise fence barriers would be included on this section of the viaduct on both sides of the route to provide acoustic screening

for properties in Long Eaton: these would be 4m in height for those parts of the viaduct closest to residential properties and 2m or 3m in height elsewhere (see Volume 2: Map CT-06-432, I5 to Map CT-06-433, G6);

- a balancing pond for railway drainage to the east of the route of the Proposed Scheme, with road access provided via internal roads within the East Midlands Hub station (see Volume 2: Map CT-06-433, B6 to C6);
- realignment of Long Eaton Footpath 4, approximately 70m west of its current alignment for 150m, running to the west of the route of the Proposed Scheme (see Volume 2: Map CT-06-433, C5 to D5);
- closure of Beeston Bridleway 125, Beeston Bridleway 126, Beeston Bridleway 127 and Beeston Bridleway 128 where these would cross the route of the Proposed Scheme and lie within the footprint of East Midlands Hub station. Pedestrians would be diverted to Long Eaton Footpath 17 on the eastern side of the East Midlands Hub station (see Volume 2: Map CT-06-433, D7 to Map CT-06-434a, B6);
- Toton embankment, 800m in length, 6m in height at its southern end and at existing ground level at its northern end (see Volume 2: Map CT-06-433, H6 to Volume 2: Map CT-06-433, G5 to J6);
- a balancing pond for railway drainage to the west of the route of the Proposed Scheme, with road access provided via internal roads within the East Midlands Hub station (see Volume 2: Map CT-06-434a, B3 to B4);
- a section of Toton trough[30], an open cut concrete channel with retaining walls 900m in length and up to 3m below ground level. Approximately 700m of the Toton trough would be located in the Ratcliffe-on-Soar to Long Eaton area and the remaining 200m would be located in the Stapleford to Nuthall area (LA06). 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 of Sandiacre (see Volume 2: Map CT-06-434a, C5 to F5);
- two balancing ponds for highway drainage to the west of the route of the Proposed Scheme, with road access provided via the A52 Brian Clough Way (see Volume 2: Map CT-06-434a, D3 to D4);
- A52 Brian Clough Way River Erewash underbridge, 20m in length and up to 8m above ground level to enable the River Erewash to pass under the realigned A52 Brian Clough Way, located to the west of the route of the Proposed Scheme (see Volume 2: Map CT-06-434a, D4);
- an area of landscape mitigation planting and woodland habitat creation, to the

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

east of the Proposed Scheme, adjacent to the realigned Bessell Lane and the A52 Brian Clough Way (see Volume 2: Map CT-06-434a, C6 to E8);

- the A52 Brian Clough Way would be realigned from the Erewash Canal to the B6003 Toton Lane Bardills roundabout. The realignment would include the A52 Brian Clough Way overbridge[31] located 25m south of the existing A52 Brian Clough Way bridge. The overbridge would comprise a dual two lane carriageway 60m in length, up to 8m above ground level and up to 10m above track level, passing over the route of the Proposed Scheme and the Erewash Valley Line, together with the rail and highway access into DB Cargo (see Volume 2: Map CT-06-434a, D5);
- A52 Brian Clough Way Bessell Lane underbridge, 13m in length and up to 8m above ground level, to enable Bessell Lane to pass under the realigned A52 Brian Clough Way, located to the east of the route of the Proposed Scheme (see Volume 2: Map CT-06-434a, D6);
- an attenuation tank and pumping station, on the western side of the route of the Proposed Scheme and to the north of the A52 Brian Clough Way. The attenuation tank and pumping station would enable surface water from the Proposed Scheme (which would be below existing ground level at this location) to be retained and pumped to an outlet above ground level, before being discharged to the River Erewash (see Volume 2: Map CT-06-434a, E4 to E5);
- a balancing pond for highway drainage to the east of the route of the Proposed Scheme, with road access provided via a junction from Bessell Lane (see Volume 2: Map CT-06-434a, D6 to E7);
- realignment of the B5010 Derby Road, 500m in length, to cross over the Proposed Scheme on the B5010 Derby Road overbridge. The B5010 Derby Road overbridge would be 45m in length, up to 8m above ground level and 10m above track level. Retaining walls, 600m in length and up to 7m in height, would be located along B5010 Derby Road, Bessell Lane and the DB Cargo access road (see Volume 2: Map CT-06- 434a, F5); and
- B5010 Derby Road River Erewash underbridge, 11m in length and up to 6m above ground level, to enable the River Erewash to pass under the realigned B5010 Derby Road (see Volume 2: Map CT-06- 434a, F4).

2.2.29 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.

2.2.30 Construction of this section would be managed from the Long Eaton and East Midlands Hub station main compound, East Midlands Hub station main compound

[31] A bridge crossing over a transport corridor such as a railway line.

and B5010 Derby Road satellite compound, which are described in Section 2.3, and shown on map CT-05-433 and map CT-05-434a in the Volume 2: LA05 Map Book.

East Midlands Hub station

2.2.31 East Midlands Hub station would provide an intermodal interchange for passengers between HS2 and conventional railway services. East Midlands Hub station would occupy land within the existing Toton Yard.

2.2.32 The footprint of the East Midlands Hub station would be 415m in length and 165m in width.

2.2.33 The East Midlands Hub station would include:

- a roof and canopy structure, up to 10m in height, that would span the length of the platforms allowing natural light into the station;
- four high speed platforms (each approximately 415m in length), arranged into two island platforms;
- four conventional line platforms (each approximately 280m in length), arranged into two island platforms;
- a station concourse;
- a station entrance plaza that would provide a flexible space for a range of uses, including retail and social spaces;
- clear signage would be incorporated throughout the station. All routes through the station would be fully accessible (i.e. to include lifts and ramps where appropriate);
- new or existing pedestrian routes, cycle routes and bridleways would be incorporated within and around the station to improve connectivity with local communities;
- a 4,000 space surface car park to the west and east of the station, including parking for both public and station staff;
- an area of public realm around the station building, which would include cycle parking facilities and informal recreational space;
- utility diversions (including water main, electricity and telecommunications cables); and
- areas of hard standing around the station perimeter for maintenance and emergency vehicle access.

2.2.34 Two dedicated tracks would pass through the station between the Proposed Scheme platform tracks, to accommodate non-stopping HS2 services. The two dedicated tracks for non-stopping HS2 services would run at a different height to the platform tracks, approximately 3m in height above at the southern end of the station; and approximately the same level as the platforms at the northern end of the station.

2.2.35 Lifts, stairs and escalators would connect directly from the station concourse to the platform level above the concourse.

2.2.36 Vehicular access would be provided from the A52 Brian Clough Way and allowance for a corridor for a future extension of the Nottingham Express Transit (NET) tramline on the east side of the station.

2.2.37 A transport interchange for buses, taxis and private car hire facilities would be provided at the western entrance of East Midlands Hub station. This would include a taxi drop-off and pick-up zone adjacent to the entrance to the station concourse and a car hire pick-up and drop-off zone located alongside the station access road. This section of the Proposed Scheme is illustrated in the Volume 2: LA05 Map Book, Map Series CT-06-433 to CT-06-434a.

2.2.38 The station would be located within the River Erewash floodplain. Flood protection would be provided for the station, car park, access road, the realigned conventional lines and the Proposed Scheme, as it passes under the A52 Brian Clough Way.

2.2.39 An area of woodland, grassland and wetland habitat would be created to the east and west of the Proposed Scheme, adjacent to the route of the Proposed Scheme and East Midlands Hub station, to provide new public open spaces and replacement habitat (see Volume 2: Map CT-06-433, C9 to J3).

2.2.40 Six ecological mitigation ponds, to the east of the route of the Proposed Scheme to provide replacement habitat, with surrounding terrestrial habitat (see Volume 2: Map CT-06-433, C7 to D7).

2.2.41 Two balancing ponds would be provided, to the east of the surface car park and to the east and west of the high speed platforms adjacent to the Toton Fields LNR. These balancing ponds would store surface drainage water from the high speed and conventional railway, the station building, car park and local highways, and discharge to the River Erewash (see Volume 2: Map CT-06-433, D5 to D6 and Map CT-06-433, E7).

2.2.42 East Midlands Hub station culvert, located immediately to the west of the existing Bessell Lane, would be provided to realign an unnamed watercourse[32], under the route of the Proposed Scheme (see Volume 2 Map CT-06-434a, B5 to B6). The East Midlands Hub station access culvert, located to the east of the existing Bessell Lane, to enable an unnamed watercourse to cross under the East Midlands Hub station access route on its existing alignment (see Volume 2 Map CT-06-434a, B6).

2.2.43 The East Midlands Hub station would incorporate an area of public realm designed to integrate the station into the surrounding landscape and promote increased connectivity between Long Eaton and Stapleford. The public realm would seek to enhance the existing character of the area, strongly defined by the River Erewash, Toton Fields LNR and the industrial heritage of Toton Yard.

[32] This is also referred to as a tributary to the River Erewash (2) in Section 15, Water resources and flood risk

2.2.44 The entrances to the East Midlands Hub station would incorporate areas of hard surfacing to allow access and ingress to the station building, as well as gathering and meeting points for pedestrians.

2.2.45 Construction of the East Midlands Hub station would be managed from the Long Eaton and East Midlands Hub station main compound and East Midlands Hub station main compound, which is described in Section 2.3, and shown on map CT-05-433 and map CT-05-434a in the Volume 2: LA05 Map Book.

Modifications to existing Erewash Valley Line

2.2.46 To accommodate the Proposed Scheme and to facilitate the introduction of conventional passenger rail services at the East Midlands Hub station, modifications would be required to the existing conventional railway infrastructure.

2.2.47 This section of the Proposed Scheme is illustrated on maps CT-06-432, CT-06-433 and CT-06-434a in the Volume 2: LA05 Map Book.

2.2.48 The existing Long Eaton Low Level Line and Long Eaton High Level Line would be realigned within the existing conventional rail corridor from Trent Junction at Meadow Lane in the south, through Long Eaton north of Station Street up to where the Proposed Scheme would pass over the River Erewash on the Long Eaton and Toton viaduct.

2.2.49 To accommodate the construction of the Proposed Scheme and realigned Erewash Valley Line to the west, areas of existing railway infrastructure within Toton Yard would be removed, including the tracks, buildings, access roads and parking areas. The Network Rail High Output Operations Base (HOOB) and the Local Distribution Centre (LDC) would be relocated away from Toton. The existing DB Cargo and Network Rail sidings would remain in their current position, with altered rail connections to the Erewash Valley Line.

2.2.50 The existing Long Eaton Low Level Line is at ground level and the Long Eaton High Level Line is on embankment through Long Eaton. The Long Eaton High Level Line would be realigned approximately 2m to the west of its current alignment as it crosses over the A6005 Nottingham Road. The existing railway bridge over the A6005 Nottingham Road would be rebuilt to accommodate the railway realignment (see Volume 2: Map CT-06-432, I7).

2.2.51 From the north of the A6005 Nottingham Road to the south of the River Erewash, the Long Eaton High Level Line would be realigned approximately 50m to the west of its existing alignment to cross under the route of the Proposed Scheme. The realigned Long Eaton High Level Line would descend on embankment up to 4m in height to form a new junction with the Long Eaton Low Level Line (see Volume 2: Map CT-06-432, I7 to Map CT-06-433, B6 to C5).

2.2.52 The Long Eaton Low Level Line would remain at ground level as it crosses under the A6005 Nottingham Road before rising on embankment up to 4m above existing level to form a new junction with the Long Eaton High Level Line. The existing road bridge over the railway would be rebuilt to accommodate the railway realignment (see Volume 2: Map CT-06-432, J5).

2.2.53 The two conventional lines would converge on embankment to form a four track line on the approach to the East Midlands Hub station, before running onto the East Midlands Hub station Network Rail viaduct. The viaduct would cross over the River Erewash and enable the lines to rise to the same level as the route of the Proposed Scheme, up to 7m above existing ground level at East Midlands Hub station (see Volume 2: Map CT-06-433, D5 to E5).

2.2.54 At East Midlands Hub station, the four tracks would diverge to serve the four conventional line platforms (see Volume 2: Map CT-06-433, E6 to G5). To the north of East Midlands Hub station, the four tracks would descend from the Network Rail viaduct onto the Toton embankment back to the ground level of the existing railway (see Volume 2: Map CT0-06-433, G5). New tracks to connect the realigned sections of the Erewash Valley Line to the sidings within Toton Yard would be provided (see Volume 2: Map CT-06-434a, D5).

2.2.55 The Balfour Beatty rail yard, a depot that acts as a base for rail maintenance operations and includes a number of sheds, offices and storage areas, would be displaced to accommodate the Proposed Scheme.

2.2.56 Construction of this section would be managed from the Long Eaton main compound, Long Eaton and East Midlands Hub station main compound and East Midlands Hub station compound, which is described in Section 2.3, and shown on map CT-05-432 and map CT-05-433 in the Volume 2: LA05 Map Book.

Demolitions

2.2.57 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.

2.2.58 At this stage of the design development, it is anticipated that demolition of 183 existing residential properties, 52 commercial/business properties (including farm outbuildings) and 18 other structures would be required to construct the permanent features in the Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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[33] 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:

- 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

[33] 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

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 would 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 routes, 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 Part of the construction of the Proposed Scheme would take place on or immediately adjacent to the existing Erewash Valley Line. Where possible, such construction would be planned to normally take place at night, weekends or during bank holidays, so that there is less disruption to services.

2.3.16 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

2.3.17 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.

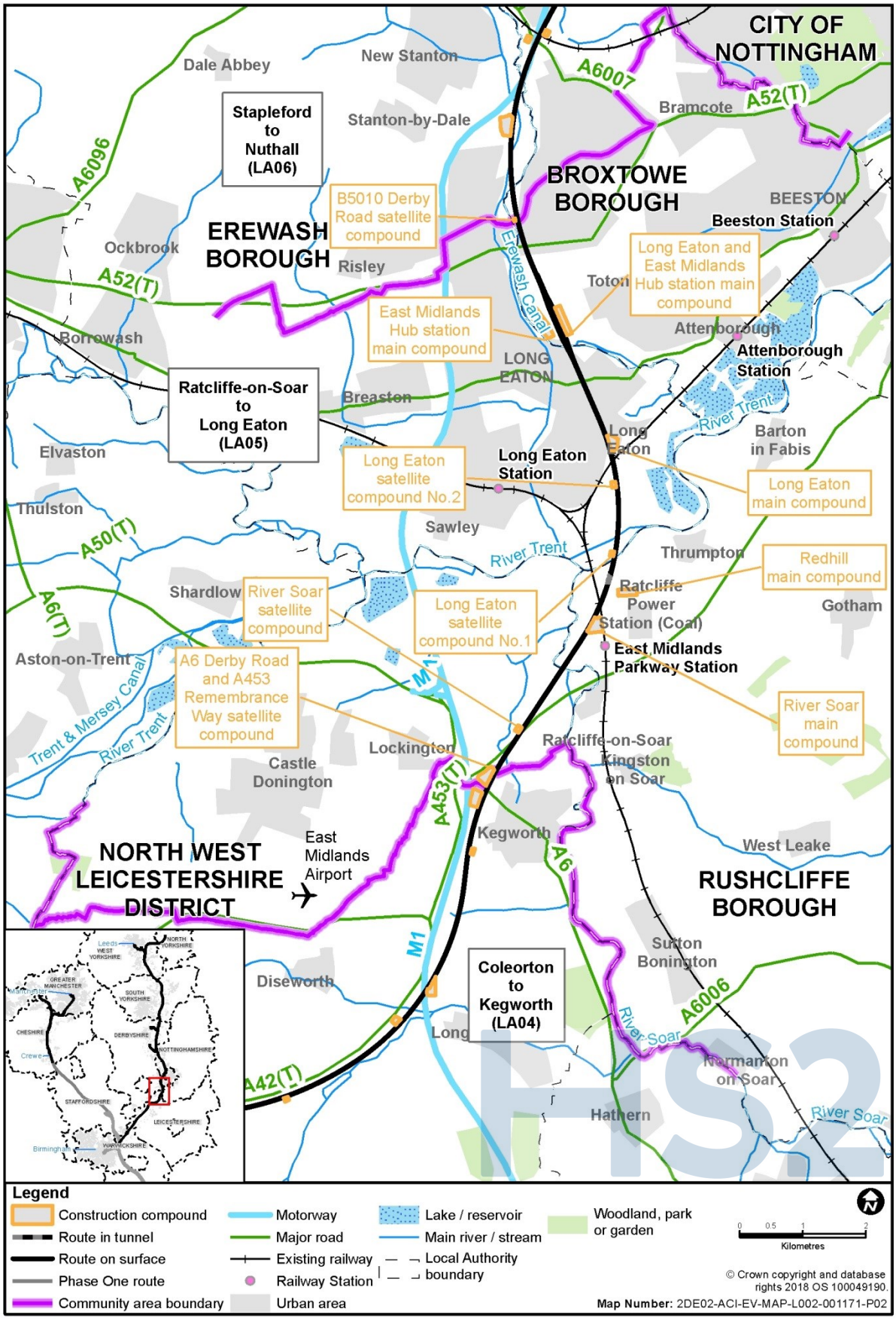
2.3.18 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.19 There would be five main civil engineering compounds within the Ratcliffe-on-Soar to Long Eaton area. These would manage five civil engineering satellite compounds in the Ratcliffe-on-Soar to Long Eaton area, all 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 Ratcliffe-on-Soar to Long Eaton area would be managed from main compounds located in the Appleby Parva to Ashby-de-la-Zouch area (LA03) (see Volume 2: Community area LA03, Appleby Parva to Ashby-de-la-Zouch) and the Coleorton to Kegworth area (LA04) compound (see Volume 2: Community area LA04, Coleorton to Kegworth).

2.3.21 The location of construction compounds in the Ratcliffe-on-Soar to Long Eaton area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA05 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Ratcliffe-on-Soar to Long Eaton 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 and subsoil 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 Ratcliffe-on-Soar to Long Eaton area are described in the subsequent sections of this report.

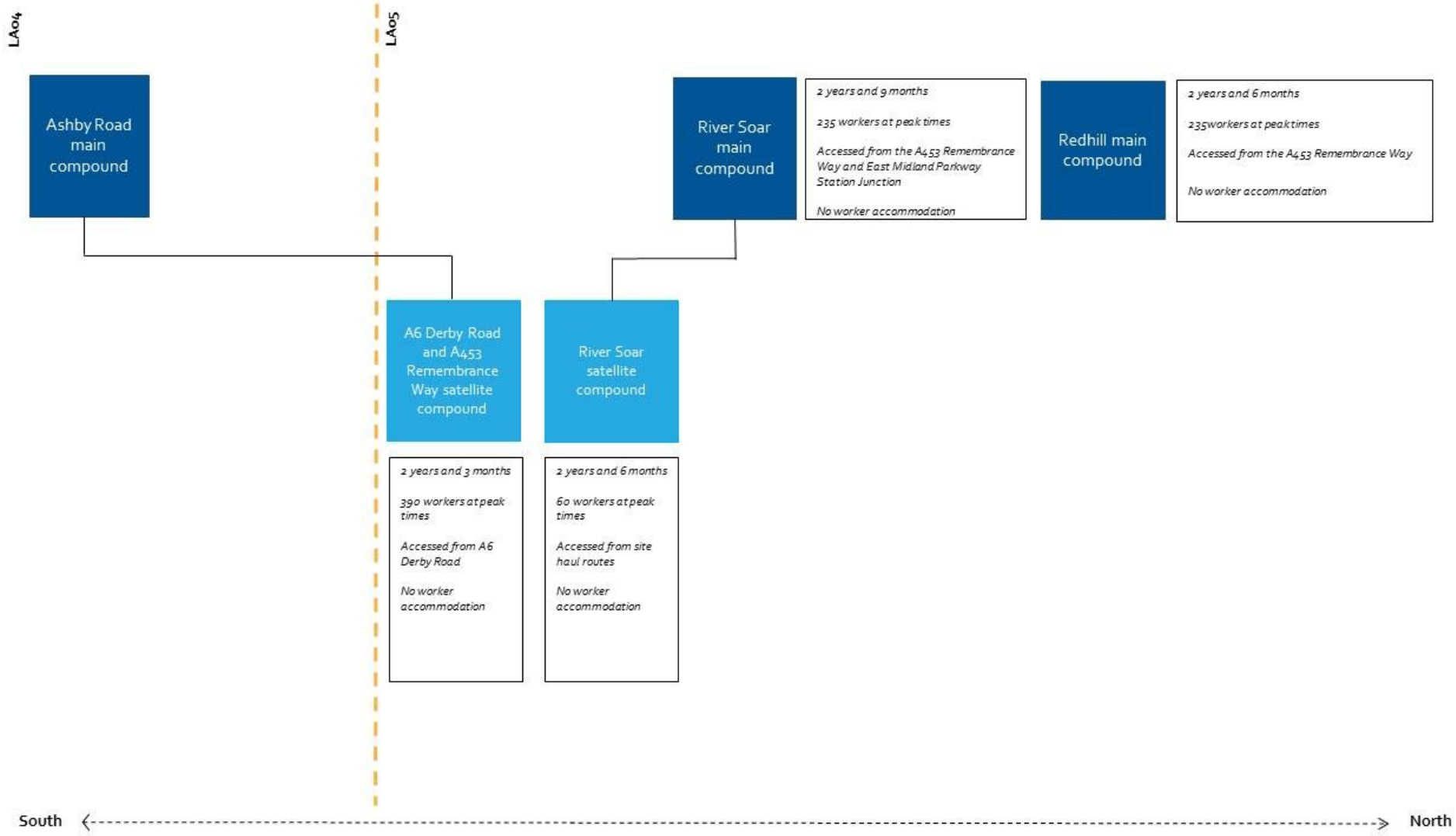
2.3.27 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.

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 Ratcliffe-on-Soar to Long Eaton 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



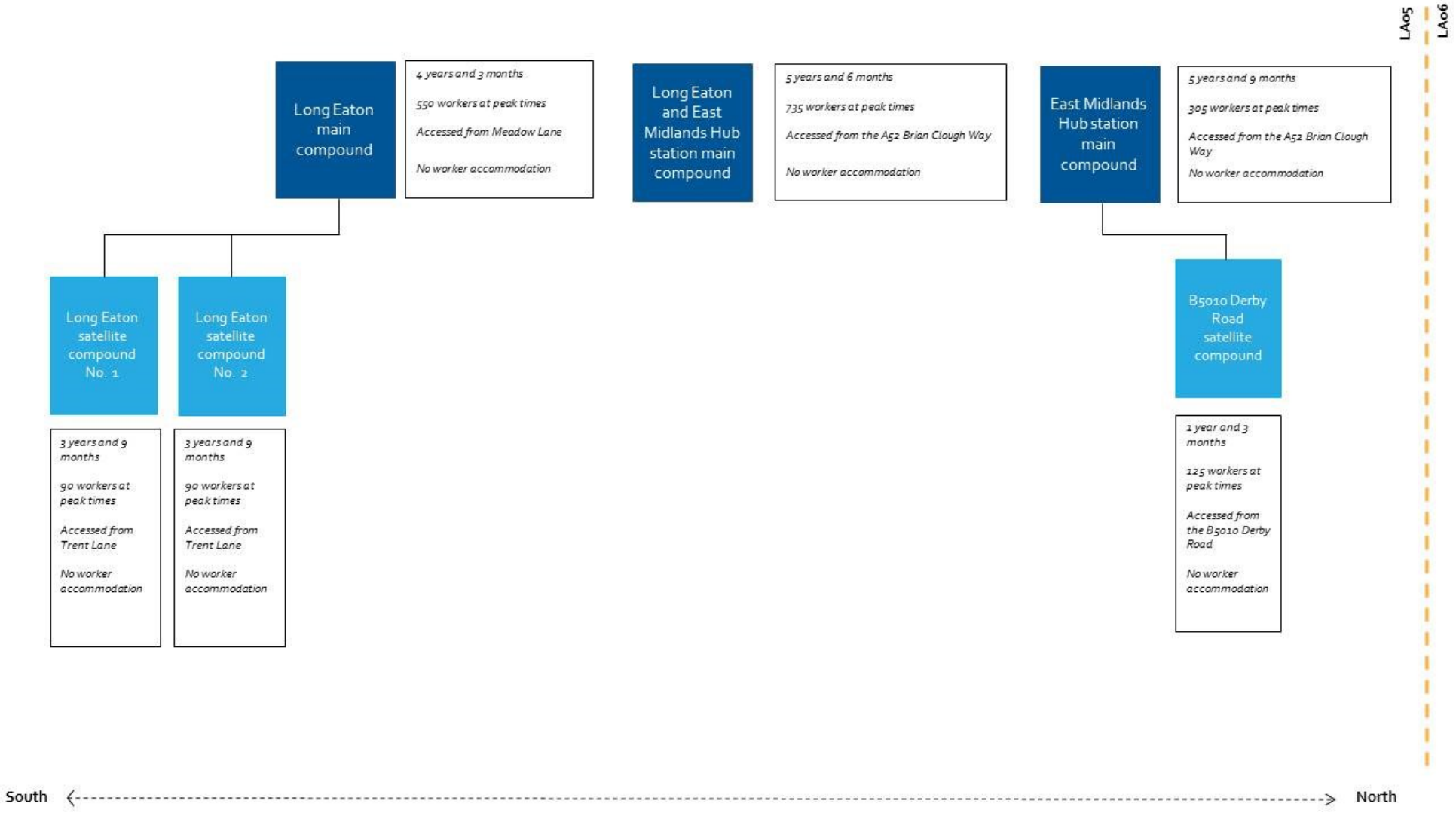
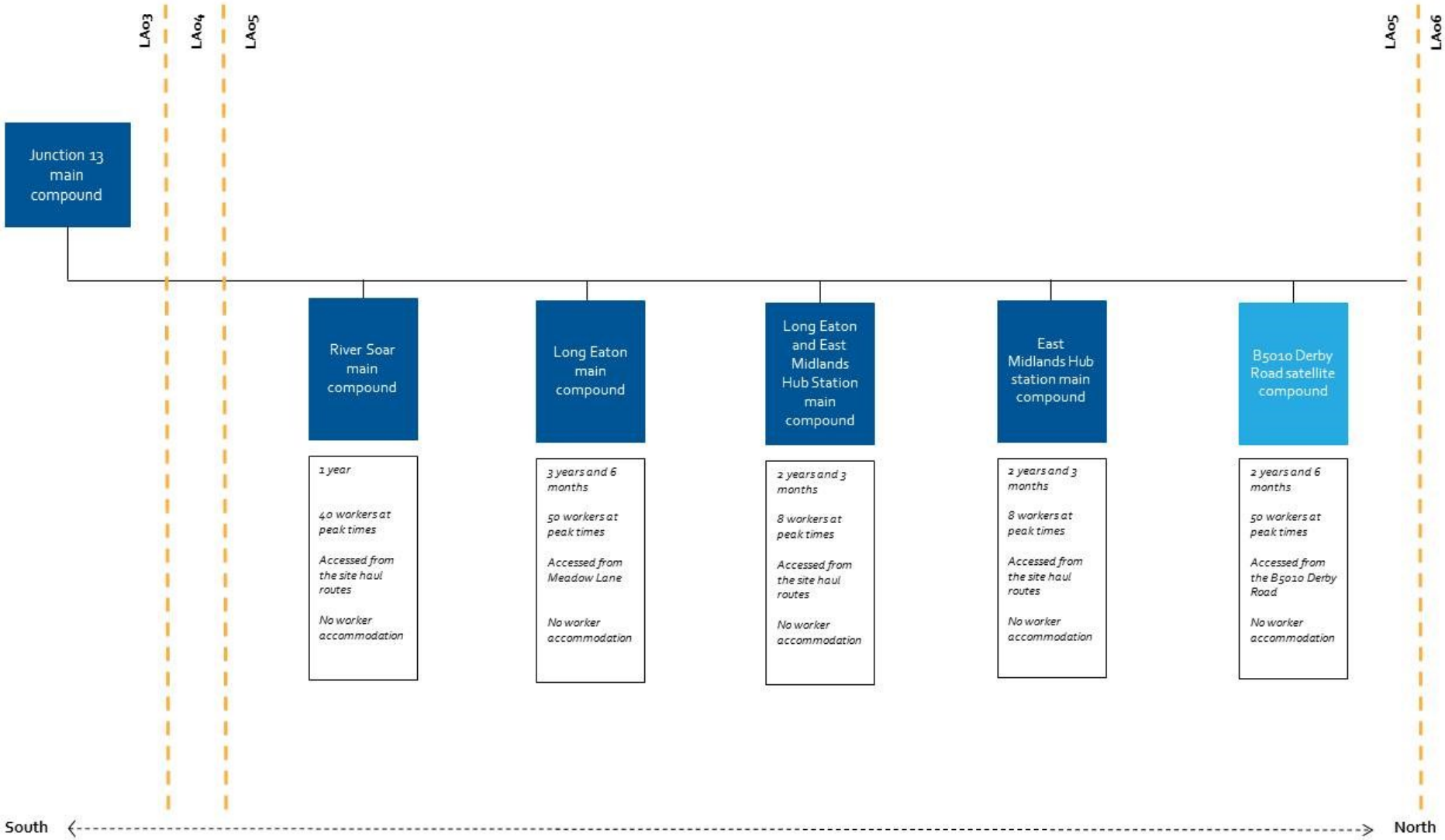

LA05
LA06
Long Eaton main compound
4 years and 3 months
550 workers at peak times
Accessed from Meadow Lane
No worker accommodation
Long Eaton and East Midlands Hub station main compound
5 years and 6 months
735 workers at peak times
Accessed from the A52 Brian Clough Way
No worker accommodation
East Midlands Hub station main compound
5 years and 9 months
305 workers at peak times
Accessed from the A52 Brian Clough Way
No worker accommodation
Long Eaton satellite compound No. 1
3 years and 9 months
90 workers at peak times
Accessed from Trent Lane
No worker accommodation
Long Eaton satellite compound No. 2
3 years and 9 months
90 workers at peak times
Accessed from Trent Lane
No worker accommodation
B5010 Derby Road satellite compound
1 year and 3 months
125 workers at peak times
Accessed from the B5010 Derby Road
No worker accommodation
South
North

Figure 6: Construction compounds for railway systems works



Ashby Road main compound

2.3.30 This main compound (see Map CT-05-428b, G4) would be located within the Coleorton to Kegworth area (LA04). It is described in Volume 2: Community area report LA04, Coleorton to Kegworth. The compound would be used to manage the construction of the Kegworth auto-transformer feeder station, within the Ratcliffe-on-Soar to Long Eaton area.

A6 Derby Road and A453 Remembrance Way satellite compound

2.3.31 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 3.

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

2.3.33 The compound would be used to manage part of the construction of the Ratcliffe-on-Soar viaduct, which would take two years and three months to complete.

2.3.34 The compound would be used to manage construction of the A6 Kegworth embankment in the Coleorton to Kegworth area, which would take two years and three months to complete.

2.3.35 The compound would be used to manage construction of the A453 Remembrance Way crossing (part of the Ratcliffe-on-Soar viaduct), which would take one year and nine months to complete.

2.3.36 Access to the compound would be from the A6 Derby Road. This would require the existing Delta Force Paintball Nottingham Road access to be upgraded for construction traffic.

River Soar satellite compound

2.3.37 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 5.

2.3.38 The works to be managed from this compound would require demolition of the following buildings, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the River Soar satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Keepers Cottage, Green Lane, Kegworth	Ratcliffe-on-Soar viaduct
Residential property	Dowells Barn, Green Lane, Kegworth	Ratcliffe-on-Soar viaduct

2.3.39 The compound would be used to manage construction of the Ratcliffe-on-Soar viaduct, which would take two years and six months to complete.

2.3.40 The compound would be used to manage construction of the A453 Remembrance Way crossing (part of the Ratcliffe-on-Soar viaduct), which would take one year and nine months to complete.

2.3.41 The construction of the A453 Remembrance Way crossing is likely to result in the temporary closure of the A453 Remembrance Way during construction, with diversions along local roads.

2.3.42 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Ratcliffe-on-Soar viaduct would be located at this compound for a period of two years and six months.

2.3.43 The compound would be used to manage a number of utility diversions.

River Soar main compound

2.3.44 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 3 and Figure 4, 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.

2.3.45 The works to be managed from this compound would require demolition of the following building, as described in Table 2.

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

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Middle Gate Cottage, Ratcliffe-on-Soar, Nottingham	Ratcliffe-on-Soar viaduct

2.3.46 The compound would be used to manage the construction of the Ratcliffe-on-Soar viaduct, which would take two years and nine months to complete.

2.3.47 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Ratcliffe-on-Soar viaduct would be located at this compound for a period of two years and nine months, accessed from the A453 Remembrance Way and East Midlands Parkway station junction.

2.3.48 The works to be managed from this compound would require the permanent diversion of Long Lane approximately 35m to the east of its existing alignment, which would take two years and nine months to complete and would be constructed offline[34].

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

- temporary diversion of the Leicestershire Bridleway 101 for a period of two years and nine months. On completion of construction Leicestershire Bridleway 101 would be permanently reinstated to its existing alignment;
- temporary diversion of the Leicestershire Footpath 60 for a period of two years and nine months. On completion of construction, Leicestershire Footpath 60 would be permanently extended 185m north of its current alignment for 300m,

[34] Offline works are works which are generally constructed along or nearby existing routes, which will remain open during construction.

crossing under the route of the Proposed Scheme to meet the diversion of Long Lane to the east of the route of the Proposed Scheme;

- temporary diversion of the Leicestershire Footpath 61 for a period of two years and nine months. On completion of construction, Leicestershire Footpath 61 would be permanently reinstated to its existing alignment; and
- temporary diversion of the Ratcliffe-on-Soar Footpath 7 for a period of two years and nine months. On completion of construction, Ratcliffe-on-Soar Footpath 7 would be permanently reinstated to its existing alignment.

2.3.50 Key railway systems works to be managed from this main compound would include trackform construction and installation, which would take approximately one year to complete.

Redhill main compound

2.3.51 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 5.

2.3.52 The works to be managed from this compound would require demolition of the following building, as described in Table 3.

Table 3: Demolitions required as a result of the works to be managed from the Redhill main compound

Description	Location	Feature resulting in the demolition
Commercial		
Commercial property	Ratcliffe-on-Soar Power Station, Ratcliffe-on-Soar	Ratcliffe-on-Soar viaduct

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

- Ratcliffe-on-Soar cutting, which would take one year to complete; and
- Redhill north cutting, which would take two years and six months to complete.

2.3.54 The compound would be used to manage the construction of Redhill tunnel, which would take two years and six months to complete. Material excavated from the Redhill tunnel would be used as engineering material within the Ratcliffe-on-Soar to Long Eaton area and in adjacent areas, where possible.

Redhill tunnelling facility and logistics area

2.3.55 The Redhill main compound would provide the tunnelling facility and logistics area required for the construction of the Redhill tunnel. The area would occupy land to the south-east of the Redhill tunnel, within the operational footprint of the existing Ratcliffe-on-Soar Power Station and would be operational for two years and six months. This would provide an area for the storage of bulk materials, such as aggregates, structural steel and steel reinforcement and for the transfer of materials associated with the tunnelling works. The cut-and-cover construction of Redhill tunnel would require the storage and removal of excavated material. This area would be

accessed from the existing junction for the power station with the A453 Remembrance Way and would operate for a period of two years and six months.

Long Eaton satellite compound No. 1

2.3.56 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 5.

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

2.3.58 The compound would be used to manage construction of the Long Eaton and Toton viaduct, which would take three years and nine months to complete.

2.3.59 The compound would be used to manage construction of the River Trent crossing, including two piers in the river channel.

2.3.60 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Long Eaton and Toton viaduct would be located at this compound for a period of three years and nine months, accessed from Trent Lane.

2.3.61 The works to be managed from this compound would require improvements to Trent Lane, to enable construction compound access. On completion of construction, temporary lane restrictions and traffic management measures would be implemented to enable connection between the realigned road and the existing road.

2.3.62 The works to be managed from this compound would require the temporary diversion of Long Eaton Footpath 12. On completion of construction, Long Eaton Footpath 12 would be permanently reinstated to its existing alignment.

Long Eaton satellite compound No. 2

2.3.63 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 5.

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

2.3.65 The compound would be used to manage construction of the Long Eaton and Toton viaduct, which would take three years and nine months to complete.

2.3.66 The compound would be used to manage the construction of West Lake causeway, which would take one year and nine months to complete. The West Lake causeway would allow the Long Eaton and Toton viaduct to cross the lake from south to north.

2.3.67 The compound would be used to manage construction of the crossing of the route of the Proposed Scheme over the Nottingham to Trent Junction Line.

2.3.68 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Long Eaton and Toton viaduct would be located at this compound for a period of three years and nine months, accessed from Trent Lane.

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

2.3.70 The works to be managed from this compound are not anticipated to require works to PRoW.

Long Eaton main compound

2.3.71 This compound would be used to manage both civil engineering and railway systems works and provide main compound support to two satellite compounds in the Ratcliffe-on-Soar to Long Eaton area (Long Eaton satellite compound No. 1 and Long Eaton satellite compound No.2), as illustrated in Figure 5.

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

Table 4: Demolitions required as a result of the works to be managed from the Long Eaton main compound

Description	Location	Feature resulting in the demolition
Residential		
13 residential properties on Station Road	Station Road, Long Eaton	Long Eaton and Toton viaduct
16 residential properties on Bonsall Court	Bonsall Court, Long Eaton	Long Eaton and Toton viaduct
73 residential properties on Bonsall Street	Bonsall Street, Long Eaton	Long Eaton and Toton viaduct
Five residential properties on Thornfield Square	Thornfield Square, Long Eaton	Long Eaton and Toton viaduct
12 residential properties on Newbery Avenue	Newbery Avenue, Long Eaton	Long Eaton and Toton viaduct
32 Residential properties on New Tythe Street	New Tythe Street, Long Eaton	Long Eaton and Toton viaduct
Seven residential properties on Meadow Lane	Meadow Lane, Long Eaton	Long Eaton and Toton viaduct
Four residential properties at Gate House	Gate House, Main Street, Long Eaton	Long Eaton and Toton viaduct
Eleven residential properties at Trent Cottages	Trent Cottages, Long Eaton	Long Eaton and Toton viaduct
Commercial		
Two commercial properties at The New Media Centre	The New Media Centre, New Tythe Street, Long Eaton	Long Eaton and Toton viaduct
Commercial property	Station Road, Long Eaton	Long Eaton and Toton viaduct
Five retail units on Station Road	Station Road, Long Eaton	Long Eaton and Toton viaduct
Café	Station Road, Long Eaton	Long Eaton and Toton viaduct
Two industrial units at Smiths Yard	Smiths Yard, New Tythe Street, Long Eaton	Long Eaton and Toton viaduct
Four commercial properties and an outbuilding on Bonsall Street	Bonsall Street, Long Eaton	Long Eaton and Toton viaduct
Four commercial units at Meadow Brook Business Park	Meadow Brook Business Park, Meadow Lane, Long Eaton	Long Eaton and Toton viaduct
Commercial property	Meadow Lane, Long Eaton	Long Eaton and Toton viaduct

Description	Location	Feature resulting in the demolition
Two storage buildings on Trent Cottages	Trent Cottages, Long Eaton	Long Eaton and Toton viaduct
Industrial building	Toton Yard, Long Eaton	Long Eaton and Toton viaduct
Commercial property	Mayfield Grove, Long Eaton	Long Eaton and Toton viaduct
Other		
Kingdom Hall of Jehovah's Witnesses	New Tythe Street, Long Eaton	Long Eaton and Toton viaduct
Electricity sub-station	Trent Cottages, Long Eaton	Long Eaton and Toton viaduct
Pumping station	New Sawley Brook Pumping Station, Trent Lane, Long Eaton	Long Eaton and Toton viaduct
Utility infrastructure	A6005 Nottingham Road, Long Eaton	Long Eaton and Toton viaduct
Three signal huts	A6005 Nottingham Road, Long Eaton	Long Eaton and Toton viaduct
Four signal huts	Trent Junction, Long Eaton	Long Eaton and Toton viaduct

2.3.73 This compound would be used to manage the construction of the Long Eaton and Toton viaduct, which would take four years and three months to complete.

2.3.74 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Long Eaton and Toton viaduct would be located at this compound for a period of four years and three months, accessed from Meadow Lane.

2.3.75 The works to be managed from this compound would require the temporary realignment of Long Eaton Footpath 12, Long Eaton Footpath 4, Long Eaton Footpath 6 and Long Eaton Footpath 72. On completion of construction, Long Eaton Footpath 12 and Long Eaton Footpath 6 would be permanently reinstated to their existing alignments. Long Eaton Footpath 4 and Long Eaton Footpath 72 would be permanently realigned to the west of the route of the Proposed Scheme.

2.3.76 The key railway systems works to be managed from this compound would include construction and installation of the Trent Junction auto-transformer station, track installation and modifications to the Long Eaton High Level and Long Eaton Low Level lines. The construction and installation of the Trent Junction auto-transformer station would take one year to complete. The Long Eaton track installation and works to the conventional lines would take two years and six months to complete.

Long Eaton and East Midlands Hub station main compound

2.3.77 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 3 and Figure 4, for a period of five 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 two years and three months.

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

Table 5: Demolitions required as a result of the works to be managed from the Long Eaton and East Midlands Hub station main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Bessell Lane, Stapleford	A52 Brian Clough Way Bessell Lane underbridge
Commercial		
Four commercial properties at Phoenix Mills	Phoenix Mills, Nottingham Road, Long Eaton	Long Eaton and Toton viaduct
Other		
Tank	Royal Avenue, Long Eaton	Long Eaton and Toton viaduct
Community centre	Greenwood Community Centre, Chester Green, Toton	Long Eaton and Toton viaduct
Outbuilding	DB Cargo, Toton Yard, Long Eaton	Long Eaton and Toton viaduct
Pumping station	Lock Lane, Sandiacre	East Midlands Hub station
Chimney	Phoenix Mills, Nottingham Road, Long Eaton	Long Eaton and Toton viaduct

2.3.79 The compound would be used to manage construction of the Long Eaton and Toton viaduct, which would take four years to complete, along with the construction of some elements of East Midland Hub station.

2.3.80 A pre-cast laydown area to store concrete elements, such as viaduct beams, and facilitate the construction of the Long Eaton and Toton viaduct would be located at this compound for a period of four years, accessed from the A52 Brian Clough Way.

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

- temporary realignment of Long Eaton Footpath 123 for a period of five years and six months. On completion of construction, Long Eaton Footpath 123 would be permanently reinstated to its existing alignment; and
- permanent closure of Beeston Bridleway 125, Beeston Bridleway 126, Beeston Bridleway 127 and Beeston Bridleway 128. Pedestrians would be permanently diverted to Long Eaton Footpath 17 on the eastern side of the East Midlands Hub station.

2.3.82 The key railway systems works to be managed from this compound would include track installation and works to the Erewash Valley Line, which would take two years and three months to complete.

East Midlands Hub station main compound

2.3.83 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 3 and Figure 4, for a period of five 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 two years and three months.

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

2.3.85 Along with the Long Eaton and East Midlands Hub station main compound, this compound also would be used to manage construction of the East Midlands Hub station, which would take five years and nine months to complete. Areas within the East Midlands Hub station compound would be used to provide storage and for the delivery of materials. Construction of the East Midlands Hub station would require the installation of a number of temporary tower cranes to enable structural elements to be lifted in place.

2.3.86 Constructing the East Midlands Hub station and maintain existing rail operations would require works to be carried out in stages as described below:

- Phase 1: enabling and site preparation works including mobilisation, site investigation, ground remediation, demolition, utility and road diversions, and protection of existing assets (such as the Erewash Valley lines and DB Cargo facilities to remain operational during construction) and advance works including provision of car parking;
- Phase 2: establishment of main compounds, continuing site clearance and demolition;
- Phase 3 and 4: Long Eaton and Toton viaduct and platform construction commences, Erewash Valley line track adjustments to facilitate diversions and station southern approach works;
- Phase 5: East Midlands Hub station Network Rail viaduct and platform construction commences;
- Phase 6: superstructure works, including construction of the new station building envelope, superstructure and roof canopy supports, and internal structures and slabs. Station fit-out would also commence in this phase; and
- Phase 7: station roof structure works, including installation of the roof canopy and associated glazing, cladding, drainage, lighting and internal finishes; station building fit-out and railway systems and finishing works.

2.3.87 This compound would be used to managed the construction of the following bridges:

- the A52 Brian Clough Way River Erewash underbridge, which would take two years to complete;
- the A52 Brian Clough Way overbridge, which would take two years to complete. The existing bridge would be demolished once the construction of the new overbridge had been completed; and
- the A52 Brian Clough Way Bessell Lane underbridge (the construction duration of which will be reported in the formal ES).

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

- Toton embankment, which would take four years to complete; and
- Toton trough, which would take four years to complete.

2.3.89 The works to be managed from this compound would require the permanent realignment of the A52 Brian Clough Way 25m south of its existing alignment, which would take one year and nine months to complete and would be constructed offline.

2.3.90 The key railway systems works to be managed from this compound would be the works to the Erewash Valley Line which would take approximately two years and three months to complete.

B5010 Derby Road satellite compound

2.3.91 This compound would be used to manage civil engineering works in the Ratcliffe-on-Soar to Long Eaton area, as illustrated in Figure 5, for a period of one year and three months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works for a period of two years and six months.

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

Table 6: 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		
Four residential properties on Bessell Lane	Bessell Lane, Stapleford	A52 Brian Clough Way Bessell Lane underbridge
Two residential properties on Station Road	Station Road, Sandiacre	B5010 Derby Road overbridge
Commercial		
Two commercial properties on Station Road	Station Road, Sandiacre	B5010 Derby Road overbridge
Retail unit	Station Road, Sandiacre	B5010 Derby Road overbridge
12 commercial properties on Bessell Lane	Bessell Lane, Stapleford	B5010 Derby Road overbridge
Retail unit	Palmer Drive, Stapleford	B5010 Derby Road overbridge
Four commercial properties on Palmer Drive	Palmer Drive, Stapleford	B5010 Derby Road overbridge
Hotel	Midland Hotel, Derby Road, Stapleford	B5010 Derby Road overbridge
Commercial property	Osmaston Street, Sandiacre	B5010 Derby Road overbridge
Office block	Station Road, Sandiacre	B5010 Derby Road overbridge
Other		

Description	Location	Feature resulting in the demolition
Outbuilding	Toton Yard, Long Eaton	B5010 Derby Road overbridge
Signal hut	Toton Yard, Long Eaton	B5010 Derby Road overbridge

2.3.93 This compound would be used to manage the construction of the B5010 Derby Road overbridge, which would take one year and three months to complete.

2.3.94 The compound would also be used to manage construction of the B5010 Derby Road River Erewash underbridge, which would take nine months to complete.

2.3.95 The works to be managed from this compound would require the permanent realignment of the B5010 Derby Road, which would take one year and three months to complete and would be constructed online[35].

2.3.96 The key railway systems works to be managed from this compound would include track installation and works to conventional lines. The track installation and works to the conventional lines would take two years and six months to complete.

Construction waste and material resources

2.3.97 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.

2.3.98 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.

2.3.99 Local excess or shortfall of excavated material within the Ratcliffe-on-Soar to Long Eaton 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.

Commissioning of the railway

2.3.100 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

2.3.101 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.

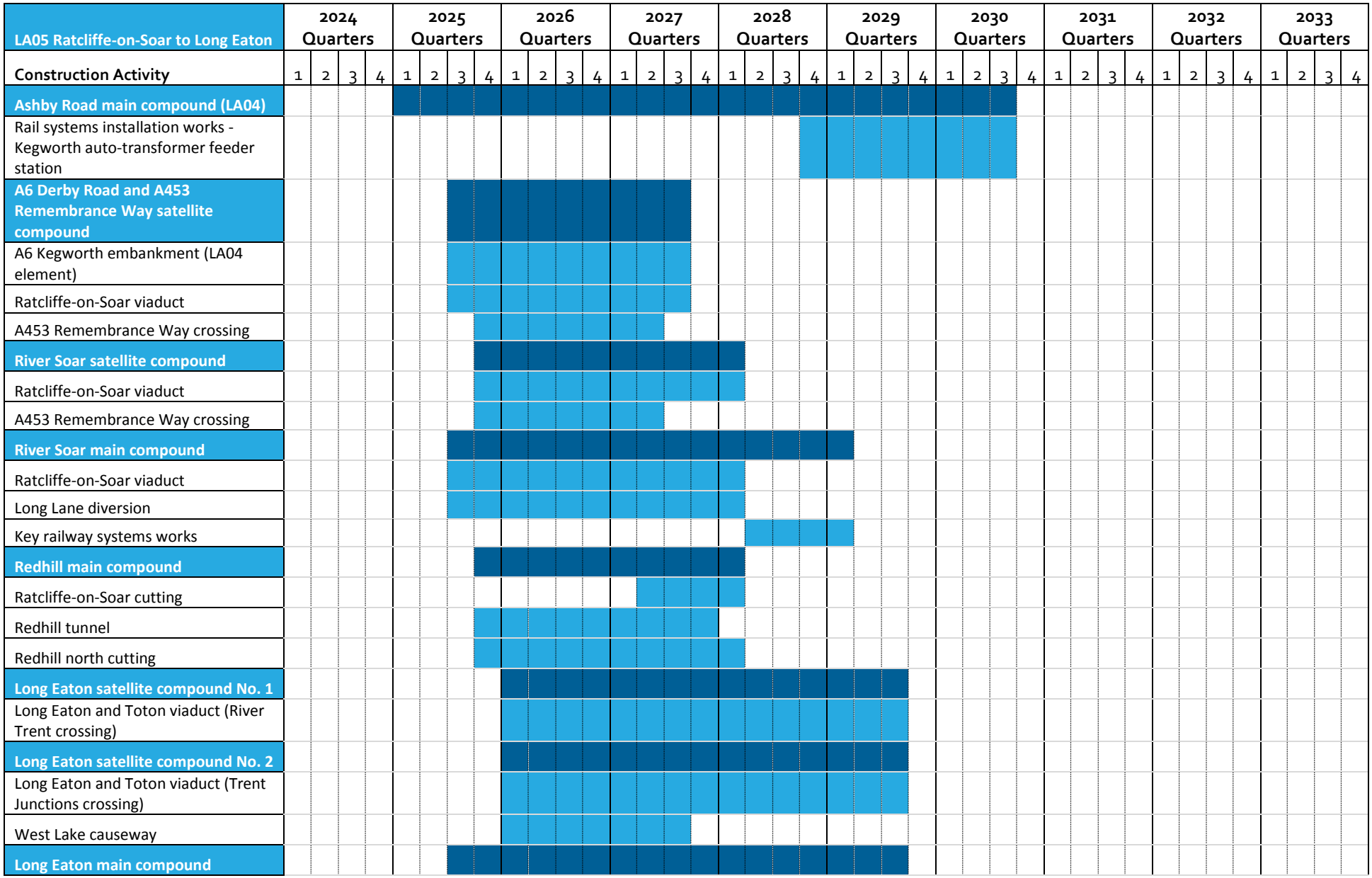
[35] Online works are works which are generally constructed on existing routes, which will require closures or diversions to be in place during construction.

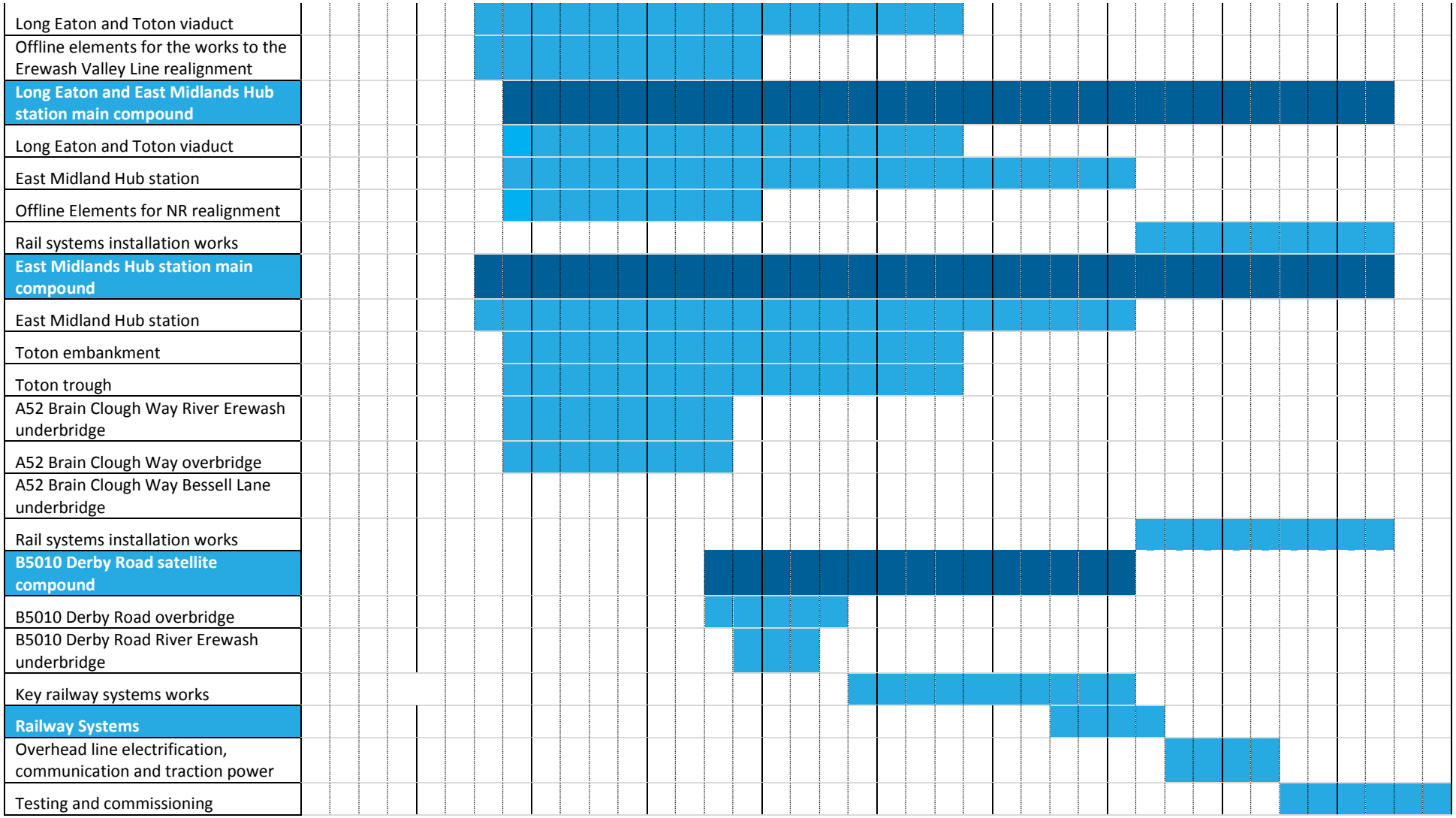
Monitoring during construction

2.3.102 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.

2.3.103 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




Long Eaton and Toton viaduct
Offline elements for the works to the Erewash Valley Line realignment
Long Eaton and East Midlands Hub station main compound
Long Eaton and Toton viaduct
East Midland Hub station
Offline Elements for NR realignment
Rail systems installation works
East Midlands Hub station main compound
East Midland Hub station
Toton embankment
Toton trough
A52 Brain Clough Way River Erewash underbridge
A52 Brain Clough Way overbridge
A52 Brain Clough Way Bessell Lane underbridge
Rail systems installation works
B5010 Derby Road satellite compound
B5010 Derby Road overbridge
B5010 Derby Road River Erewash underbridge
Key railway systems works
Railway Systems
Overhead line electrification, communication 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 Ratcliffe-on-Soar to Long Eaton 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 nine trains per hour each way south of the East Midlands Hub station passing through the Ratcliffe-on-soar to Long Eaton area. North of the East Midlands Hub station there would be up to 11 trains per hour each way, passing through the northern part of the Ratcliffe-on-soar to Long Eaton 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

Proposed auto-transformer feeder station and grid supply point locations

2.5.1 During the design development process since the announcement of the preferred route in July 2017, consideration has been given to the location of an auto-transformer feeder station in the south of the Ratcliffe-on-Soar to Long Eaton area, which would supply electrical power from the National Grid network to the Proposed Scheme. The auto-transformer feeder station would house the electrical equipment that would protect and control the power supply to the Proposed Scheme. The auto-transformer feeder station would be required at the start of a neutral section[36] along the route of the Proposed Scheme at a location with a potential grid supply point to provide grid connection to existing electrical infrastructure.

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 1: the auto-transformer feeder station would be located 1km north-east of junction 24 of the M1 in Kegworth, immediately to the west of the route of the Proposed Scheme and south-west of Ratcliffe-on-Soar Power Station and Redhill Marina. This option would require the construction of a new grid supply point, located immediately to the west of the auto-transformer feeder station, providing a direct incoming feeder cable connection to supply electrical power to the auto-transformer feeder station;
- Option 2: the auto-transformer feeder station would be located immediately to the east of junction 24 of the M1, to the west of the route of the Proposed Scheme and between the A453 Remembrance Way and the A6 Derby Road. There are four possible options for a new grid supply point throughout the Kegworth area, with feeder cable connections ranging from 1.7km to 2.6km in length to connect to this auto-transformer feeder station, including:
  - an option (grid supply point 1) in the same location as the grid supply point in Option 1, located 1km north-east of junction 24 of the M1 in Kegworth, which would require a feeder cable route 1.7km in length along the route of the Proposed Scheme;
  - an option (grid supply point 2) south of the Ratcliffe-on-Soar Power Station, east of Kegworth Road and adjacent to the A453 Remembrance Way, which would require a feeder cable route 2.6km in length along the A453 corridor (this is the preferred grid supply point option taken forward into the Proposed Scheme);

[36] A neutral section is an insulated section that prevents two differing electrical sections from touching, by introducing an electrical clearance (an earth section)

- an option (grid supply point 3) south of the Ratcliffe-on-Soar Power Station, east of Kegworth Road and 500m south of the A453 Remembrance Way, which would require a feeder cable route 2.6km in length along the A453 corridor; and
- an option (grid supply point 4) immediately north-west of junction 24A of the M1 and north of the A50 Derby Southern Bypass, which would require a feeder cable route 2km in length along the M1 corridor.

- Option 3: the auto-transformer feeder station would be located 11km to the south of Kegworth on land between the route of the Proposed Scheme and the A42, 800m north of Worthington in the Coleorton to Kegworth area (LA04). This option would require the construction of a new grid supply point immediately to the south of the auto-transformer feeder station, which would provide incoming feeder cable connections 550m in length.

2.5.3 Table 7 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 7: Consideration of local alternatives for an auto-transformer feeder station in the Ratcliffe-on-Soar to Long Eaton area

Option	Outcome of analysis	Further action/considerations
Option 1	Greater potential for flooding impacts in comparison to the Proposed Scheme due to location within River Soar floodplain (Flood Zones 2 and 3). Similar impact on watercourses as the Proposed Scheme as the auto-transformer feeder cable would cross the River Soar floodplain (Flood Zones 2 and 3). Greater impact on historic environment during operation in comparison with the Proposed Scheme due to potential impact on the setting of the Roman site at Redhill Scheduled Monument. Greater impact on landscape character compared with the Proposed Scheme due to location of the auto-transformer feeder station within an open floodplain. Similar impact on agricultural land as the Proposed Scheme as the auto-transformer feeder station would directly impact arable fields. Protecting infrastructure from flood events during construction would necessitate increased traffic movements in the local area, however, fewer traffic impacts overall when compared to the Proposed Scheme. The grid supply point would be located further away from residential receptors in Ratcliffe-on-Soar, and would have less noise, landscape and visual impacts on these receptors, compared with grid supply point 2 of the Proposed Scheme. Better performing option for railway systems in comparison to the Proposed Scheme as the grid supply point and auto-transformer feeder station would be located adjacent, requiring short incoming feeder cables. Greater cost than the Proposed Scheme due to the requirement to protect infrastructure from flooding.	This option will not be subject to further consideration.

Option 2 (the Proposed Scheme)	Less potential for flooding impact compared to Option 1 and Option 3 due to location outside of the River Soar floodplain. Greater potential for impact on watercourses in comparison to Option 3 as the feeder cables would need to cross the River Soar floodplain (Flood Zones 2 and 3). Similar impacts compared to Option 1. Fewer impacts on the setting of the Roman site at Redhill Scheduled Monument during operation in comparison to the alternative options. Less impact on landscape character in comparison to Option 1 and similar to Option 3 due to location of the auto-transformer feeder station in the M1 corridor. Less impact on agricultural land when compared to Option 3, and similar impact when compared to Option 1. New access required for the A6 would have greater traffic impacts when compared to Option 1 and Option 3. Longer incoming feeder cable than Option 1 and Option 3. Land requirements for feeder cables would be greater than Option 1 and Option 3 to connect the GSP to the ATFS. Reduced railway systems performance in comparison to Option 1 due to length of incoming feeder cables required. Lower cost when compared to Option 1 and similar cost to Option 3 as the Proposed Scheme would remove the requirement to provide flood protection.	This is the selected option taken forward into the Proposed Scheme
	Grid supply point 1: Greater potential for flood impacts than grid supply point 2 (the Proposed Scheme) as the grid supply point is located within the River Soar floodplain. Fewer impacts on watercourses compared to grid supply point 2 (the Proposed Scheme) as the feeder cables would not need to cross the River Soar. Fewer noise, landscape and visual impacts on residential receptors when compared to grid supply point 2 (the Proposed Scheme) due to distance from nearest communities.	This option will not be subject to further consideration.
	Grid supply point 2: Avoids potential flood impacts associated with grid supply point 1 as the grid supply point is located outside the River Soar floodplain. Greater potential for impact on watercourses in comparison to grid supply point 1, grid supply point 3 and grid supply point 4 as the feeder cables would need to cross the River Soar floodplain (Flood Zones 2 and 3). Greater noise, landscape and visual impacts on residential receptors as the grid supply point would be located closer to Ratcliffe-on-Soar than grid supply point 1 and grid supply point 4; similar to grid supply point 3.	This is the selected option taken forward into the Proposed Scheme
	Grid supply point 3:	This option will not be subject to further consideration.

	Similar to grid supply point 2 (the Proposed Scheme), this option avoids potential flood impacts associated with the grid supply point as it is located outside the River Soar floodplain. Similar potential for impact on watercourses to grid supply point 2 (the Proposed Scheme) as the feeder cables would not need to cross the River Soar (Flood Zones 2 and 3). Similar noise, landscape and visual impacts on residential receptors as grid supply point 2 (the Proposed Scheme) due to distance from Ratcliffe-on-Soar.	
	Grid supply point 4: Similar to grid supply point 2 (the Proposed Scheme), this option avoids potential flood impacts associated with the grid supply point as it is located outside the River Soar floodplain. Fewer impacts on watercourses compared to grid supply point 2 (the Proposed Scheme) as the feeder cables would not need to cross the River Soar. Fewer noise, and landscape and visual impacts on residential receptors when compared to grid supply point 2 (the Proposed Scheme) due to distance from nearest communities.	This option will not be subject to further consideration.
Option 3	Less potential for flooding impacts compared to Option 2 as this option would be located outside of the River Soar floodplain. Cabling works between the auto-transformer feeder station and the grid supply point would less likely to impact watercourses than the Proposed Scheme due to location outside of the River Soar floodplain. Greater impact on historic environment during operation in comparison with the Proposed Scheme due to potential impact on the setting of Mill House Farm (Grade II) listed buildings. Similar impact on landscape character as the Proposed Scheme due to location of the auto-transformer feeder station in the M1 corridor. Greater loss of agricultural land in comparison with the Proposed Scheme due to the positioning of the auto-transformer feeder station and the grid supply point over five arable fields. Site access via Worthington Lane and/or Doctor's Lane would necessitate more traffic movements in the local area, however, fewer traffic impacts overall than the Proposed Scheme. Fewer impacts on residential receptors as the grid supply point would be located further away from Ratcliffe-on-Soar than grid supply point 2 of the Proposed Scheme. Reduced railway systems performance in comparison to the Proposed Scheme due to length of incoming feeder cables required. Marginally higher cost compared to the Proposed Scheme due to requirement for additional road access.	This option will not be subject to further consideration.

2.5.4 Option 2 was taken forward into the Proposed Scheme. Option 3 would be located outside the floodplain of the River Soar, and therefore, would not require flood protection or compensation. Option 2 would also have fewer adverse impacts on the setting of historic assets including Mill House Farm (Grade II) listed buildings north-

east of Worthington, and the Roman site at Redhill Scheduled Monument north-east of the M1 junction 24. The Proposed Scheme, in comparison to Option 1 and Option 3, would have a lower cost associated with the construction and maintenance of the grid supply point and would have less landscape and visual impacts due to location of the auto-transformer feeder station close to the M1 junction 24. Option 2 would also impact less agricultural land than Option 3. Option 2 would be located further away from residential receptors than Option 1 and Option 3, and therefore, would be less likely to adversely affect sensitive receptors as a result of noise, landscape and visual impacts.

A52 Brian Clough Way realignment

2.5.5 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 under the A52 Brian Clough Way in Sandiacre. The current A52 Brian Clough Way overbridge spanning the existing conventional railway does not provide sufficient span or headroom to accommodate the Proposed Scheme, the Erewash Valley Line and the associated overhead line equipment. The A52 Brian Clough Way overbridge would be reconstructed and a new roundabout constructed to the east of the route of the Proposed Scheme. Ongoing design development has allowed refinement of the construction methods and design of the A52 Brian Clough Way realignment. Opportunities to reduce disruption to the existing road network and maintain operational capacity have been considered.

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

- Option 0: the A52 Brian Clough Way overbridge would be reconstructed. A new ground level roundabout would be constructed online to the east of the route of the Proposed Scheme. This roundabout would provide access to East Midlands Hub station and Bessell Lane;
- Option A: the A52 Brian Clough Way overbridge would be reconstructed off-line and realigned permanently. A new online ground level roundabout to the east of the Proposed Scheme would be constructed;
- Option B: a compact grade separated junction on the A52 Brian Clough Way with the overbridge constructed off-line and realigned permanently;
- Option C: a compact grade separated junction on the A52 Brian Clough Way with the overbridge constructed off-line and realigned permanently. Traffic on the new station access would have priority and the existing Bessell Lane would be a minor road;
- Option D: the existing A52 Brian Clough Way would be realigned to the south of its existing alignment in a cutting 8m deep. A new 'dumbbell' roundabout[37] would be constructed at the existing ground level, comprising the existing

[37] A 'dumbbell' roundabout is configured as a pair of roundabouts to create a type of diamond interchange.

roundabout to the north of the realigned A52 Brian Clough Way and a new roundabout to the south; and

- Option E: the A52 Brian Clough Way would be realigned further south-east of the existing Bardills roundabout. A new 'dumbbell' roundabout would be constructed at existing ground level, comprising the existing roundabout to the north of the realigned A52 Brian Clough Way and a new roundabout to the south.

2.5.7 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 under the A52 Brian Clough Way in Sandiacre

Option	**Outcome of analysis**	**Further action/considerations**
Option 0	Similar impact on agricultural land compared to the Proposed Scheme. Similar direct impact on Archers Field Recreation Ground amenity area compared to the Proposed Scheme. Less habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way compared to the Proposed Scheme. Potential for visual impacts on residential receptors and recreational uses of the Erewash Canal (Erewash Borough Council green belt and Erewash Borough Council green corridor) and Sustrans cycle route, similar to the Proposed Scheme. Greater potential for impact on road traffic during peak times (morning and evening) at the roundabout junction in comparison with the Proposed Scheme. Temporary traffic management and subsequent speed restrictions would result in higher levels of congestion and delays, similar to the Proposed Scheme. Greater technical and engineering complexity compared to the Proposed Scheme due to requirement to construct over the existing A52 Brian Clough Way and the restrictions on access. Would avoid the demolition of commercial properties on Palmer Drive required for the Proposed Scheme. Longer construction programme compared to the Proposed Scheme. Lower cost compared to the Proposed Scheme.	This option will not be subject to further consideration
Option A	Similar impact on agricultural land compared to the Proposed Scheme. Similar direct impact on Archers Field Recreation Ground amenity area compared to the Proposed Scheme. Less habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way compared to the Proposed Scheme. Potential for visual impacts on residential receptors and recreational uses of the Erewash Canal (Erewash Borough Council green belt and	This option will not be subject to further consideration

Option	Outcome of analysis	Further action/considerations
	Erewash Borough Council green corridor) and Sustrans cycle route, similar to the Proposed Scheme. Greater impact on road traffic during peak times (morning and evening) at the roundabout junction in comparison with the Proposed Scheme. Temporary traffic management and subsequent speed restrictions would result in higher levels of congestion and delays, similar to the Proposed Scheme. Greater technical and engineering complexity compared to the Proposed Scheme due to requirement to construct over the existing A52 Brian Clough Way and the restrictions on access. Would avoid the demolition of commercial properties on Palmer Drive required for the Proposed Scheme. Longer construction programme compared to the Proposed Scheme. Similar cost as the Proposed Scheme due to increased engineering complexity and the requirement for greater flood compensation areas.	
Option B (the Proposed Scheme)	Impact on agricultural land similar to Option 0, Option A, Option C and less impact when compared to Option D and Option E. Direct impact on Archers Field Recreation Ground amenity area, similar to Option 0 and Option A, however, fewer community impacts overall when compared to Option C, Option D and Option E. Greater habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way than Option 0, Option A, Option D and Option E, however, similar to Option C. Potential for visual impacts on residential receptors and recreational uses of the Erewash Canal (Erewash Borough Council green belt and Erewash Borough Council green corridor) and Sustrans cycle route, similar to Option 0, Option A and Option C, however, lower impacts when compared to Option D and Option E. Less impacts on road traffic during peaks times (morning and evening) at the junction in comparison with other options. Temporary traffic management and subsequent speed restrictions would result in similar levels of congestion and delays as Option 0, Option A and Option C, and less than Option D and Option E. Less technical and engineering complexity compared to Option 0 and Option A due to less disruption to the A52 Brian Clough Way, however, greater complexity when compared to Option C, Option D and Option E. Demolition of commercial properties on Palmer Drive, similar to Option C and Option D. These demolitions would be avoided by Option 0, Option A and Option E. Shorter construction programme in comparison to Option 0 and Option A, however, longer than other options.	This is the selected option taken forward into the Proposed Scheme

Option	Outcome of analysis	Further action/considerations
	Lower cost than Option C, Option D and Option E, however, greater cost than Option 0 and similar cost to Option A.	
Option C	Impact on agricultural land similar to the Proposed Scheme. Greater impact on Archers Field Recreation Ground and industrial units north of the A52 Brian Clough Way when compared to the Proposed Scheme as a result of a larger construction footprint. Habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way, similar to the Proposed Scheme, however, greater than Option 0, Option A, Option D and Option E. Potential for visual impacts on residential receptors and recreational uses of the Erewash Canal (Erewash Borough Council green belt and Erewash Borough Council Green Corridor) and Sustrans cycle route, similar to the Proposed Scheme. Greater impact on road traffic during peak times (morning and evening) at the roundabout junction in comparison with the Proposed Scheme. Temporary traffic management and subsequent speed restrictions would result in higher levels of congestion and delays, similar to the Proposed Scheme. Less technical and engineering complexity compared to the Proposed Scheme due to the avoidance of access restrictions during construction. Greater number of commercial properties on Palmer Drive to be demolished compared with the Proposed Scheme. Shorter construction programme in comparison to the Proposed Scheme. Greater cost than the Proposed Scheme.	This option will not be subject to further consideration.
Option D	Greater impact on agricultural land compared to the Proposed Scheme due to severance of agricultural properties to the west of the existing A52 Brian Clough Way. Greater impact on Archers Field Recreation Ground amenity area compared to the Proposed Scheme as a result of the larger construction footprint. Less habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way compared to the Proposed Scheme. Greater visual impacts on residential receptors compared to the Proposed Scheme as a result of greater intrusion in an agricultural area. Greater impact on road traffic during peak times (morning and evening) at the roundabout junction in comparison with the Proposed Scheme. Temporary traffic management and subsequent speed restrictions would result in higher levels of congestion and delays than the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
	Less technical and engineering complexity compared to the Proposed Scheme due to the avoidance of access restrictions during construction. Demolition of commercial properties on Palmer Drive, similar to the Proposed Scheme. Shorter construction programme in comparison to the Proposed Scheme. Greater cost than the Proposed Scheme.	
Option E	Greater impact on agricultural land compared to the Proposed Scheme due to islanding of agricultural properties to the west of the existing A52 Brian Clough Way. Greater impact on Archers Field Recreation Ground amenity area compared to the Proposed Scheme as a result of the larger construction footprint. Less habitat loss (hedgerows, trees, woodland area) along the existing A52 Brian Clough Way compared to the Proposed Scheme. Greater visual impacts on residential receptors compared to the Proposed Scheme as a result of greater intrusion in an agricultural area. Greater impacts on road traffic during peak times (morning and evening) at the roundabout junction in comparison with the Proposed Scheme. Temporary traffic management and subsequent speed restrictions would result in higher levels of congestion and delays than the Proposed Scheme. Less technical and engineering complexity compared to the Proposed Scheme due to the avoidance of access restrictions during construction. Would avoid the demolition of commercial properties on Palmer Drive required for the Proposed Scheme. Shorter construction programme in comparison to the Proposed Scheme. Greater cost than the Proposed Scheme.	This option will not be subject to further consideration.

2.5.8 Option B was taken forward into the Proposed Scheme. The Proposed Scheme would have a lower capital cost than options that require full realignment of the A52 Brian Clough Way. Although Option B would be more costly than Option 0, it would provide sufficient operational capacity, which would not be provided by Option 0 and Option A.

2.5.9 Option B would have fewer impacts on existing residential, commercial and recreational receptors as well as limiting construction within flood zone areas around the East Midlands Hub station in comparison with other options that include a full realignment of the A52 Brian Clough Way and a new 'dumbbell' junction (Option D and Option E).

2.5.10 Option B would also limit construction activities to the areas surrounding the East Midlands Hub station compared to Option D and Option E. Options D and E would introduce new environmental impacts to the west of the A52 Brian Clough Way including additional severance of land.

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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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;
- local connections to and wider strategic connectivity of East Midlands Hub station;
- 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 Long Eaton Footpath 6 and Long Eaton Footpath 72, Beeston Bridleway 125, Beeston Bridleway 126 and Beeston Bridleway 127;
- temporary or permanent changes to road access including impacts to the B5010 Derby Road, Bessell Lane and Bonsall Street;
- impacts to traffic including Ratcliffe-on-Soar, Long Eaton and Toton during construction;
- impacts on access to local community educational/care/sporting/leisure/ cultural facilities including Long Eaton Health Centre; and
- impacts to local businesses, including furniture and furnishing and IT businesses on Bonsall Street, those within Meadowbrook Business Park and Megavaux scrapyard.

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 Ratcliffe-on-Soar to Long Eaton 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	Meeting 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
Maggie Throup MP – Member for Erewash	Meeting with MP for Erewash to discuss the Proposed Scheme, including timescales and current progress of design and discussion around the planned Engagement events
Anna Soubry MP – Member for Broxtowe	Meeting with MP for Broxtowe to discuss the Proposed Scheme, including timescales and current progress of design and discussion around the planned Engagement events
Rt Hon Kenneth Clarke QC MP – Member for Rushcliffe	Meeting with MP for Rushcliffe to discuss the Proposed Scheme, including timescales and current progress of design and discussion around the planned Engagement events
Friends of Toton Fields	Meeting to discuss possible impacts of the Proposed Scheme in this locality and to understand what mitigation may be required
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 Resilience Forum - Nottingham Police	Initial meeting with the group to discuss the potential impacts of the Proposed Scheme
Nottinghamshire Local Access Forum (LAF)	Initial meeting with the LAF to discuss potential impacts of the Proposed Scheme
Nottingham City LAF	Initial meeting with the LAF to discuss potential impacts of the Proposed Scheme
Chetwynd: The Toton and Chilwell Neighbourhood Forum	Meetings with the Forum to discuss potential impacts of the Proposed Scheme
Kingdom Hall of Jehovah's Witnesses (Long Eaton)	Meetings to discuss potential impacts of the Proposed Scheme, timescales to obtain information around activities and attendees of facilities and understand local concerns
Long Eaton Baptist Church	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities
St Laurence Church, Long Eaton	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities and understand local concerns

Long Eaton English Martyrs Church	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities
Long Eaton Mosque	Introductory meeting to discuss potential impacts of the Proposed Scheme, and to obtain information around activities and attendees of facilities
Long Eaton Library	Initial meeting to discuss the Proposed Scheme, including timescales and current progress on design
Longmoor Primary School	Initial meeting to discuss the Proposed Scheme, including timescales and current progress on design
English Martyrs' Catholic Primary School	Initial meeting to discuss the Proposed Scheme, including timescales and current progress on design
Long Eaton Natural History Society (LENS)	Introductory meeting to discuss the project and listen to concerns
Erewash Riders Association	Discussion around potential impacts of the Proposed Scheme on routes used by this organisation, both during construction and operation
Redhill Marina	Discussions around the Proposed Scheme, including potential impacts and possible mitigation

Local authorities and parish councils

3.4.6 Direct engagement has been undertaken with county, borough, district and parish councils within the Ratcliffe-on-Soar to Long Eaton 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 Key issues identified during engagement with local authorities and parish councils include those 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 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

	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
	Meeting to discuss sensitive ecological receptors, plans for mitigation and gather information to assist the ecological assessment within the working draft ES
Nottinghamshire 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 around wider impacts including the traffic and transport assessment
	Engagement around representative view point and photomontage locations for landscape assessment and surveys
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
Broxtowe Borough Council	Briefings to discuss high level detail around the Proposed Scheme, including discussion around potential local impacts, timescales and design progression
Castle Donnington Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Erewash Borough Council	Briefings to discuss high level detail around the Proposed Scheme, including discussion around potential local impacts, timescales and design progression
	Engagement around representative view point and photomontage locations for landscape assessment and surveys
Lockington cum Hemington Parish Council	Communication to provide information on the Proposed Scheme and gather any feedback and concerns
Rushcliffe Borough Council	Briefings to discuss high level detail around the Proposed Scheme, including discussion around potential local impacts, timescales and design progression

	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration, and waste
Sawley Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Kegworth Parish Council	Engagement to provide information on the Proposed Scheme and gather any feedback and concerns
Stapleford Town 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)[38].

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;
- Ashby Canal Association and Trust;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Derbyshire Wildlife Trust;
- East Midland Gateway Modelling Group;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;

[38] Supporting document: Draft Code of Construction Practice

- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Nottinghamshire Wildlife Trust;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/ The Wildlife Trusts; and
- Woodland 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 such as Western Power Distribution, National Grid (electricity) Network Rail, Severn Trent Water, Cadent, the Oil and Pipelines Agency, BT Open Reach, Virgin Media and Genesys to establish what infrastructure exists in the Ratcliffe-on-Soar to Long Eaton area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Ratcliffe-on-Soar to Long Eaton area.

3.4.15 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 loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.16 Information gathered from one farm visit has informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.17 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.

3.4.18 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 Ratcliffe-on-Soar to Long Eaton area, an information event was held at West Park Leisure Centre on 27 June 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.19 Engagement has been undertaken with Uniper (owners of Ratcliffe-on-Soar Power Station), Redhill Marina, Steed Upholstery on Bonsall Street, Andrew Paul Furniture and Thrumpton Hall.

3.4.20 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 Ratcliffe-on-Soar to Long Eaton 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[39].

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: LA05 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)[40].

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 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)[41] 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

[39] 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
[40] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[41] 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 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 has 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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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)[42]. Superficial deposits of alluvium are associated with the watercourses in the study area, including the Rivers Soar, Trent and Erewash. Alluvial deposits mostly comprise consolidated silty clay, but also contain silt, sand, peat and gravel.

4.3.3 River terrace deposits are extensive within the valleys of the River Trent and River Soar. They include the Hemington Member between Kegworth and Long Eaton; the Wanlip Member and the Syston Member between Kegworth and Ratcliffe-on-Soar; the Birstall Member along the River Soar; the Holme Pierrepont Sand and Gravel Member between Thrumpton and Long Eaton; and the Beeston Sand and Gravel Member in the area of Toton and north of Long Eaton.

4.3.4 Superficial deposits of glacial head overlie the bedrock geology around Ratcliffe-on-Soar and across mid-slopes at Toton, and typically comprise sand and gravel, locally with silt, clay or peat and organic material. Glacial till, comprising sandy and silty clay with pebbles, is found on higher ground to the north of Ratcliffe-on-Soar Power Station.

4.3.5 The bedrock throughout most of the study area is Triassic-age mudstone and siltstone within the Mercia Mudstone Group, comprising the Branscombe Mudstone Formation, the Arden Sandstone Formation, the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation.

4.3.6 Triassic-age mudstone of the Branscombe Mudstone Formation forms the main shallow geology across the south of the study area, extending from junction 24 of the M1 to the River Trent, and comprises mudstone and siltstone. Narrow outcrops of the Arden Sandstone Formation are found just north of junction 24 of the M1, and north of Wood Hill near Thrumpton, and comprise mudstones with siltstones and sandstones.

4.3.7 The Sidmouth Mudstone Formation underlies much of the northern part of the study area and includes mudstone and siltstone, with some subordinate dolomitic siltstones and fine-grained sandstones.

4.3.8 The Tarporley Siltstone Formation is also mapped in the north of the study area and comprises interbedded siltstones, mudstones and fine- to very fine-grained sandstones in equal proportions.

Topography and drainage

4.3.9 The main topographic feature in the Ratcliffe-on-Soar to Long Eaton area is the broad valley of the River Trent, which is cut into the underlying mudstone to an altitude of approximately 25-30m above Ordnance Datum (AOD). The River Trent is fed by the two main tributaries of the River Soar and the River Erewash in this study area.

4.3.10 In the south of the study area, the River Trent is generally flanked by a broad plain of up to approximately 30m AOD, with steeper valley sides of more than 11 degrees to

[42] British Geological Survey (2018). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

the south at Redhill rising up to 60m AOD. Shallow valley footslopes at Toton in the north of the study area reach up to approximately 40m AOD.

4.3.11 Agricultural land in the south of the study area is drained via a network of ditches which carry water toward the River Soar, River Trent and Sawley Cut. Drainage in the north of the study area is via the River Erewash.

4.3.12 Agricultural land at risk of flooding by rivers is widespread throughout the study area. Most of the agricultural land in the study area is classed as Flood Zone 3 on the Environment Agency's Flood map [43], 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[44] and their general distribution is shown on the National Soil Map[45]. Soils possessing similar characteristics are amalgamated into associations.

4.3.14 The soil associations of the study area can be distinguished according to the underlying geology. There are three mapped groups of soil associations likely to be present in this study area. The presence of each group has been confirmed in parts of the study area by published survey data.

4.3.15 The most prevalent group comprises the Wharfe and Fladbury 2 associations which are developed in the superficial alluvium deposits within the Trent Valley. The Wharfe soils include clay loam topsoils overlying clay loam or sandy loam subsoils. The Fladbury 2 association characteristically comprises clay throughout. Both associations are typically deep and stoneless and are affected by groundwater. Soils of the Wharfe association may be of Wetness Class[46] (WC) II to IV depending on the proximity to watercourses, whilst the Fladbury 2 soils are of WC IV. These soils have been identified in detailed surveys undertaken to the north of Kegworth[47] and at Toton[48].

4.3.16 The next most prevalent group comprises the Worcester and Hodnet associations which have developed over Triassic mudstone in the south and north of the study area. Worcester soils are characterised by clay loam or clay topsoils overlying clay or silty clay subsoil horizons. The Hodnet soils are generally lighter in texture, with sandy silt loam or clay loam topsoils overlying clay loam subsoils. Both associations are slowly permeable in the subsoil horizons and are most commonly assessed as WC III. These soils have been identified in surveys undertaken in the north of the study area at Toton.

[43] Environment Agency, (2018), Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/confirm-location?easting=449851.15&northing=329364.36&placeOrPostcode=ratcliffe-on-soar
[44] 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.
[45] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[46] 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.
[47] MAFF (1995). Agricultural Land Classification, North West Leicestershire Local Plan, Site J13/J13b. Ref no 77/95
[48] ADAS (1994). Agricultural Land Classification, Toton Sidings, Stapleford, Nottinghamshire. Ref no 101/94.

4.3.17 The least prevalent group, the Wick 1 association, is developed in glaciofluvial and river terrace deposits to the north of Kegworth. Profiles comprise sandy loam or sandy silt loam topsoils which overlie loamy sand or sand subsoil horizons. Profiles are deep and well drained, of WC I, though may be slightly droughty. Localised stoniness in the topsoil can have a downgrading effect. This soil type has been identified in surveys to the north of Kegworth.

Soil and land use interactions

Agricultural land quality

4.3.18 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.

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

4.3.20 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[49] limitations of the land.

4.3.21 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[50] for three points within the study area. The data show climate in the area to be moderately warm and dry. The number of Field Capacity Days[51] (FCDs), when the moisture deficit[52] is zero, is around 130 to 132 days per annum which is lower than average for lowland England (150 days) and generally favourable for providing opportunities for agricultural cultivations and soil handling. Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately large.

4.3.22 Site factors[53] include flood risk which is likely to affect agricultural land quality throughout much of the study area, limiting land quality to Subgrade 3b. Further details on flood risk are provided in Section 15, Water resources and flood risk. Gradient and microrelief[54] are also likely to be limiting to agricultural land quality at Redhill, with some slopes exceeding seven degrees and others in excess of 11 degrees, although the steeper slopes are wooded rather than in agricultural use.

4.3.23 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness and soil droughtiness. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the

[49] 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
[50] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[51] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the 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.
[52] 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.
[53] Site factors include slope or flood risk but may be other things specific to a site that affect agricultural land quality.
[54] Microrelief is the complex change of slope angle and direction over short distances, or the presence of boulders or rock outcrops, which can severely limit the use of agricultural machinery.

number of FCD. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.

4.3.24 The alluvial soils of the Wharfe and Fladbury 2 associations are variably affected by wetness and flood risk. Profiles of the Wharfe association in WC II with medium clay loam topsoils are limited by wetness to Grade 2 whilst those with heavy clay loam topsoils are limited to Subgrade 3a. Profiles of WC III with medium clay loam topsoils are limited to Subgrade 3a, whilst those with heavy clay loam topsoils are limited to Subgrade 3b. All profiles of WC IV have a wetness limitation to Subgrade 3b; this includes the Fladbury 2 association, which have clay topsoils and are limited to Subgrade 3b. The overriding limitation within the Trent Valley is however likely to be flood risk limiting the area to Subgrade 3b.

4.3.25 ALC surveys records for land north of Kegworth and at Toton confirm that alluvial soils of WC III with heavy clay loam or clay topsoil over slowly permeable, grey clays are limited by wetness to Subgrade 3b. In many profiles, gravelly material ranging from sandy clay loam to sand is encountered at depth.

4.3.26 The Worcester and Hodnet associations are typically of WC III. The Worcester association soils include topsoil textures of clay loam or clay. Where the topsoil is of medium clay loam, the soils are limited by wetness and workability to Subgrade 3a. Profiles with heavier topsoil textures of heavy clay loam or clay are limited more severely, to Subgrade 3b. The lighter variant of the Hodnet soils which includes a sandy silt loam topsoil texture can be WCII and is limited less severely by wetness to Grade 2.

4.3.27 Each variant and corresponding grade is confirmed by publicly available survey records for land at Toton, together with some profiles of WC II with heavy loam topsoils which are limited to Subgrade 3a.

4.3.28 Coarse loamy profiles of the Wick 1 association are affected most by soil droughtiness. The publicly available survey records for land to the north of Kegworth confirm the presence of sandy loam or sandy clay loam topsoil overlying sandy loam or gravelly loamy sand subsoils. Sand is sometimes found at depth and occasional profiles are affected by fluctuating groundwater. The profiles are of WC I or II and have a droughtiness limitation to Grade 2 or, where gravelly subsoil horizons exist, to Subgrade 3a.

4.3.29 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[55] shows that there is a moderate likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.

4.3.30 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly and commercially available data and

[55] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

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

4.3.31 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[56] and the Government's White Paper, The Natural Choice: securing the value of nature[57], 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.

4.3.32 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.

4.3.33 The floodplains of the River Trent, River Soar and River Erewash occupy 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 floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.34 The south of the study area is predominantly in agricultural use, with arable land dominant other than on the floodplains of the Rivers Trent, Soar and Erewash. The floodplains are generally under grass pasture for livestock. There are a number of active sand and gravel workings in the south of the study area as well as former workings which have since been restored to arable agriculture. The north of the study area, to the north of Thrumpton, is primarily urban land, and not considered further as part of this assessment.

4.3.35 Woodland is generally scarce within the rural parts of the study area but there are some broadleaved copses and tree belts on the Lockington and Thrumpton Estates. The Lockington Estate includes March Covert and Green Spot Wood in the south of

[56] Defra (2009), *Soil Strategy for England.*
[57] HM Government (2011), *The Natural Choice: securing the value of nature.*

the study area, and an area of alder and willow carr woodland at Lockington Marshes Site of Special Scientific Interest to the west of the River Soar. Areas of woodland on the Thrumpton Estate were planted under the England Woodland Grant Scheme.

4.3.36 A number of environmental designations influence land use within the study area. With the exception of an area extending to the west from the confluence of the River Soar and River Trent towards Sawley, the study area is a nitrate vulnerable zone in which statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.37 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.

4.3.38 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 focussed 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. Holdings that have land entered into an agri-environment scheme are identified in Table 12.

Number, type and size of holdings

4.3.39 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.

4.3.40 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
Lockington Farms*	Mixed	816	Not known	ELS and HLS	Medium
Long Lane Farm*	Arable	45	None	None	Medium
Land east of Kegworth Road*	Arable (restored)	113	None	None	Medium
Redhill Farm*	Mixed	50	Not known	None	Medium
Thrumpton Estate	Mixed	60	Corporate and private hire	ELS and HLS	Medium
Cranfleet Farm*	Sheep	63	Not known	None	Medium
Land north of Cranfleet Canal*	Arable	73	Not known	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)[58] 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);
- 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);

[58] Supporting document: Draft Code of Construction Practice

- 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 The effect of severance of agricultural land for most of the farm holdings in this study area would be reduced by the opportunity to provide agricultural access to land on either side of the Proposed Scheme under the Ratcliffe-on-Soar viaduct (CT-06-439b – CT-06-430), the Long Eaton and Toton viaduct (CT-06-431) and the Stanton Gate viaduct (CT-06-435a).

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

4.4.5 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.

4.4.6 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. Some poorly or very poorly drained land or land with heavier textured soils (such as some of the Wharfe association soils and all Fladbury 2 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

4.4.7 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.

4.4.8 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

4.4.9 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 130ha of agricultural land within the Ratcliffe-on-Soar to Long Eaton area during the construction phase, of which approximately 15ha (13%) are likely to be classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.

4.4.10 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 minor adverse, which would be unlikely to produce a significant effect.

4.4.11 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

4.4.12 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.

4.4.13 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[59]. These principles would be followed throughout the construction period.

4.4.14 Alluvial, clayey and seasonally waterlogged soils (including the Wharfe soils in WC IV and the Fladbury 2 association) are least able to remain structurally stable if moved in wet conditions, or disturbed by use of inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.15 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

4.4.16 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.

4.4.17 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.

4.4.18 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.

[59] Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*

4.4.19 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
Lockington Farms Medium sensitivity	Low	Negligible	Minor adverse
Long Lane Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Land east of Kegworth Road Medium sensitivity	Low	Negligible	Minor adverse
Redhill Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Thrumpton Estate Medium sensitivity	Low	Negligible	Minor adverse
Cranfleet Farm Medium sensitivity	Low	Negligible	Minor adverse
Land north of Cranfleet Canal Medium sensitivity	High	Negligible	Major/moderate adverse

4.4.20 Overall, the construction of the Proposed Scheme could potentially have a temporary effect on seven holdings in the Ratcliffe-on-Soar to Long Eaton area. On the basis of currently available information, two could experience major/moderate adverse temporary effects from construction and one could experience moderate adverse effects, which would be significant for each holding.

4.4.21 Both Redhill Farm and land north of Cranfleet Canal are expected to experience major/moderate adverse effects during the construction phase of the Proposed Scheme due to the high proportion of land required temporarily. Long Lane Farm is expected to experience a moderate adverse effect during the construction phase due to the area of land required temporarily in proportion to the overall size of the holding. The remaining farms are all expected to experience minor adverse effects due to the low proportion of land required and also negligible severance effects resulting from the opportunity to provide agricultural access beneath the viaducts.

4.4.22 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

4.4.23 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 35ha of agricultural land permanently within the Ratcliffe-on-Soar to Long Eaton area, of which approximately 5ha (14%) are likely to be classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.

4.4.24 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 minor adverse, which would be unlikely to produce a significant effect.

Impacts on forestry land

4.4.25 It is currently expected that no areas of commercial forestry land would be required for the Proposed Scheme in this study area. 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

4.4.26 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.

4.4.27 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
Lockington Farms Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Long Lane Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land east of Kegworth Road Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Redhill Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Thrumpton Estate Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Cranfleet Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land north of Cranfleet Canal Medium sensitivity	Negligible	Negligible	Negligible	Negligible

4.4.28 Overall, the construction of the Proposed Scheme could potentially permanently affect seven holdings in the Ratcliffe-on-Soar to Long Eaton area permanently. On the basis of information currently available, it is unlikely that any of the identified holdings would experience permanent significant effects.

4.4.29 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

4.4.30 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.

4.4.31 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

4.4.32 Although the extent of land required permanently by ALC grade is not yet known in the Ratcliffe-on-Soar to Long Eaton area, current indications are that the effect on BMV agricultural land would be minor adverse temporarily during construction and permanently following construction, which would be unlikely to produce a significant effect.

4.4.33 Three of the seven farm holdings identified are expected to experience major/moderate or moderate adverse temporary effects during construction but it is unlikely that the Proposed Scheme would produce any permanent significant effects on farm holdings.

4.4.34 Effects on forestry land and soils to be disturbed will be 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 One set of farm buildings at Redhill Farm lies within approximately 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.

4.5.4 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.

4.5.5 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

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

Summary of likely residual significant effects

4.5.7 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

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

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[60] (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 North West Leicestershire District Council (NWLDC), Erewash Borough Council (EBC), Broxtowe Borough Council (BBC) and Rushcliffe Borough Council (RBC) 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, LA05 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)[61].

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[62]:

- 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 the construction of the Proposed Scheme.

[60] 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.
[61] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[62] The assessment of construction dust emissions should be 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 Ratcliffe-on-Soar to Long Eaton area are emissions from road vehicles and agricultural activities. The main roads within the area are the M1, the A52 Brian Clough Way, the A453 Remembrance Way and the A6005 Nottingham Road in Long Eaton.

5.3.2 There are two industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Ratcliffe-on-Soar Power Station and Lockington Quarry and Landfill. 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)[63] 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 Ratcliffe-on-Soar to Long Eaton area.

Local monitoring data

5.3.4 There are currently 14 local authority diffusion tube sites within the Ratcliffe-on-Soar to Long Eaton area for monitoring NO2 concentrations. There is one continuous monitoring site at East Midlands Airport for monitoring NO2, PM10 and PM2.5 concentrations. Measured concentrations in 2016 were within the air quality standards for all pollutants[64].

Air quality management areas

5.3.5 There is one air quality management area (AQMA) within the Ratcliffe-on-Soar to Long Eaton area, the Long Eaton AQMA 2. This AQMA covers the B5010 Derby Road, Long Eaton to the east of the M1, south of junction 25 and was declared in February 2002. The AQMA was designated for exceedances in the annual mean NO2 standard.

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

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

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 two statutory designated ecological sites identified within the Ratcliffe-on-Soar to Long Eaton area, namely Lockington Marshes Site of Special Scientific Interest (SSSI) and Attenborough Gravel Pits SSSI. There are 27 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)[65]. 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 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 and minimise emissions of 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
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

[65] Supporting document: Draft Code of Construction Practice

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[66], have been assessed for their risk to have an effect on dust soiling, human health[67] and ecological sites. There are residential and ecological receptors located within the Ratcliffe-on-Soar to Long Eaton area.

5.4.6 It has been identified for demolition, 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 demolition, earthworks and activities. There would also be a medium to high risk of human health effects from demolition and 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 A52 Brian Clough Way between the M1 and Bramcote roundabout, the A453 Remembrance Way between the M1 and the Ratcliffe-on-Soar Power Station, the B5010 Derby Road, Bostock's Lane, the B6002 Wilsthorpe Road/ Petersham Road/ Longmoor Road, Field Farm Road, Main Street, Meadow Lane and Trent Lane would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on Ratcliffe Lane, the A52 Brian Clough Way and the B5010 Derby Road where it crosses the Erewash Valley Line north of Toton Yard. A detailed assessment

[66] 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.
[67] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

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 from 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, changes in road alignment and emissions from the operation of combustion plant in buildings.

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.

Combustion plant emissions

5.5.5 Emissions from any stationary sources, such as combustion plant at East Midlands Hub station, will be included in the formal ES. Concentrations of NO_2 will be predicted at sensitive receptors and any effects will be reported in the formal ES.

Other mitigation measures

5.5.6 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

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

Monitoring

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

5.5.9 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 Ratcliffe-on-Soar to Long Eaton area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including with Nottinghamshire County Council (NCC), Leicestershire County Council (LeCC), Nottingham City Council (NoCC), Rushcliffe Borough Council (RBC), Broxtowe Borough Council (BBC), Derbyshire County Council (DCC), Erewash Borough Council (EBC), North West Leicestershire District Council (NWLDC) and the Toton and Chilwell Residents Association (TCRA). The purpose of this engagement has been to understand how the community facilities are used and to obtain relevant baseline information and 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: LA05 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)[68].

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

[68] 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, heavy goods vehicle (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 Ratcliffe-on-Soar to Long Eaton area would be approximately 9.4km in length and lie within the NWLDC, RBC, EBC and BBC areas. It would extend from Ratcliffe-on-Soar, in the south, passing the settlements of Thrumpton, Long Eaton and Toton in the north.

6.3.2 The Ratcliffe-on-Soar to Long Eaton area is primarily rural in the south and urban in the north. In general, the majority of community facilities are located in the urban areas of Long Eaton and Toton, in the north of the area.

Ratcliffe-on-Soar, Thrumpton and surrounds

6.3.3 Ratcliffe-on-Soar is a village located 1.6km north of Kegworth, directly south of the A453 Remembrance Way. The nearest residential properties in the village would be approximately 600m east of the route of the Proposed Scheme. Thrumpton is a village located 1.6km south-east of Long Eaton and north and west of the A453 Remembrance Way. The nearest residential properties in the village would be approximately 1km east of the route of the Proposed Scheme. Together, the settlements comprise approximately 300 residential properties.

6.3.4 The Holy Trinity Church is a community facility located in Ratcliffe-on-Soar. Recreational facilities in or near to Ratcliffe-on-Soar include Delta Force Paintball (a paintballing venue hosting schools, youth groups, communities and sports groups). The Midshires Way, a 362km long promoted walking route[69], passes Ratcliffe-on-Soar to the north-west along Long Lane. In Nottinghamshire, the Midshires Way follows public bridleways and quiet country lanes and is frequented by walkers and cyclists with some sections also available to horse riders. Kegworth Shooting Ground is located along the Midshires Way, approximately 400m west of the route of the Proposed Scheme.

6.3.5 The River Soar passes immediately to the west of Ratcliffe-on-Soar. The river is a 95km waterway starting in southern Leicestershire at its southern extent and ending at the River Trent at its northern extent. In total, approximately 38km of the river is navigable and used by various types of watercraft including narrowboats, river cruisers, canoes and dinghies. The River Soar Canoe Trail was created in 2015 to improve canoeing facilities between Trent Lock and Narborough, and encourage communities to use the waterway. Redhill Marina, located approximately 250m north-west of the route of the Proposed Scheme, hosts events such as the annual Redhill Music Festival.

6.3.6 The All Saints' Church is a community facility in Thrumpton. Recreational Facilities in or near to Thrumpton include Thrumpton Cricket Club and Thrumpton Hall (an event venue predominantly hosting weddings). Thrumpton Hall owns 0.8ha of well-kept gardens as well as a 140ha area of landscaped parkland. The Thrumpton Hall gardens are accessible during weddings, to members of the Historic Houses Association once a week in the summer months, and during the Thrumpton Flower and Garden Festival (a summer festival organised to fund the upkeep of All Saints' Church). The parkland is accessible to members of the Ashfield Angling Club who operate an angling venue in the park which covers a stretch of the River Trent.

6.3.7 The River Trent passes immediately to the north of Thrumpton. In this area, the River Trent carries commercial river traffic and is used for recreational activities such as canoeing, rowing and sailing.

Long Eaton

6.3.8 Long Eaton is a town located between Toton to the east and the M1 to the west. The town comprises approximately 20,500 residential properties. Some residential properties would be on the route of the Proposed Scheme. National Cycle Network Route 6 passes through Long Eaton via the A6005 Nottingham Road and Station Road. Long Eaton is linked to Toton and the M1 via the A6005 Nottingham Road, which is also the main road passing through the town. The town has a railway station (Long Eaton railway station) on the Midland Main Line (MML), which is located in the New Sawley area of the town, approximately 1km south-east of the commercial centre.

[69] Promoted PRoW refers to those PRoW which are "promoted" destinations in their own right as a recreational resource.

6.3.9 There are a wide range of community facilities in Long Eaton. Religious facilities include the Kingdom Hall of Jehovah's Witnesses, Long Eaton Masjid mosque as well as numerous churches such as Long Eaton Baptist Church. There are many educational facilities including St Laurence Church of England Primary School, Grange Primary School, Brooklands Primary School and Trent College. There are also healthcare centres, pharmacies, social centres, care homes, public houses, youth centres, a mental health clinic and the Long Eaton Library.

6.3.10 Recreational facilities in Long Eaton include gyms, sports clubs (martial arts, boxing, dance, football, rugby, bowling, baseball, cricket and sailing) and the Cyril's Nut Hut children's amusement centre. To the south-east of Long Eaton, the Trent Windsurfing Club has access to two lakes, known to members as West Lake and East Lake.

6.3.11 The Norfolk Road Recreation Ground and River Erewash Toton Washlands are both open spaces located in Long Eaton. The Norfolk Road Recreation Ground comprises of an informal open space and children's play area for local residents. The River Erewash Toton Washlands is a nature reserve created by the Environment Agency that serves as a flood defence for the River Erewash and includes footpaths and recreational walking opportunities.

6.3.12 The River Erewash and the Erewash Canal both pass through Long Eaton. The River Erewash flows south along the Nottinghamshire/Derbyshire border ending at the River Trent. Recreational angling takes place along the river. The Erewash Canal is a 12km long north-south waterway between the River Trent in the south and Langley Mill, Derbyshire in the north. The canal has a towpath, which is popular for walking and cycling and forms part of the Erewash Valley Trail promoted route.

6.3.13 The Cranfleet Canal, built to bypass a weir in the River Trent, is located south of Long Eaton. The Nottingham Yacht Club, which hosts events for boaters passing through the area, is based on the canal. The canal is popular with recreational anglers and its towpath forms part of the Erewash Valley Trail. The Erewash Valley Trail is a 48km promoted recreational route for walkers and cyclists running along the Nottinghamshire/Derbyshire border area. The Trent Valley Way is a 124km pedestrian and cycle path which follows the River Trent from Long Eaton to its confluence with the Chesterfield Canal.

Toton

6.3.14 Toton is a town with approximately 2,700 residential properties. The nearest residential properties would be adjacent to the route of the Proposed Scheme. Toton is predominantly residential and is bordered by Chilwell to the east and Long Eaton to the west. The B6003 Stapleford Lane is the main north-south route through Toton and connects the settlement to the A6005 Nottingham Road in the south and the A52 Brian Clough Way in the north. Near to the B6003 Stapleford Lane /A52 Brian Clough Way junction, Toton has a tram stop (Toton Lane) on the Nottingham Express Transit (NET) network, which also has free park-and-ride facilities. The tram stop is the terminus of line 1 of the NET, to Hucknall via Chilwell, Beeston and Nottingham city centre.

6.3.15 There are a range of community facilities in Toton. Religious facilities include the Church of Jesus Christ of Latter-day Saints and the Toton Methodist Church. There is a primary school (Toton Bispham Drive Junior School) and two nurseries (Banks Road Infant and Nursery School and Children 1st @ Toton). There is also a community centre (the Greenwood Community Centre) which is owned by the Toton Greenwood Community Association and provides facilities for hire to local residents. The 1st Toton Scout Group is based at the community centre as well as Toton Tots, which is a pre-school for children aged 2-5 years old.

6.3.16 Toton Fields is a 16.5ha open space comprising of a local nature reserve and two recreation grounds (Manor Farm Recreation Ground and Banks Road Open Space). Toton Fields LNR is regularly used by local residents for both formal and informal recreation, including walking, exercising dogs, running, horse riding and cycling. Manor Farm Recreation Ground and Banks Road Open Space are both part of Toton Fields LNR. The Banks Road open space comprises of a small park and children's play area. The Manor Farm Recreation Ground offers informal recreational space as well as three football pitches, a cricket pitch, tennis courts and a bowling green. Toton Sidings Local Wildlife Site (LWS) is adjacent to Toton Fields LNR is used by a local horse riding club (St Leonard's Riding School and Livery Stable).

Sandiacre, Stapleford and surrounds

6.3.17 Sandiacre and Stapleford are towns located north-east of junction 25 on the M1 at the border between Nottinghamshire and Derbyshire. Together, the towns comprise approximately 12,000 residential properties. Some residential properties in both Sandiacre and Stapleford 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.

6.3.18 Community facilities in the Stapleford, Sandiacre and surrounds area include places of worship (Stapleford Methodist Church, Church of Christ) and schools (William Lilley Infant & Nursery School, Fairfield Primary Academy, George Spencer Academy). There are a number of public houses including The Midland Hotel and The West End public house. The Midland Hotel hosts bi-weekly live music events, pool league fixtures and has outside child play space. The West End public house offers a function room for hire and frequently hosts live music events.

6.3.19 There are a number of open spaces in the area including Archers Field Recreation Ground, Hayworth Road Recreation Ground, Queen Elizabeth Park and the Peatfield and Albany allotments. Archer's Field Recreation Ground is a large open space popular with local residents. It offers a full-sized football pitch, a teen shelter and a pavilion. Recreational facilities in the area include Sandiacre Town Cricket Club and Sandiacre Town Football Club.

6.4 Effects arising during construction

Avoidance and 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:

- Long Eaton and Toton viaduct, which would enable the Proposed Scheme to pass over the Midshires Way and Nutbrook Trail promoted routes, residential properties and community facilities in Long Eaton. This would enable the use of these resources to continue.

6.4.2 The draft Code of Construction Practice (CoCP)[70] includes a range of provisions to 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);
- 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 HGV 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 the 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 the land required for construction of the Proposed Scheme.

Recreational facilities

6.4.5 In Ratcliffe-on-Soar, land used by Delta Force Paintball would be required for approximately two years and three months for construction of the Ratcliffe-on-Soar viaduct. Construction of the viaduct would require temporary loss of 1.7ha equating to 30% of the total area of the land used by the paintball centre. It is expected that activities would be able to be carried out on the remaining land at a reduced capacity. There are alternative facilities in the East Midlands area. Nationwide Paintball, for

[70] Supporting document: Draft Code of Construction Practice

example, is located 16km away from the site. The temporary loss of land forming part of this facility would result in a minor adverse effect which would not be significant.

6.4.6 The paintball centre would also experience severance in its access due to the road currently being used to access the site being required for construction access purposes. Proposed mitigation and an updated assessment of the likely effects of this loss of access on the paintball centre will be reported in the formal ES.

Open space and recreational PRoW

6.4.7 In Ratcliffe-on-Soar, the Midshires Way promoted recreational walking route would be impacted by the diversion of Long Lane (to accommodate the Ratcliffe-on-Soar viaduct) for approximately two years and nine months. The Midshires Way is a long (362km) recreational walking route of which 0.9km (0.25%) would be impacted. The resource is popular with walkers, cyclists and horse riders from across the East Midlands. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.8 In Ratcliffe-on-Soar, the River Soar would be closed for the construction of the Ratcliffe-on-Soar viaduct for approximately two weeks. Whilst closed, users of the waterway would be unable to use the river to travel between the River Trent to the north and Ratcliffe-on-Soar to the south. This resource is regularly used for recreational purposes by users across the East Midlands region, especially for narrowboat cruises. The temporary closure of the waterway would result in a minor adverse effect which would not be significant.

6.4.9 In Thrumpton, the Ashfield Angling Club at Thrumpton Park would be impacted by construction of the Redhill tunnel and the Long Eaton and Toton viaduct for approximately three years and nine months. At this location, the club promotes angling on a 1.8km stretch of the River Trent, of which 45m (2.5%) would be impacted by construction of the Proposed Scheme. Therefore, the majority of the venue would still be available for use. Other sections of the River Trent, though not managed by angling clubs, provide comparable alternatives for users. The temporary closure of part of this resource would result in a minor adverse effect which would not be significant.

6.4.10 The angling venue would also experience severance to its access due to the road currently being used to access the site being required for construction access purposes. Proposed mitigation and an updated assessment of the likely effects of severance on the angling venue will be reported in the formal ES.

6.4.11 In Long Eaton, the Cranfleet Canal would be temporarily closed to enable construction of the Long Eaton and Toton viaduct. The canal would be closed for two-hour intervals over a two-week period which would enable canal boats to navigate outside of the construction period. The canal is used by the Nottingham Yacht Club and is important for boaters on the River Trent as it acts as a bypass route for a weir which would otherwise make the River Trent unnavigable. The temporary closure of the canal would result in a minor adverse effect which would not be significant.

6.4.12 In Long Eaton, the Erewash Valley Trail (at its location on Long Eaton Footpath 12) would be impacted by construction of the Long Eaton and Toton viaduct for

approximately three years and nine months. The trail is a long recreational walking route (48km) and only 50m of the route would be impacted. The route 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.

6.4.13 In Long Eaton, Route 6 of the National Cycle Network would be impacted by construction of the Long Eaton and Toton viaduct for approximately three years and nine months. National Cycle Network Route 6 travels on existing roads in Long Eaton and crosses the Proposed Scheme at Station Street which would be closed and diverted for approximately two weeks. As Station Street would also be used as a site haul route, a temporary crossing point would be required at the intersection of Station Street and the construction traffic route. National Cycle Network Route 6 is regularly used by sub-regional (Nottinghamshire and Derbyshire) users and there are limited alternatives in the area. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.14 The lakes south-east of Long Eaton, used by Trent Windsurfing Club, would be impacted by construction of the Long Eaton and Toton viaduct for approximately three years and nine months. The Long Eaton and Toton viaduct would have an impact on access to West Lake during construction. East Lake would still be available for club members. West Lake is exclusively used by intermediate and advanced users, whereas East Lake is used primarily by beginners and for club events. Advanced and intermediate users of West Lake would only be able to use East Lake and therefore this may impair their experience of using the resource. The temporary closure of East Lake would result in a major adverse effect which would be significant.

6.4.15 In Long Eaton, a section of the Norfolk Road Recreation Ground and children's play area would be impacted by construction of the Long Eaton and Toton viaduct and East Midlands Hub station for approximately five years and nine months. Construction would require temporary loss of 0.45ha equating to 26% of the total area of the open space. The recreation ground has no formal use and the children's play area would not be impacted. Local residents would still be able to access the recreational ground for informal uses albeit at a reduced capacity. Manor Farm Recreation Ground, located approximately 500m away, is a significantly larger open space alternative with adequate space for informal recreational uses. The temporary loss of part of this open space would result in a minor adverse effect which would not be significant.

6.4.16 In Toton, the Toton Fields LNR would be impacted by construction of the East Midlands Hub station for approximately five years and nine months. Construction of the East Midlands Hub station would require the temporary loss of 6.1ha which is equivalent to 37% of the Toton Fields LNR total area. The land impacted by the Proposed Scheme would include a car park and a bridleway used by a local riding school. Access would be severed between the north (land by Banks Road Open Space) and south (land by the River Erewash and Manor Farm Open Space) of the nature reserve.

6.4.17 As well as being used by the local riding school (St Leonard's Riding School and Livery Stable), Toton Fields LNR is regularly used by local residents for both formal and informal recreation, including walking, exercising dogs, running and cycling. For users

from the local riding school, the majority of the bridleway would remain accessible however they would be unable to use all of the bridleway. There are also few other comparable alternatives for horse riding within the local area. For informal uses, other areas of Toton Fields LNR and two open spaces (Banks Road Recreation Ground and Manor Farm Open Space) would still be available. The temporary loss of an area of this local nature reserve would result in a moderate adverse effect which would be significant.

6.4.18 In Stapleford, the Archer's Field Recreation Ground would be impacted by highway works associated with the Proposed Scheme at the A52 Brian Clough Way for approximately two years. Approximately 0.64ha of the recreation ground, at its south-west corner, would be impacted by the Proposed Scheme which is equivalent to 10% of the total area of the recreation ground. The area which would be impacted includes a full-sized football pitch. There is adequate space within the unaffected section of the recreation ground to relocate the pitch. Queen Elizabeth Park, located 300m away, has a marked out, full sized football pitch and is considered to be a comparable alternative. The recreation ground is popular with local residents for informal uses such as walking. The majority of the recreation ground, as well as Queen Elizabeth Park, would be available for informal use. The temporary loss of part of this open space would result in a minor adverse effect, which would not be significant.

Permanent effects

Residential properties

6.4.19 In Ratcliffe-on-Soar, construction of the Ratcliffe-on-Soar viaduct would require the demolition of two residential properties on Green Lane. These properties would be permanently lost.

6.4.20 In Ratcliffe-on-Soar, construction of the Ratcliffe-on-Soar viaduct would require the demolition of Middle Gate Cottage. This residential property would be permanently lost.

6.4.21 In Long Eaton, construction of the Long Eaton and Toton viaduct would require the demolition of 23 residential properties on Newbery Avenue and Trent Cottages. The permanent loss of these properties would result in a major adverse effect which would be significant.

6.4.22 In Long Eaton, construction of the Long Eaton and Toton viaduct would require the demolition of 150 residential properties on Bonsall Street, Bonsall Court, Station Road, New Tythe Street, Thornfield Square, Main Street and Meadow Lane. The permanent loss of these properties would result in a major adverse effect which would be significant.

6.4.23 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.

6.4.24 This community effect occurs at the boundary 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 community area 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.

Community facilities

6.4.25 In Long Eaton, construction of the Long Eaton and Toton viaduct would require the demolition of The Kingdom Hall of Jehovah's Witnesses on New Tythe Street. There are two other Kingdom Halls of Jehovah's Witnesses within 5km (usage and capacity of which are unknown) however, this facility is a place of worship providing specific value to the community. The loss of this place of worship would result in a major adverse effect which would be significant.

6.4.26 In Toton, construction of the Long Eaton viaduct and East Midlands Hub station would require the demolition of the Greenwood Community Centre on Chester Green. The facility is owned by the Toton Greenwood Community Association which hires out the centre to local residents for community purposes. The Toton Tots Pre-School is based at the community centre as well as the 1st Toton Scout Group. Another scout group is located 1km away. However, there are limited comparable facilities available to be hired out by community groups within the local area. The loss of this community centre would result in a major adverse effect which would be significant.

6.4.27 In Stapleford, highway works associated with the Proposed Scheme would require the demolition of the Midland Hotel on the B5010 Derby Road. The Midland Hotel hosts pool league fixtures, has child play space and hosts bi-weekly live music events. It therefore has a distinct community value and is popular with local residents. There are a number of other public houses within close vicinity of the Midland Hotel, however, there are only two other public houses in Sandiacre and Stapleford which host regular live music (The West End public house which would be significantly affected being one of them) and the Midland Hotel is the only public house to offer child play space. The loss of this community facility would result in a major adverse effect which would be significant.

Recreational facilities

6.4.28 In Thrumpton, the Ashfield Angling Club at Thrumpton Park would be permanently impacted by construction of the Redhill tunnel and the Long Eaton and Toton viaduct. Only 20m of the 1.8km stretch of the River Trent where the venue operates would be permanently impacted (equivalent to 1.1%). Therefore, the majority of the venue would still be available for use and the section impacted would not include the weir pool which is the particularly attractive place to fish. There are also other sections of the River Trent which, though not managed by angling clubs, are comparable alternatives for users. The partial loss of this resource would result in a negligible effect which would not be significant.

Open space and recreational PRoW

6.4.29 In Long Eaton, the lakes south-east of Long Eaton, used by the Trent Windsurfing Club, would be permanently impacted by construction of the West Lake causeway.

The causeway, used to construct the viaduct, would be permanently located in the south-west corner of West Lake and would require 0.66ha which is equivalent to 3.3% of the total area of the lake. The majority of the lake would therefore remain useable. The entirety of East Lake would also remain viable and the impact of the construction of the viaduct over West Lake would represent 2.5% of the total area of the lakes. Advanced and intermediate users of West Lake would have their experience of the resource permanently impacted by being unable to access the entirety of West Lake. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.30 In Toton, the Toton Sidings LWS would be permanently lost by construction of the East Midlands Hub station. The LWS is used by a local horse riding school (St Leonard's Riding School and Livery Stable) for exercising. The nearest comparable alternative for this type of activity, Toton Fields, would also be impacted as part of the Proposed Scheme. The loss of this local wildlife site would result in a major adverse effect which would be significant.

6.4.31 In Stapleford, Archers Field Recreation Ground would be permanently impacted by highway works associated with the Proposed Scheme at the A52 Brian Clough Way. Approximately 0.2ha of the recreation ground, at its south-west corner, would be required by the Proposed Scheme for new highway space which is equivalent to 3.3% of the total area of the recreation ground. The majority of the recreation ground would remain available for use and the marked-out football pitches would not be affected. The permanent loss of part of this open space would result in a negligible effect which would not be significant.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

- West Lake and East Lake to the south-east of Long Eaton; and
- Toton Fields LNR.

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

- loss of residential properties on Newbery Avenue and Trent Cottages in Long Eaton;
- loss of residential properties on Bonsall Street, Bonsall Court, Station Road, New Tythe Street, Thornfield Square, Main Street and Meadow Lane in Long Eaton;

- loss of residential properties on Bessell Lane, the B5010 Derby Road, Station Road, Rutland Grove, Brookhill Street and West End Street in Sandiacre and Stapleford;
- demolition of the Kingdom Hall of Jehovah's Witnesses in Long Eaton;
- demolition of the Greenwood Community Centre on Chester Green in Toton;
- demolition of the Midland Hotel in Stapleford;
- demolition of The West End public house in Stapleford; and
- closure of Toton Sidings LWS.

Cumulative effects

6.4.36 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.

6.4.37 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 identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Ratcliffe-on-Soar to Long Eaton 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, Derbyshire County Council (DCC), Leicestershire Wildlife Trust, Leicestershire County Council (LeCC), and Friends of Toton Fields 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: LA05 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, Section 8 and the Scope and Methodology Report (SMR)[71].

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.

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

7.3.2 Land required for the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area consists of agricultural land, woodland and the floodplains of the River Trent, River Soar, River Erewash and associated tributaries. In the northern section of this area, these habitats are largely constrained within a landscape enclosed by, or otherwise dominated by, the residential and industrial areas of Long Eaton, Toton, Stapleford and Sandiacre.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA05 Map Book.

Designated sites

7.3.4 There are no internationally important sites relevant to the assessment in the Ratcliffe-on-Soar to Long Eaton area.

7.3.5 There are two nationally important Sites of Special Scientific Interest (SSSI) relevant to the assessment in the Ratcliffe-on-Soar to Long Eaton area. For both of these sites, the land required for the Proposed Scheme is within the Impact Risk Zone[72] relevant to railway infrastructure as identified by Natural England. They are:

- Lockington Marshes SSSI, covering an area of 11ha, is designated for one of the largest remaining areas of willow carr woodland in Leicestershire and supports a diverse complex of wetland habitat (including species-rich marshy meadow and pools), and an important invertebrate fauna with many nationally scarce beetles, flies and other species which are rare in Leicestershire. Additional interest features include wintering water fowl. The SSSI is south of Long Eaton and west of East Midlands Parkway Station, 80m west of the land required for the Proposed Scheme on the west bank of the River Soar; and
- Attenborough Gravel Pits SSSI, covering an area of 221ha, is designated for its lowland eutrophic open waters with emergent vegetation, wet floodplain woodland, unimproved floodplain grassland, a rich assemblage of breeding birds associated with lowland open waters and their margins, and wintering shoveler and bittern. It is also one of the most important sites in the county for water birds in the non-breeding season. The SSSI is adjacent to the western bank of the River Trent and 1km east of the land required for the Proposed Scheme. It is also designated as a Local Wildlife Site (LWS).

7.3.6 There are three local nature reserves (LNR) relevant to the assessment in the Ratcliffe-on-Soar to Long Eaton area, each of which is considered to be of up to county/metropolitan value:

- Forbes Hole LNR, covering an area of 3.4ha, supports a variety of habitats including open water, wet woodland, broadleaved woodland and grassland. The LNR is located 10m west of the land required for the Proposed Scheme, off Fields Farm Road, Long Eaton. Some of the land within the LNR is also designated as Forbes Hole LNR LWS;

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

- Manor Farm LNR, covering an area of 4ha, is located along the River Erewash and supports diverse habitats including open grassland, running water, hedgerow, scrub and woodland. The LNR is also known to support populations of reptiles, amphibians and water vole. The LNR is 160m to the east of the land required for the Proposed Scheme, between the A6005 Nottingham Road and Doncaster Grove in Long Eaton; and

- Toton Fields LNR, covering an area of 16.5ha, is located alongside the River Erewash and supports a variety of habitats including wetland, wet grassland and young woodland. There are records for a number of protected and notable species including black poplar, otter, water vole, bats, grass snake and invertebrates[73]. The LNR is partially within the land required for the Proposed Scheme, along the southern edge of Toton.

7.3.7 There are 27 LWS relevant to the assessment in the Ratcliffe-on-Soar to Long Eaton area, each of which is of county/metropolitan value unless stated otherwise. For this assessment, formally notified LWS have been included here, and habitats within potential and deferred LWS are described below under the relevant habitat and species 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 the LWS site interest features and reasons for designation will be updated in the formal ES. The notified LWS are:

- River Soar (Loughborough Meadows to Trent) LWS, covering an area of 55ha, comprises the River Soar and associated habitats on the river banks. This LWS is partially within the land required for the Proposed Scheme where the LWS would be crossed by the route of the Proposed Scheme on the Ratcliffe-on-Soar viaduct;

- Ratcliffe on Soar Pond LWS, covering an area of 0.01ha supports standing water. It is located 18m south of the land required for the Proposed Scheme;

- Red Hill, Ratcliffe-on-Soar LWS, covering an area of 5.3ha, includes woodland, scrub and grassland habitats and is adjacent the land required for the Proposed Scheme, to the west of Ratcliffe-on-Soar Power Station;

- Thrumpton Park LWS, covering an area of 79ha, includes areas of broadleaved woodland and grassland habitat as well as wood pasture and is partially within the land required for the Proposed Scheme, to the west of Thrumpton and bordering the River Trent to the north;

- Erewash Canal LWS, covering an area of 26.5ha and extending for 5.8km between Trent Lock and the northern boundary of the Ratcliffe-on-Soar to Long Eaton area, is designated for its standing open water habitats, aquatic plant species, water vole and grass snake. The LWS is adjacent to the land required for the Proposed Scheme at Long Eaton;

[73] Derbyshire Wildlife Trust (2017), Toton Fields LNR Management Plan 2017 - 2021, Derbyshire Wildlife Trust. Accessed online at: https://www.broxtowe.gov.uk/media/3329/toton-fields-management-plan-2017-finalrevb-fa.pdf

- River Trent North Bank LWS, covering an area of 3.8ha, is designated for its semi-improved neutral grassland. It is located 260m east of the land required for the Proposed Scheme, to the north of Thrumpton;
- Narrow Bridge Fish Pond LWS, covering an area of 1.8ha, is designated for the assemblage of aquatic plants. It is located 125m west of the land required for the Proposed Scheme, to the north of Trent Lock;
- Sheetstores Junction Pond LWS, covering an area of 0.3ha, is designated for its standing open water habitat. It is located 150m west of the land required for the Proposed Scheme, to the north of Trent Lock;
- Poplars Fish Pond LWS, covering an area of 1.2ha, is designated for its standing open water habitat. It is located 25m west of the land required for the Proposed Scheme, to the north-east of Trentside;
- South Junction Pond LWS, covering an area of 1ha, is designated for its reedbed and wet woodland habitat. It is located 70m west of the land required for the Proposed Scheme, to the south of Long Eaton;
- Forbes Hole LNR LWS, covering an area of 2.7ha, is located within, but is smaller than the extent of, Forbes Hole LNR. It is designated for its willow carr and dry woodland, scrub, grassland, and mature hedgerow habitats which support several species of threatened or notable plant and invertebrate species[74]. The LWS is located 10m west of the land required for the Proposed Scheme, off Fields Farm Road in Long Eaton;
- Meadow Lane Carr LWS, comprising two discrete land parcels covering a combined area of 1ha, is designated for its secondary broadleaved wet woodland and unimproved neutral grassland habitats. It is located within the land required for the Proposed Scheme, to the south of Meadow Lane in Long Eaton;
- Attenborough West Gravel Pits LWS, covering an area of 15.4ha, is connected to the south-west boundary of Attenborough Gravel Pits SSSI. It is designated for its wetland habitat mosaic, bird assemblage, and water vole population. It is located 630m north-east of the land required for the Proposed Scheme;
- Attenborough Gravel Pits LWS, covering an area of 228ha. This LWS encompasses, but extends beyond the boundary of Attenborough Gravel Pits SSSI, and is considered to be of up to national value with the same habitat and species assemblage as the SSSI. It is located on the River Trent downstream and 1km east of the land required for the Proposed Scheme;
- Barton Pool LWS, covering an area of 0.8ha, is designated for its secondary broadleaved wet woodland and lowland swamp habitats. It is located 410m east of the land required for the Proposed Scheme, north-east of Meadow

[74] Derbyshire Wildlife Trust (2013), Forbes Hole LNR Management Plan 2013 – 2023, Derbyshire Wildlife Trust. Accessed online at: https://www.erewash.gov.uk/media/files/Erewash_in_Bloom/Forbes%20Hole%20LNR%20Management%20Plan%202013.pdf

Lane on the eastern edge of Long Eaton;

- Attenborough Junction Tip LWS, covering an area of 12ha, is designated for its unimproved neutral grassland, scrub and habitat mosaic. It is located 205m east of the land required for the Proposed Scheme, to the south of Grange Park in Long Eaton;
- Nottingham Road Carr LWS, covering an area of 1.2ha, is designated for its secondary broadleaved wet woodland. It is located within the land required for the Proposed Scheme, to the east of Midland Street in Long Eaton;
- Toton Sidings Pond LWS, covering an area of 2.4ha, is designated for its standing open water and secondary broadleaved wet woodland habitats. It is located within the land required for the Proposed Scheme within an area for the purposes of ecological enhancement, to the west of Norfolk Road Recreation Ground in Long Eaton;
- River Erewash floodplain, Long Eaton LWS, covering an area of 5ha, is designated for its lowland swamp habitat and associated water vole population. It is located within the land required for the Proposed Scheme within an area for the purposes of ecological enhancement, on land between the Erewash Canal and the River Erewash in Long Eaton;
- Toton Erewash Channel LWS, covering an area of 1.7ha, supports running water in the form of the River Erewash and Bypass Channel and associated habitats. It is partially located within the land required for the Proposed Scheme at Toton;
- Toton Sidings LWS, covering an area of 13.4ha, supports grassland, scrub and broadleaved woodland habitat. It is located within the land required for the Proposed Scheme, to the west of Toton;
- Toton Sidings Riverside LWS, covering an area of 5.2ha, supports grassland and woodland habitat. It is located within the land required for the Proposed Scheme, to the north of Long Eaton and east of the River Erewash;
- Toton Sidings Grassland and Scrub LWS, covering an area of 1.7ha, supports grassland and scrub habitat. It is located within the land required for the Proposed Scheme;
- Toton Grassland LWS, covering an area of 1.2ha is designated for its unimproved neutral grassland and water vole population. It is located within the land required for the Proposed Scheme, on land between the Erewash Canal and the River Erewash in Long Eaton;
- Toton Sidings Pond LWS, covering an area of 1.3ha, is located within the land required for the Proposed Scheme and is designated for standing open water and secondary broadleaved wet woodland. It is located to the west of the Proposed Scheme to the south of Sandiacre and the A52 Brian Clough Way;
- Erewash Grassland, Stapleford LWS, covering an area of 1.6ha, supports grassland and scrub habitat. It is located within the land required for the

Proposed Scheme, immediately south of Sandiacre and the A52 Brian Clough Way; and

- Lock Lane Scrub, Sandiacre LWS, covering an area of 1ha, is designated for its wet grassland habitat, and the citation also lists dense scrub and tall herbs as habitats that are present. It is located within the land required for the Proposed Scheme, immediately south of Sandiacre and the A52 Brian Clough Way.

7.3.8 There are no Ancient Woodland Inventory Sites (AWIS) relevant to the assessment of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area.

7.3.9 A review is being undertaken to identify any 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[75], and Leicestershire[76], Derbyshire[77] and Nottinghamshire[78] local Biodiversity Action Plan (BAP) habitats), which would be within or partly within the land required for the Proposed Scheme. These woodland areas are located at:

- March Covert near the M1 junction 24;
- Riverside Farm at Ratcliffe-on-Soar;
- along the Long Eaton Low Level and Long Eaton High Level Line through Long Eaton; and
- along the River Erewash in Long Eaton.

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 extensive grassland on the floodplain of the River Soar from Ratcliffe-on-Soar to Thrumpton Park, and additional areas on the floodplain of the River Trent at Trentside and on the floodplain of the River Erewash to the south of the A52 Brian Clough Way. Some of these floodplain grasslands have been identified as potential LWS (Soar Meadow near Ratcliffe Lock candidate LWS and Cranfleet Farm

[75] Natural Environment and Rural Communities Act 2006. London, The Stationery Office
[76] Leicestershire and Rutland Environmental Records Centre (2016), Leicester, Leicestershire and Rutland BAP 2016-2026, Leicestershire and Rutland Environmental Records Centre. Accessed online at: http://www.lrwt.org.uk/what-we-do/biodiversity-action-plan/
[77] Lowland Derbyshire Biodiversity Partnership (2011), Lowland Derbyshire Biodiversity Action Plan 2011-2020, Lowland Derbyshire Biodiversity Partnership. Accessed online at: http://www.derbyshirebiodiversity.org.uk/lbaps/lowland-derbyshire.php
[78] The Nottinghamshire Biodiversity Action Group (1998), Local Biodiversity Action Plan for Nottinghamshire, The Nottinghamshire Biodiversity Action Group. Accessed online at: http://www.nottsbag.org.uk/projects.htm#bap

Flood Bank potential LWS). On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands), grasslands within candidate and potential LWS are considered to be of up to county/metropolitan value, and other grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.14 Many of the hedgerows in the Ratcliffe-on-Soar to Long Eaton area are likely to qualify as a habitat of principal importance and local BAP habitats. Some may also meet the wildlife and landscape criteria for 'important' hedgerows as defined in the Hedgerows Regulations 1997[79]. In addition, they could also provide commuting corridors for wildlife and nesting and feeding habitat. In particular, an extensive hedgerow network is present on land required for the Proposed Scheme between Long Lane Farm and Trent Meadows, Long Eaton. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.15 In addition to the watercourses located within designated sites, the River Trent, River Erewash and Cranfleet Canal, along with an additional 11 smaller watercourses and drains, would be crossed by the route of the Proposed Scheme.

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

Water bodies

7.3.17 There are 12 ponds that are located within, or partly within, the land required for the Proposed Scheme. Five of these ponds are located within the land required for the Proposed Scheme for the purposes of ecological enhancement or environmental mitigation, and would be retained. 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 water bodies have been assumed to be of up to county/metropolitan value.

7.3.18 In addition, there is a complex of water bodies formed from gravel extraction pits, including West Lake covering an area of 20ha, partially within the land required for the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, the complex of water bodies at West Lake has been assumed to be of up to county/metropolitan value.

[79] The Hedgerows Regulations 1997 (SI 1997 No. 1160). London, The Stationery Office

Open mosaic habitat

7.3.19 Pending the results of the field surveys, it is possible that open mosaic habitat on previously developed land (a habitat of principal importance) is present within the land required for the Proposed Scheme, particularly along the existing rail corridor and sidings in the Ratcliffe-on-Soar to Long Eaton area. On a precautionary basis, pending the findings of field surveys, open mosaic habitat in this location has been assumed to be of up to district/borough value.

Ancient and veteran trees

7.3.20 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 the completion of further survey and reported in the formal ES.

Protected and notable species

7.3.21 A summary of the likely value of flora and 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 Ratcliffe-on-Soar to Long Eaton area

Resource/feature	Value	Rationale
Bats	Up to regional	From a review of desk study data, eight species of bat have been recorded within the Ratcliffe-on-Soar to Long Eaton area. There are recent records of bat roosts within 2km of the land required for the Proposed Scheme, including brown long-eared bat, whiskered bat and Natterer's bat roosts around Kegworth and Lockington and common pipistrelle bat roosts in Kegworth, Ratcliffe-on-Soar and Long Eaton. Soprano pipistrelle, noctule and Daubenton's bat have also been recorded in the area, including at Attenborough Gravel Pits SSSI and LWS, Toton Fields LNR and along the River Trent. Higher quality habitat for bats is present within and adjacent to the land required for the Proposed Scheme, including woodland areas at Kegworth, Thrumpton Park and Toton, and wetland habitats associated with the River Soar, River Trent, River Erewash and the identified nature conservation designations within or close to the land required for the Proposed Scheme. 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 bat species in the Ratcliffe-on-Soar to Long Eaton area.
Otter	County/metropolitan	Local BAPs identify that otter populations in Leicestershire, Nottinghamshire and Derbyshire are beginning to recover after a period of decline, but the species remains scarce. There are recent (2014) records of otter from Toton Fields LNR within the River Erewash Bypass Channel. There are records of otter field signs to the south-east of Trent Meadows/east of Long Eaton Gravel Pits, the River Trent near Cranfleet Canal Bridge, Long Eaton Gravel pits and Long Eaton Canal near the A6005 Nottingham Road overbridge.

Resource/feature	Value	Rationale
Water vole	County/metropolitan	Water vole has been recorded along the entire length of the River Erewash Bypass Channel within Toton Fields LNR, and there are records from other designated site citations in the Ratcliffe-on-Soar to Long Eaton area.
Polecat	Up to county/metropolitan	Records indicate that polecat is uncommon but widespread in Nottinghamshire and Derbyshire, but there are no verified records for Leicestershire[80]. However, as this is a species that is gradually increasing and recolonising much of England, its current status may be under-estimated. As the species occupies a variety of habitat types, from farmland to woodland, habitats of potential suitability are widespread along the route of the Proposed Scheme.
Great crested newt	Up to county/metropolitan	There are 19 water bodies within the land required for the Proposed Scheme (5 are located within the land required for the Proposed Scheme) and an estimated additional 52 water bodies within 250m of the land required for the Proposed Scheme. Terrestrial habitats suitable to support great crested newt are present within the land required for the Proposed Scheme. Pending further survey, it is currently assumed that all of the identified water bodies (apart from one where great crested newt were confirmed absent by an environmental DNA survey in 2017) are suitable for great crested newt.
Birds	Up to county/metropolitan	The citation for Attenborough Gravel Pits SSSI identifies a number of species that breed, overwinter and roost there as part of the designated interest. Similar species assemblages may use other habitats outside the SSSI and within the land required for the Proposed Scheme. This could include the Long Eaton Gravel Pits and the River Trent immediately to the east of the Proposed Scheme extending to the western boundary of Attenborough Gravel Pits SSSI and LWS. These areas provide suitable habitat for breeding and wintering waterfowl, including the Schedule 1 species, kingfisher, which has been recorded using these habitats during the winter months. The farmland and woodland is suitable for breeding and wintering birds. Barn owl may occur within the wider landscape given the likelihood of suitable nesting and feeding habitat available. According to the NWT[81] and the Barn Owl Conservation Network (BOCN)[82], there are around 100 barn owl nests in Nottinghamshire.
White-clawed crayfish	Up to county/metropolitan	White-clawed crayfish are rare and continue to decline in this area. White-clawed crayfish are known to occur in watercourses in the upper catchment of the River Erewash, although no records were identified through desktop study in the land required for the Proposed Scheme in this area.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates (other than white-clawed crayfish) is likely to be present in the River Trent, River Soar, River Erewash and Cranfleet Canal as well as in the smaller watercourses and the 19 water bodies within the land required for the Proposed Scheme.

[80] Croose, E. (2016), The Distribution and Status of the Polecat (Mustela putorius) in Britain 2014-2015, The Vincent Wildlife Trust. Accessed online at: http://www.vwt.org.uk/wp-content/uploads/2016/04/Polecat-Report-2016.pdf
[81] Nottinghamshire Wildlife Trust (2018), Barn Owl Factsheet, Nottingham Wildlife Trust. Accessed online at: https://www.nottinghamshirewildlife.org/wildlife-explorer/birds/birds-prey/barn-owl
[82] Barn Owl Conservation Network (undated), BOCN Organisers and Local Information, Barn Owl Conservation Network. Accessed online at: http://bocn.org/map.asp

Resource/feature	Value	Rationale
Terrestrial Invertebrates	Up to district/borough	Habitats with potential to support notable assemblages of terrestrial invertebrates occur within land required for the Proposed Scheme; for example, on river floodplains, in the vicinity of Ratcliffe-on-Soar Power Station, along the railway corridor adjacent to Long Eaton where there is potential for specialist species associated with open mosaic habitats to occur, and in association with the habitat corridor along the River Erewash.
Fish	Up to county/metropolitan	There are records of spined loach from 2009 (listed on Annex II of the EC Habitats Directive[83]) in the River Soar at Ratcliffe-on-Soar and the River Trent. There are records of European bullhead (Annex II species) at Redhill Lock east of Thrumpton Park in 2012. Bullhead has also been recorded by the Environment Agency at the following locations: River Soar, River Trent and River Erewash. European eel have been recorded by the Environment Agency in the River Soar and River Erewash. Field surveys have identified the presence of spawning habitat suitable in the River Trent for species such as barbel (Annex V species), which were observed spawning at the location of the viaduct crossing.
Reptiles	Up to district/borough	There are records of reptiles within 500m of the land required for the Proposed Scheme of adder, slow worm, grass snake and common lizard. Habitats with potential to support reptiles are present along the route of the Proposed Scheme e.g. in the vicinity of Ratcliffe-on-Soar Power Station, along the Cranfleet Canal, the railway corridor adjacent to Long Eaton, and along the habitat corridor associated with the River Erewash.

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: LA05 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:

- viaducts over the River Soar, River Erewash and Cranfleet Canal would avoid direct effects to these watercourses and allow free passage for wildlife including along the rivers and their banks;
- new woodland habitat creation and landscape mitigation planting (37.5ha) would compensate for losses of woodland (including areas of planting north of Ratcliffe-on-Soar Power Station, north of Cranfleet Canal, Long Eaton and by the sewage treatment works south of the A52 Brian Clough Way);
- provision of new ponds (e.g. to the south of the River Erewash Bypass Channel), which would form part of the measures to address loss of water

[83] Council Directive 92/43/EEC of May 1992 on the Conservation of natural habitat and wild fauna and flora

bodies and effects on great crested newt and other species;

- new species-rich hedgerows (6.3km), using appropriate native species would help towards compensating for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including near March Covert, Ratcliffe-on-Soar, and Trentside;
- provision of new grassland habitats (20.9ha), including some species-rich grasslands (including translocation where appropriate) to compensate for grassland losses, including losses of wet and floodplain grassland; and
- inclusion of some areas of LWS within the land required for the Proposed Scheme for the purposes of appropriate ecological enhancement only, including Toton Grassland LWS, Toton Sidings Pond LWS, River Erewash floodplain, Long Eaton LWS and Toton Erewash Channel LWS, totalling 7.6ha of habitat enhancement measures.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[84], 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

[84] Supporting document: Draft Code of Construction Practice

undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

Designated sites

7.4.5 Lockington Marshes SSSI would not be directly affected by construction of the Proposed Scheme. The nearest point of construction would be 80m east of the SSSI, and on the opposite side of the River Soar to the SSSI. Habitats within the SSSI are groundwater dependent. Whilst the viaduct could result in localised impacts on groundwater and surface water flows, it is expected that there would be no significant adverse effect on the SSSI. 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. Given this, it is considered that there would be no significant effect on the integrity of Lockington Marshes SSSI.

7.4.6 Attenborough Gravel Pits SSSI and LWS would not be directly affected by construction of the Proposed Scheme. The nearest point of construction would be 1km west of the SSSI (Long Eaton and Toton viaduct and associated temporary works). Potential indirect effects through changes to groundwater are not expected due to the Proposed Scheme being on viaduct at this location and being 1km from the SSSI. Whilst the viaduct could result in localised impacts on groundwater it is expected that the effects would not extend as far as the SSSI.

7.4.7 Loss of farmland habitat near the SSSI and disturbance may result in adverse effects for birds that are interest features of the SSSI, if they are using such habitats regularly e.g. as a feeding resource. Habitat losses would be relatively small in the context of the extent of similar habitat along the floodplain of the River Soar and River Trent. Surveys to date indicate only small numbers of wintering bird species are in the vicinity of the Proposed Scheme around West Lake, the River Trent and the land between the River Trent and Cranfleet Canal. No significant effect on the SSSI is expected from disturbance to wintering birds. Should ongoing breeding bird surveys and assessment indicate the presence of SSSI qualifying species that could be disturbed by construction of the Proposed Scheme during the breeding season, it is anticipated that implementation of measures in the draft CoCP would reduce the impacts to a level where there would be no significant effect on the integrity of the SSSI.

7.4.8 Forbes Hole LNR and LWS would not be directly affected by construction of the Proposed Scheme. The land required for the Proposed Scheme would be 10m east of the LNR. The water assessment suggests that construction of the Long Eaton and Toton viaduct piers could result in a temporary impact on the water levels at the pond within the LNR. On a precautionary basis it is assumed there would be a permanent effect on the integrity of the Forbes Hole LNR and LWS that would be significant at up to the county/metropolitan level.

7.4.9 Construction of balancing ponds and East Midlands Hub station would result in the loss of 6 ha of Toton Fields LNR (36% of the LNR), affecting woodland and grassland habitats on the floodplain of the River Erewash. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential indirect effects to a level where there would be no significant effect. Habitat losses would

result in a permanent adverse effect on the integrity of the Toton Fields LNR that would be significant at up to the county/metropolitan level.

7.4.10 Construction of Redhill tunnel, Long Eaton and Toton viaduct and associated temporary works would result in the loss of 11.7ha of Thrumpton Park LWS (15%). The relevant habitats that would be affected are woodland and grassland, and habitat on the banks of the River Soar. It is anticipated that potential indirect effects would be reduced through implementation of measures in the draft CoCP to a level where there would be no significant effect. The proposed woodland and grassland habitat creation within the LWS will help to reduce potential impacts to the remainder of the site and further measures such as habitat enhancement of areas of the LWS will be identified following ongoing surveys and assessment. Habitat losses would be a permanent adverse effect on the integrity of the Thrumpton Park LWS that would be significant at the county/metropolitan level.

7.4.11 Meadow Lane Carr LWS is located within the land required for the Proposed Scheme and all of the broadleaved wet woodland and unimproved neutral grassland habitats that comprise the LWS (1ha) would be lost. This would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

7.4.12 Nottingham Road Carr LWS is located within the land required for the Proposed Scheme and all of the broadleaved wet woodland habitats that comprise the LWS (1.2ha) would be lost. This would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

7.4.13 Toton Sidings Riverside LWS would be directly affected by construction of the Proposed Scheme with the loss of 0.8 ha of the LWS (15%). The affected habitats would be broadleaved woodland. It is anticipated that potential indirect effects would be reduced through implementation of measures in the draft CoCP to a level where there would be no significant effect. Although there is proposed ecological enhancement of habitats within part of the retained area of the LWS (2.14ha), on a precautionary basis, the loss of LWS habitats would be significant at up to the county/metropolitan level.

7.4.14 Toton Sidings Grassland and Scrub would be directly affected by construction of the Proposed Scheme with the loss of 0.5ha (29%) of the LWS. The affected habitats would be grassland and scrub. It is anticipated that potential indirect effects would be reduced through implementation of measures in the draft CoCP to a level where there would be no significant effect. The loss of habitat would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

7.4.15 Toton Sidings LWS is located within the land required for the Proposed Scheme and would be directly affected by construction of the Proposed Scheme with the loss of 12ha (91%) of the LWS. The affected habitats would be woodland and grassland. This would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

7.4.16 Toton Sidings Pond LWS is located within the land required for the Proposed Scheme in an area allocated solely for the purpose of environmental mitigation, to the west of

Long Eaton Low Level Line. Although there would be no direct habitat loss within the LWS, potential changes to hydrological regimes could have an adverse effect. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential effects to a level where there would be no significant effect. However, on a precautionary basis and in the absence of further information, at this stage the assessment assumes there would be an adverse effect on integrity of the LWS that would be significant at up to the county/metropolitan level.

7.4.17 Erewash Grassland, Stapleford LWS would be directly affected by construction of the Proposed Scheme. The A52 Brian Clough Way realignment and balancing pond would result in the loss of the entire LWS. The affected habitats would be grassland and woodland. Habitat loss would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

7.4.18 Lock Lane Scrub, Sandiacre LWS is located within the land required for the Proposed Scheme and all of the wet grassland and scrub habitat that comprise the LWS would be lost (1ha). This would be a permanent adverse effect on the integrity of the LWS that would be significant at the county/metropolitan level.

Habitats

Woodland

7.4.19 Construction of the Proposed Scheme would result in the loss of 11.4ha of broadleaved woodland outside designated sites. This loss includes 1.8ha of March Covert, woodland along the River Erewash and along the Long Eaton High and Low Level lines. This is a permanent adverse effect that is significant at up to the county/metropolitan level. The proposed planting of woodland (woodland habitat creation and landscape mitigation planting) would compensate for losses of existing woodland, and on a precautionary basis, pending further survey and assessment, the residual effect (following establishment of new woodland) would be significant at up to district/borough level. However if the ongoing review identifies any additional ancient woodland, the residual adverse effect would be significant at up to the county/metropolitan level.

Grassland

7.4.20 In the absence of further survey data, it is estimated that the Proposed Scheme would result in the loss of 30.3ha of grassland outside designated sites. This comprises up to 1.6ha of floodplain grassland of potential LWS quality (from Soar Meadow near Ratcliffe Lock candidate LWS and Cranfleet Farm Flood Bank potential LWS), up to 22.7ha of other grasslands in floodplain areas, and 6ha of other grassland. This is a permanent adverse effect that is significant at up to county/metropolitan level for grasslands in potential LWS and at district/borough level for other grasslands. Whilst the proposed grassland creation and enhancement measures included in the design would compensate for loss of existing grassland (following establishment of new grassland), until further surveys and assessment are completed the permanent loss of these grasslands is considered on a precautionary basis to have a residual adverse effect that would be significant at up to district/borough level for the grassland lost within the potential LWS. For all other grassland losses, it is considered that the residual adverse effect would be reduced to a level that is not significant.

Hedgerows

7.4.21 The land required for the Proposed Scheme would result in the permanent loss of 7.5km of hedgerows, and would result in severance of the hedgerow network in many places, adversely affecting 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[10].

7.4.22 The Proposed Scheme includes new hedgerow planting to 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 integrity of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.23 The Proposed Scheme would cross the River Soar, River Trent, River Erewash, Cranfleet Canal and a number of smaller watercourses and drains on viaduct. Some construction works would be required on the relevant floodplains, and in-channel works would be required for the construction of viaduct piers in the River Trent. Construction of in-channel piers would directly affect the habitats of the River Trent, but these works would be localised. Section 15, Water resources and flood risk concludes that the impact on hydromorphology of the river would be minor. It is anticipated that habitat disturbance effects during construction of the Proposed Scheme would be controlled through implementation of the measures in the draft CoCP and would be negligible given the size of the River Trent and the extent of comparable habitats, and are therefore not significant.

7.4.24 The potential for indirect construction effects on the River Trent and other watercourses would be controlled through the implementation of measures in the draft CoCP. The Ratcliffe-on-Soar viaduct and Long Eaton and Toton viaduct would be of sufficient height to reduce the potential for watercourses to be indirectly affected by shading, such that any shading effect would not be significant. On this basis, the Proposed Scheme would be unlikely to produce a significant effect on watercourse habitats.

Water bodies

7.4.25 Seven ponds would be lost as a result of the Proposed Scheme. The loss of these water bodies could result in a permanent adverse effect that would be significant at up to county/metropolitan level. Replacement ponds are to be created to the south of the River Erewash Bypass Channel and elsewhere in this area, which would compensate for habitat losses. On a precautionary basis, pending further survey information and assessment, it is considered that the residual adverse effect would be significant at up to district/borough level, particularly if it is confirmed through field surveys that they support species of higher conservation importance.

7.4.26 West Lake and the associated complex of water bodies would be crossed by the Long Eaton and Toton viaduct on West Lake causeway which comprises two embankments which extend out into West Lake. On a precautionary basis, in the absence of field

survey information, this would result in permanent adverse effects on lake habitats which would be significant at up to county/metropolitan level.

Open mosaic habitat

7.4.27 It is assumed that any open mosaic habitat within the land required for the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area would be permanently lost. The loss of this habitat type would result in a permanent adverse effect that would be significant at up to district/borough level.

Ancient and veteran trees

7.4.28 It is assumed that if any ancient and veteran trees are within the land required for the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area, they would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would be significant at district/borough level in each case.

Species

Bats

7.4.29 At least eight bat species are present in the Ratcliffe-on-Soar to Long Eaton 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 the implementation of measures in the draft CoCP.

7.4.30 The proposed woodland, grassland and hedgerow planting would 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 is considered 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

7.4.31 All watercourses associated with the Proposed Scheme are likely to be used by otter, but territories are more likely to be present on the main watercourses of the Rivers Soar, Trent and Erewash, and the Cranfleet Canal. There would be no loss of watercourse habitats suitable for otter. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential disturbance effects during construction, to a level where there would be no significant effect. On a precautionary basis, in the absence of survey information, it is considered that there is potential for a temporary adverse effect on otters that would be significant at up to county/metropolitan level.

Water vole

7.4.32 There would be no loss of watercourse habitats suitable for water voles; however, there is potential for adverse effects on water vole and its habitat where suitable water bodies and watercourses would be disturbed. Similarly, there would be no loss

of habitat or habitat connectivity along watercourses, as the design of the Proposed Scheme includes viaducts over the main watercourses and their associated floodplains, and no watercourses would be culverted. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of potential disturbance effects during construction, to a level where there would be no significant effect. On a precautionary basis, in the absence of survey information, it is considered that there is potential for a temporary adverse effect on water vole that is significant at up to the county/metropolitan level.

Polecat

7.4.33 The loss of woodland, grassland and hedgerows could affect polecat if surveys show this species to be present. 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

7.4.34 It is assumed that, pending further survey information, eighteen of the nineteen water bodies and surrounding terrestrial habitat within the land required for the Proposed Scheme may support breeding populations of great crested newt, and 12 water bodies would be lost during construction.

7.4.35 The loss of 12 potentially suitable ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of populations of great crested newts across this area and result in a permanent reduction in the availability of breeding habitat for the species. The associated losses, severance and isolation of terrestrial habitat would also be adverse for the conservation status of affected populations of great crested newt. There are a further 52 ponds within 250m of the land required for the Proposed Scheme which could support great crested newt. If this species is present, the loss of terrestrial habitat associated with these ponds would have an adverse effect on the status of great crested newt present within these ponds.

7.4.36 New ponds and terrestrial habitat are included in the Proposed Scheme design and these will be suitable for great crested newt. 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 the full mitigation, 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

7.4.37 The Proposed Scheme would result in the loss of nesting, roosting and foraging habitat for a range of breeding and wintering birds, including waterfowl species using Long Eaton Gravel Pits and farmland and woodland species. Barn owl, a Schedule 1

species, may be affected if any nest sites or important feeding areas are identified within the land required for the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it is considered 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

7.4.38 No records of white-clawed crayfish have been identified in this area; however, there is the potential for this species to occur in watercourses including the River Erewash and its tributaries. It is expected that white-clawed crayfish will not be present in the minor watercourses. However, in the absence of survey information, this species is assumed to be present in these watercourses, and there would be an adverse effect that would be significant at up to county/metropolitan level.

Aquatic invertebrates

7.4.39 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates other than white-clawed crayfish. 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

7.4.40 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, it is considered that the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Fish

7.4.41 There are records of fish from the main watercourses, including species such as European bullhead and spined loach (both listed on Annex II of the EC Habitats Directive[85]), European eel, barbel (Annex V) and brown trout. The Proposed Scheme would pass over the Rivers Soar, Trent and Erewash, the Cranfleet Canal and 11 smaller watercourses and drains on viaducts. It is anticipated that the measures within the draft CoCP would reduce the magnitude of effects on fish species. However, as a result of the placement of viaduct piers in the River Trent and consequent loss of habitat, including spawning habitat where barbel were observed spawning during field survey, on a precautionary basis it is considered that there would be an adverse effect that would be significant at up to the county/metropolitan level.

Reptiles

7.4.42 There are records of reptiles within the vicinity of the Proposed Scheme, and suitable habitat is likely to be present for adder, grass snake, slow worm and common lizard. There is potential for reptiles to be affected where suitable habitat is present within the land required for the Proposed Scheme. Potential impacts include loss of foraging

[85] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

habitat and hibernation sites. Grassland habitat creation scrub and hedgerow planting and pond creation would contribute towards reducing impacts on reptiles. 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.

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

7.4.44 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

7.4.45 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 for potential wetland habitat creation in replacement floodplain storage areas, including wet woodland;
- provision of additional broadleaved 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;
- provision of biodiversity enhancements in West Lake around the Long Eaton and Toton viaduct causeways;
- configuration of sustainable drainage systems and water treatment areas at the East Midland Hub station to maintain the water quality and Water Framework Directive (WFD) status of the River Erewash;
- 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; and
- 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 construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

Summary of likely residual significant effects

7.4.46 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
Forbes Hole LNR/LWS	Permanent adverse effect on site integrity due to potential impacts on ground water hydrology and construction effects	Up to County/metropolitan
Toton Fields LNR	Permanent adverse effect on site integrity due to loss of 6ha (36%) of the habitat resource of the LNR and associated impacts.	Up to County/metropolitan
Thrumpton Park LWS	Permanent adverse effect on site integrity due to loss of 11.7ha (14%) of the habitat resource of the LWS and associated impacts	County/metropolitan
Meadow Lane Carr LWS	Permanent adverse effect on site integrity due to loss of the entire habitat resource in the LWS and associated impacts	County/metropolitan
Nottingham Road Carr LWS	Permanent adverse effect due to loss of the entire habitat resource and associated impacts	County/metropolitan
Toton Sidings Riverside LWS	Permanent adverse effect due to the loss of 0.8ha (15%) of the habitat resource of the LWS and associated impacts	Up to county/metropolitan
Toton Sidings Grassland and Scrub LWS	Permanent adverse effect due to the loss of 0.5ha (29%) of the habitat resource of the LWS and associated impacts	Up to county/metropolitan
Toton Sidings LWS	Permanent adverse effect on site integrity due to loss of 12ha (91%) the habitat resource in the LWS	County/metropolitan
Toton Sidings Pond LWS	Permanent adverse effect on site integrity due to changes to hydrological regimes	Up to county/metropolitan

Resource/feature	Residual effect	Level at which the effect would be significant
Erewash Grassland, Stapleford LWS	Permanent adverse effect on site integrity due to loss of entire habitat resource in the LWS	County/metropolitan
Lock Lane Scrub, Sandiacre LWS	Permanent adverse effect on site integrity due to loss of entire habitat resource of the LWS	County/metropolitan
Woodland	Permanent adverse effect due to loss of woodland. Potential adverse effect on potential ancient woodland. New woodland planting is included in the Proposed Scheme design.	Up to county/metropolitan
Grassland	Permanent adverse effect on grassland due to the loss of grassland. Grassland creation is included in the Proposed Scheme design.	Up to district/borough
Hedgerow	Permanent loss and severance of hedgerows. Hedgerow creation is included in the Proposed Scheme design.	Up to district/borough
Water bodies	Potential loss of seven ponds. New water bodies are included in scheme design to address losses. Additional habitat loss and associated impacts at West Lake. New water bodies are included in the Proposed Scheme design.	Up to county/metropolitan
Open mosaic habitat	Permanent loss and fragmentation	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 temporary 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

Resource/feature	Residual effect	Level at which the effect would be significant
Polecat	Potential permanent adverse effect on conservation status due to loss of foraging habitat and fragmentation	Up to county/metropolitan.
Great crested newts	Potential permanent loss of existing breeding and terrestrial habitats, along with further habitat severance and isolation	Up to county/metropolitan.
Birds	Potential permanent adverse effect on conservation status due to loss, fragmentation and / or severance of habitat for nesting, roosting 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 and indirect effects	Up to district/borough
Terrestrial invertebrates	Potential permanent adverse effect on the conservation status of species or assemblages due to habitat loss and fragmentation	Up to district/borough
Fish	Potential permanent adverse effect on conservation status due to loss of habitat, including barbel spawning habitat in the River Trent	Up to county/metropolitan
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough

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 Trent, 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 Other bird species associated with Attenborough Gravel Pits SSSI and LWS are potentially at risk of collision with moving trains and the associated overhead infrastructure (overhead line equipment and power lines) on the Long Eaton and Toton viaduct which spans the Trent valley. It is anticipated that these bird species would avoid the new structures and fly below the Long Eaton and Toton viaduct or above the overhead line equipment, to the extent that there would be no significant adverse effects.

7.5.6 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

7.5.7 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[86] which has been developed to provide measures that would 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

7.5.8 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.

[86] Currently in development for Phase One of HS2

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

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

7.5.10 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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: LA05 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, Section 8 and the Scope and Methodology Report (SMR)[87].

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 Ratcliffe-on-Soar to Long Eaton area are:

- for impacts during construction (temporary and permanent):

[87] 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[88];
- 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 Ratcliffe-on-Soar to Long Eaton 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

[88] 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 in this area would run through mainly rural areas in the south of the study area, comprising agricultural and wooded landscapes with agricultural and recreational land uses. The route of the Proposed Scheme would pass close to the settlements of Kegworth, Ratcliffe-on-Soar and Thrumpton.

8.3.3 In the north of the study area, the route of the Proposed Scheme passes through the towns of Long Eaton, Toton, Sandiacre and Stapleford. These are predominantly urban areas comprising residential, commercial, light industrial and some recreational land uses. The majority of community facilities are in these northern urban areas.

Ratcliffe-on-Soar, Thrumpton and surrounds

8.3.4 Ratcliffe-on-Soar and Thrumpton are both villages in the Rushcliffe district of Nottinghamshire. Together Ratcliffe-on Soar and Thrumpton comprise approximately 300 residential properties. Ratcliffe-on-Soar is situated approximately 600m east of the route of the Proposed Scheme, and Thrumpton is situated approximately 1km east of the route of the Proposed Scheme.

8.3.5 There are a number of community and recreational facilities located within or nearby Ratcliffe-on-Soar, including a place of worship (the Holy Trinity Church), and the Redhill Marina situated on the River Soar. Midshires Way, a 362km promoted walking route[89], passes the village to the north-west along Long Lane and is available to walkers, cyclists and horse riders.

8.3.6 Community facilities within Thrumpton include All Saints' Church[90], Thrumpton Cricket Club and Thrumpton Hall (an event venue predominately hosting weddings) located within Thrumpton Park, a 140ha area of parkland which is open to the public for organised events. Thrumpton Park is also used as an angling venue for members of the Ashfield Angling Club.

Long Eaton and surrounds

8.3.7 Long Eaton is a town comprising approximately 20,500 residential properties, the closest of which would lie within the land required for the construction of the Proposed Scheme. There are a range of community facilities in the town including places of worship (Kingdom Hall of Jehovah's Witnesses, Long Eaton Masjid mosque, and numerous churches such as Long Eaton Baptist Church), and educational facilities (including St. Laurence Church of England Primary School, Grange Primary School, Brooklands Primary School and Trent College). There are also healthcare centres, pharmacies, social centres, care homes, public houses, youth centres, a mental health clinic, and the Long Eaton Library.

8.3.8 Recreational facilities within Long Eaton include gyms and sports clubs, a number of public rights of way (PRoW), Norfolk Road Recreation Ground and the River Erewash Toton Washlands; an informal open space with a children's play area. To the south-

[89] A promoted walking route refers to those Public Rights of Way which are "promoted" destinations in their own right as a recreational resource.
[90] This is also referred to as the 'Church of All Saints' in Section 9, Historic environment

east of Long Eaton, the Trent Windsurfing Club has access to West Lake and East Lake.

Toton and surrounds

8.3.9 Toton is a town comprising approximately 2,700 residential properties, the closest of which would lie adjacent to the route of the Proposed Scheme. There are a range of community facilities in Toton including places of worship (such as the Church of Jesus Christ of Latter-day Saints and Toton Methodist Church), one primary and two nursery schools, two scout groups, and the Greenwood Community Centre.

8.3.10 Recreational facilities within Toton include Toton Fields Local Nature Reserve (LNR), Banks Road Open Space and children's play area, and the Manor Farm Recreation Ground which offers football pitches, a cricket club, tennis courts and a bowling green. Toton Sidings Local Wildlife Site (LWS) is adjacent to Toton Fields LNR and is used by a local horse riding school (St Leonard's Riding School and Livery Stable).

Sandiacre, Stapleford and surrounds

8.3.11 Sandiacre and Stapleford are towns located north-east of junction 25 on the M1 and south of the B5010 Derby Road. Together Sandicare and Stapleford comprise approximately 12,000 residential properties, the closest of which would lie within the land required for the construction of the Proposed Scheme.

8.3.12 Within Sandiacre and Stapleford, community and recreational facilities include places of worship (Stapleford Methodist Church and Church of Christ), educational facilities (William Lilley Infant and Nursery School, Fairfield Primary Academy and George Spencer Academy) and a number of public houses including the Midland Hotel and The West End public house. Recreational facilities include Hayworth Road Recreation Ground, Archers Field Recreation Ground, Queen Elizabeth Park and the Peatfield and Albany allotments. The River Erewash and Erewash Canal are located between the two towns and provide opportunities for recreational angling and leisure craft. Recreational facilities in the area also include Sandiacre Town Cricket Club and Sandiacre Town Football Club.

Demographic and health profile of the Ratcliffe-on-Soar to Long Eaton area

8.3.13 The local communities potentially affected by the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area have a relatively high population density, commensurate with the predominantly urban nature of this area.

8.3.14 Data provided by the Office for National Statistics[91] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.15 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[92], 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

[91] 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.
[92] 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

national average with regard to changes in relevant health determinants, and with a number of vulnerabilities in terms of the health status of the population.

8.3.16 The available data provide detail down to ward level and enable a profile to be made of the whole population in the Ratcliffe-on-Soar to Long Eaton 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 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 draft Code of Construction Practice (CoCP) [93], 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

[93] Supporting document: Draft Code of Construction Practice

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 formal 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).

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 Ratcliffe-on-Soar to Long Eaton 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[94] impacts on neighbourhood quality in areas close to construction sites, including those at Long Eaton and the East Midlands Hub station. 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 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 Ratcliffe-on-Soar to Long Eaton area may 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.

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 Ratcliffe-on-Soar to Long Eaton area include the urbanised towns of Long Eaton, Toton, Sandiacre and Stapleford and the rural villages of Ratcliffe-on-Soar and Thrumpton. 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 impacts

[94] 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.

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 Ratcliffe-on-Soar to Long Eaton area is mixed in character with both urban and rural areas. The south of the study area is predominantly rural in character. Typically there is the reliance on shops and services in nearby towns and villages. Opportunities to access alternative services and 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, and libraries), as a result of increased journey times during construction. This will be assessed and reported in the formal ES.

8.4.22 The north of the study area is urban in nature, with a larger range of shops and services, with a broad selection, availability and capacity offering greater than average community resilience to changes in access and accessibility to such amenities and facilities during construction. Health effects associated with reduced access to shops and services will be assessed in the formal ES.

8.4.23 The construction of the Long Eaton and Toton viaduct would result in the demolition of the Kingdom Hall of Jehovah's Witnesses in Long Eaton, which provides a meeting and worship space for the congregation. There are two other Kingdom Halls of Jehovah's Witnesses within 5km which offer alternative worship facilities. Access to places of worship makes a positive contribution to the wellbeing of individuals belonging to that faith. The permanent loss of this facility would have an adverse effect on the wellbeing of users 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 Long Eaton area are likely to use the Hall.

8.4.24 In the Toton area, the construction of the Long Eaton viaduct and East Midlands Hub station would require the demolition of the Greenwood Community Centre on Chester Green. The facility is owned by the Toton Greenwood Community Association and used by local residents for community activities. The Toton Tots Pre-School is based at the community centre; however, there is an alternative early years education facility within 300m (Banks Road Nursery) and five alternative early years facilities within approximately 1km.The 1st Toton Scout Group is also based at the Greenwood

Community Centre. Another scout group is located 1km away which provides an alternative scout group facility; however, there are limited comparable facilities for community group use within the local area. Access to these facilities makes a positive contribution to the wellbeing of individuals. The permanent loss of this facility will adversely affect the wellbeing of users depending on their ability to access an alternative facility.

8.4.25 In the Sandiacre and Stapleford area, highway works associated with the Proposed Scheme would require the demolition of the Midland Hotel on the B5010 Derby Road. The Midland Hotel hosts pool league fixtures, has child play space and hosts live music events. There are a number of other public houses within close vicinity of the Midland Hotel; however, the Midland Hotel is one of only three public houses in Sandiacre and Stapleford to host live music (one of which, The West End public house, will also be lost to the Proposed Scheme) and the only public house to offer child play space. The permanent loss of this facility will adversely affect the wellbeing of users.

8.4.26 Highway works associated with the Proposed Scheme would require the demolition of The West End public house on the B5010 Derby Road in the Sandiacre and Stapleford area. The West End public house offers a hireable function room. There are a number of other public houses within close vicinity of The West End public house; however, The West End public house is one of only three public houses in Sandiacre and Stapleford to host live music (one of which, the Midland Hotel, will also be lost to the Proposed Scheme) and one of only two to offer a function room for hire. The permanent loss of this facility will adversely affect the wellbeing of users.

Access to green space, recreation and physical activity

8.4.27 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.

8.4.28 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.

8.4.29 The route of the Proposed Scheme would intersect a number of PRoW in the Ratcliffe-on-Soar to Long Eaton 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.

8.4.30 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 a number of roads in this area, 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 Non-Motorised Users. 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.

8.4.31 In the Long Eaton area, the construction of the Long Eaton and Toton viaduct would result in the temporary loss of access to West Lake for a period of approximately three years and nine months, and the permanent loss of approximately 3% of the total area of the lake as a result of construction of the West Lake causeway. West Lake is used by intermediate and advanced users of the Trent Windsurfing Club. There would be no direct impact on the adjacent East Lake which is also used by the Trent Windsurfing Club. The lakes provide exclusive use facilities for the Trent Windsurfing Club, and are not generally used by members of the public. Access to the two lakes for windsurfing makes a positive contribution to the wellbeing of individuals through providing access to outdoor recreational facilities. The temporary loss of access to West Lake and the permanent loss of 3% of West Lake may potentially adversely affect the health and wellbeing of users of the lake as advanced and intermediate users of West Lake may have their experience of using the resource impaired by being able to only use East Lake. The permanent loss of approximately 3% 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 the Ratcliffe-on-Soar to Long Eaton area is likely to be using the lake.

8.4.32 The Norfolk Road Recreation Ground in Long Eaton would be impacted by the construction of the Long Eaton and Toton viaduct and East Midlands Hub station for a period of approximately five years and nine months, resulting in a temporary loss of approximately 26% of the space. The recreation ground is an informal area of open space which includes a children's play area (which would not be impacted) and is used for active and passive recreation, walking, and informal play and recreation. Manor Farm Recreation Ground (approximately 500m away) provides a larger alternative open space for informal recreational uses. The temporary loss of approximately 26% of the recreation ground is unlikely to result in adverse wellbeing effects on users, as the children's play area and a large proportion of the recreational space remains accessible, there is an easily accessible alternative recreation ground nearby.

8.4.33 Within Stapleford, an estimated 10% of Archers Field Recreation Ground would be temporarily impacted for a period of approximately two years as a result of highway works associated with the Proposed Scheme. Less than 3.3% of the recreation ground would also be permanently lost. The recreation ground includes sports pitches, including a full sized football pitch which would be impacted, and open space for active and passive recreation. Queen Elizabeth Park (approximately 300m away) has a marked out, full sized football pitch which offers an alternative facility as well as an area of open space for recreation. The temporary loss of approximately 10% of the recreation ground is unlikely to result in adverse wellbeing effects on users, as a large proportion of the recreational space remains accessible and there is an easily accessible alternative football pitch and open recreational space nearby. The

permanent loss of less than 3.3% of the recreation ground is unlikely to result in adverse wellbeing effects on users however, given the very small proportion of the space which would be permanently lost to the Proposed Scheme.

8.4.34 Within Toton, the Toton Fields LNR would be temporarily impacted for a period of five years and nine months as a result of the construction of the East Midlands Hub station. This would result in the temporary loss of approximately 37% of the LNR. The LNR is used for recreation and includes walking trails, open space, and a bridleway which is used by a local riding school (which would be impacted, as well as a car park). While there are limited alternatives for horse riding within the local area, there are a number of alternative open spaces locally including Toton Fields LNR (part of which would be impacted by the Proposed Scheme), Banks Road Recreation Ground, and Manor Farm Open Space. The temporary loss of approximately 37% of the recreation ground is unlikely to result in adverse wellbeing effects on users of the open space, as a large proportion of the LNR remains accessible and there are easily accessible alternative open spaces nearby. However, the temporary loss of the approximately 37% of the recreation ground is likely to result in potential adverse effects on horse riders.

8.4.35 In the Toton area, construction of the East Midlands Hub station would require the permanent closure of the Toton Sidings LWS. The LWS is used for passive recreation and relaxation, and by a local horse riding school (St Leonard's Riding School and Livery Stable) for exercising. There are limited comparable alternatives for horse riding within the local area and the nearest comparable alternative for recreation and walking, Toton Fields LNR, would also be impacted as part of the Proposed Scheme. The permanent loss of this facility would potentially adversely affect the wellbeing of users.

Social capital

8.4.36 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[95].

8.4.37 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

[95] 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

a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.38 Settlements in the Ratcliffe-on-Soar to Long Eaton area support small, well-established communities. The size of the temporary construction workforce would be substantial relative to the size 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 the villages of Ratcliffe-on-Soar and Thrumpton. The duration of the works at each site would range from approximately one to six years. 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 villages.

8.4.39 The introduction of a temporary construction workforce into communities which have the characteristics identified above 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.

8.4.40 The draft CoCP[96] 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.

8.4.41 The Community section of the formal 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.

8.4.42 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 characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.43 In the Ratcliffe-on-Soar area, construction of the Ratcliffe-on-Soar viaduct would require the demolition of three residential properties. However, the demolition of these three properties would not constitute an erosion of social networks and impact

[96] 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.

on resident's health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.44 Within the Long Eaton area, 173 residential properties would be demolished as a result of construction of the Long Eaton and Toton viaduct. The erosion of social networks resulting from these demolitions would have the potential to reduce the beneficial health effects that are gained through social contact and support for the remaining community.

8.4.45 In the Sandiacre and Stapleford area, the highway works associated with the A52 Brian Clough Way Bessell Lane underbridge and the B5010 Derby Road overbridge would require the demolition of 25 residential properties. 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. This health effect occurs at the boundary 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 community area reports.

8.4.46 Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.47 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

8.4.48 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.

8.4.49 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.

8.4.50 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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton area. Consideration is given to the extent and 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, Leicestershire County Council (LeCC), 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: LA05 Map Book. Only designated heritage assets within the Ratcliffe-on-Soar to Long Eaton area are shown on maps CT-10-364b to CT-10-367a. 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 MDR and MNT). 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)[97], 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

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

Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

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, the exceptions to this are the Grade II listed Canal Bridge at SK496 313 (NHLE 1204307) and the locally listed New Tythe Street Mills (LL/60), which, although within the land required for the construction of the Proposed Scheme, would not be physically impacted. In addition, although the following assets are within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant:

- shallow surface quarries at Ratcliffe-on-Soar (MNT17178);
- possible mining remains in Toton (MNT7121);
- ridge and furrow (MNT11988);
- a medieval artefact scatter (MNT8781);
- remains associated with the Iron Age settlement near Redhill, Ratcliffe-on-Soar (MNT17186);
- the Midland Counties Railway (MDR12413);
- the Erewash Valley Line (MDR12415);

- the Cranfleet Canal (MDR5719);
- a 19th century rifle range (MDR11674);
- the site of gas works and hydrogen plant (MDR5707);
- anomalies identified by geophysical survey (MLE16652);
- flint scatters (MLE4657, MLE4714);
- features identified during evaluation (MLE16583);
- cropmarks (now largely under water) (MDR5658);
- the site of a ring ditch (MLE9703); and
- undated features (MLE16583 & MLE16582).

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 was not fully available, and will be reported in full in the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data was collated from a variety of sources, including:

- the NHLE (Historic England register of designated heritage assets)[98];
- Leicestershire and Rutland Historic Environment Record (HER);
- Derbyshire HER;
- Nottinghamshire HER;
- 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 The following designated heritage assets are located partially or wholly within the land required for the Proposed Scheme:

- Roman site on Red Hill (NHLE 1003667), a scheduled monument of high value;
- Canal Bridge at SK 496 313 (NHLE 1204307) Grade II listed building of moderate value;
- Sandiacre Lock Conservation Area of moderate value; and
- Thrumpton Conservation Area of moderate value (also a non-designated park and garden).

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study area:

- three scheduled monuments, comprising a site revealed by aerial photography, south-east of Dunster Barn (NHLE 1003565); the Roman villa and enclosures north of Ratcliffe Lane (NHLE 1003567); and a moated site south-east of Sawley Locks (NHLE 1003564). All are considered to be of high value;
- four Grade I listed buildings, comprising the Church of St. Winifred, Kingston-on-Soar (NHLE 1242066); Church of St. Nicholas, Lockington (part of the Lockington Conservation Area; NHLE 1074178); Church of Holy Trinity, Ratcliffe-on-Soar (NHLE 1242163); and Thrumpton Hall and the attached range of outbuildings (part of the Thrumpton Conservation Area; NHLE 1242464). All are considered to be of high value;

[98] Historic England; *National Heritage List for England*. Available online at: https://historicengland.org.uk/listing/the-list/

- three Grade II* listed buildings, comprising the Church of All Saints[99] , Thrumpton (part of the Thrumpton Conservation Area; NHLE 1242423); the Church of St. Laurence and St. James. Long Eaton (part of the Long Eaton Town Conservation Area, NHLE 1204249); and The Hall (also part of the Long Eaton Town Centre Conservation Area, NHLE 1204191). All are considered to be of high value;
- one hundred and five Grade II listed buildings, including 26 residential buildings, eight agricultural structures, 10 religious buildings and 13 other buildings in commercial, industrial or institutional use. Alongside these, are a further 13 listed items of street furniture and boundary treatments. A high proportion of listed structures are associated with the infrastructure which transects the area, including 12 canal, road and railway structures. Also listed are nine Grade II listed buildings within Thrumpton Park (forming a group with the Grade I listed Thrumpton Hall, NHLE 1242464) and four structures within Kingston Park, including Kingston Hall (NHLE 1242098). Although Grade II listed, Kingston Hall (NHLE 1242098) is considered to be of high significance due to the survival of its landscape setting. All other Grade II listed buildings are considered to be of moderate value;
- eight conservation areas, comprising Lockington Conservation Area; Hemington Conservation Area; Sawley Conservation Area; Long Eaton Lace Factories Conservation Area; Long Eaton Derby Road Conservation Area; Long Eaton Stores Conservation Area; Long Eaton Town Centre Conservation Area and Stapleford Nottingham Road Conservation Area. All are considered to be of moderate value; and
- Grade II Registered Park and Garden at Kingston Park Pleasure Gardens (NHLE 1001716) of moderate value.

Non-designated assets

9.3.5 The following non-designated asset of high value lie wholly or partially within the land required for the Proposed Scheme: an area of potential activity to the south of, and associated with, Red Hill Roman town, along with excavated evidence (MNT11983).

9.3.6 The following non-designated assets of moderate value lie wholly or partially within the land required for the Proposed Scheme: remains associated with the Iron Age settlement near Redhill, Ratcliffe-on-Soar (MNT17186).

9.3.7 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:

- medieval features and finds near Redhill Farm, including ridge and furrow, a pit and an artefact scatter (MNT11988; MNT8781);

[99] This is also shown on OS mapping as All Saints' Church

- post-medieval structures including a farmstead with a well at Red Hill, Ratcliffe-on-Soar (MNT26056); the Midland Counties Railway (MDR12413) and the Erewash Valley Line (MDR12415) (preserved in part as the Midland Main Line (MML)); the Cranfleet Canal (MDR5719); a 19th century rifle range (MDR11674); Trent Cottages (MDR12414); Station House (MDR5713), Meadow Mills (MDR5718), Former Foundry (MDR 5714), Former Lace Workshop (MDR 5712), The Cottage, Meadow Lane (MDR5715; also known as 1A Meadow Lane); Bush's Factory, Nottingham Road (MDR5705); and a Saw Mill at Stapleford (MNT12739);
- locally listed structures including 54 and 56 New Tythe Street, Long Eaton (LL/61) and New Tythe Street Mills, Long Eaton (LL/60);
- the site of a modern gas works and hydrogen plant (MDR5707); and
- features of unknown date, including anomalies identified by geophysical survey (MLE16652); flint scatters (MLE4657, MLE 4714); features identified during evaluation (MLE16583); cropmarks (now largely under water) (MDR5658); the site of a ring ditch (MLE9703); shallow surface quarries at Ratcliffe-on-Soar (MNT17178); and possible mining remains in Toton of unknown date (MNT7121).

9.3.8 Non-designated heritage assets located partially or wholly within the 500m rural study area and the 250m urban study area include:

- two assets of moderate value, consisting of Roman settlements;
- four locally listed structures associated with Trent Lock, seven locally listed structures within Long Eaton and the isolated farmstead of Cranfleet Farm, all of low value; and
- 29 assets of low value comprising prehistoric and Roman finds, and finds and features of unknown date, including a pit (MLE22767), find spots of stone tools (MNT406) and artefact scatters of Neolithic/Bronze Age date (MNT11904, MNT11989), find spots of Bronze Age flint artefacts (MNT5182, MNT7873) and an Iron Age a shield boss (MNT613), brooch and pottery (MNT7885).

Historic environment overview

9.3.9 The River Trent runs through the Ratcliffe-on-Soar to Long Eaton area to the south of Long Eaton. The River Soar, a tributary of the River Trent, runs from the south to join the River Trent to the west of Thrumpton. Around these river valleys are Pleistocene (Ice-Age) alluvium deposits and Hemington Member, which indicates that the rivers originally occupied a much wider area. Palaeochannels found in the Trent and Soar river valleys preserve waterlogged evidence from the late glacial and postglacial periods.

9.3.10 The Palaeolithic and Mesolithic periods are under-represented in comparison to other periods, both in the 500m study area and in Britain as a whole. The lack of permanent settlement means that evidence is mostly limited to individual find spots. Recorded sites of Neolithic date within the 500m study area include a pit (MLE22767), find spots

of stone tools (MNT406) and artefact scatters of Neolithic/Bronze Age date (MNT11904, MNT11989), indicating activity of this date in the area. These sites were largely located within vicinity of the Red Hill scheduled monument. The Bronze Age evidence follows similar patterns to the Neolithic, with settlements often identified through cropmarks and funerary monuments. These include barrows and a cremation cemetery. Evidence within the 500m study area of Bronze Age date is limited to find spots of flint artefacts (MNT5182, MNT7873). It is not until the Iron Age that any settlement activity is evidenced within the 500m study area.

9.3.11 Red Hill in Ratcliffe-on-Soar, located within the 500m study area, contains a number of finds of Iron Age date, including a shield boss (MNT613) and a brooch and pottery (MNT7885). There is evidence of settlement of Iron Age date, later occupied by the Romans (MNT17186). This included recovery of finds which may suggest an earlier shrine was located here, such as a unique bird brooch. There are also individual finds of Iron Age date identified around this area, as well as further south, indicating that the area was well utilised in this period.

9.3.12 The area was attractive for Roman activity. This was likely in part due to the presence of Iron Age settlement, as well as due to its location close to the Rivers Soar and Trent, on a high point. This would have given it a good location for defensive purposes as well as resources, such as fish and shellfish. Three scheduled monuments of Roman date lie within the study area, to the south of the River Trent. The first is a Roman site at Red Hill (NHLE 1003667), Ratcliffe-on-Soar, where various buildings, including a possible temple, as well as burials, have been located. The temple lies on the site of an earlier shrine, which appears to have acted as a focus for the settlement and the development of the Roman town located here. Excavations have indicated that deep urban style stratigraphy survives, and previously unrecorded remains could be located between Red Hill Roman town and the excavated features at Red Hill marina. The site dates from the start of the Roman period through to the 3rd century, based on pottery evidence, although there is evidence to suggest that it was in use until the 4th century. The second scheduled monument consists of a Roman villa and associated enclosures located to the north of Ratcliffe Lane (NHLE 1003567), of 2nd to 4th century date, while the third lies directly next to the villa, and forms a further possible Roman settlement of early Roman date (to 249AD) identified by aerial photography, south-east of Dunster Barn (NHLE 1003565).This site is likely to have origins in the Iron Age. Other possible Roman settlements have been identified around these sites.

9.3.13 The parishes along the Proposed Scheme are recorded in the Domesday Book, and so were likely to be present during at least the later part of the early medieval period. These include Kegworth, Ratcliffe-on-Soar, Thrumpton and Sawley, demonstrating an inhabited landscape into the medieval period. Evidence from the medieval period largely consists of churches, the earliest examples of which are the 11th century Church of All Saints, Sawley (NHLE 1204277) and the 13th century Holy Trinity Church in Ratcliffe-on-Soar (NHLE 1242163). Other evidence of settlements includes a shrunken medieval village (MNT17033) at Manor Farm in Ratcliffe-on-Soar.

9.3.14 The post-medieval period is characterised by the increase in industrialisation, including numerous factories and mills which are associated with the East Midland's lace and silk industries located within the expanding settlement of Long Eaton. The

lace industry became one of the main products of Nottinghamshire, and by the 1840s it became an international exporting trade. There were a large amount of lace factories and mills on 19th century OS maps in Long Eaton, with some still surviving. These include both the factories, such as Meadow Mills (MDR5718), Albion Mills (MDR5711), Nottingham Road Mills (MDR5704), Bush's Factory (MDR5705) and Phoenix Mills (MDR5706). These last three examples represent tenement factories, housing a number of different companies all employed in the making of lace. Evidence of associate industries also survive, including the former lace workshop manufacturing carriages and bobbins (MDR5712) and the former foundry (MDR5714),both on New Tythe Street.

9.3.15 Much of this industrialisation was enabled by the establishment of the canal network which enabled the movement of raw materials and finished goods. The canals were with the Erewash Canal running through the study area, connecting to the Cromford Canal to the north and River Trent to the south. The canal opened in 1779 as a means of transporting coal from the coal fields of the midlands. It closed to commercial traffic in 1952 after a steady decline in use.

9.3.16 The Erewash Canal features prominently within the 2km study area. It was completed in 1779 and a number of locks and bridges survive alongside the canal itself. The development of the railways saw the construction of the Midland Counties Railway within the study area in 1839. Originally intended to carry coal from the Nottinghamshire coal mines, it was quickly realised that it could not compete with the canals. During the railway boom the line was adopted as part of the MML, this time carrying passengers from London to Derby. Associated structures that were built include stations, bridges and tunnels, including the Red Hill tunnel, a feat of engineering which carried the railway under Thrumpton Park to the south of the River Trent. Other surviving railway infrastructure includes associated domestic buildings, such as the Station House (MDR5713) and Trent Cottages (MDDR12414) built to house the stationmaster and railway workers.

9.3.17 More significant structures from the post-medieval period include Thrumpton Hall (NHLE 1242464) and Kingston Hall (NHLE 1242098), both set within extensive grounds, including the registered Kingston Park Pleasure Garden (NHLE 1001716), and the non-designated Thrumpton Hall gardens (MNT26809),. The origins of both estates lie in the 16th century, but they were heavily altered in the early 19th century with new landscaped pleasure grounds and parkland. Thrumpton Hall itself dates from the 17th century; while Kingston Hall represents a 19th century rebuilding after the original hall was acquired by local industrialist William Strutt.

9.3.18 The importance of the area was realised during the 20th century with the increase in the movement of coal by railway. The Toton Sidings to the north of the study area was established in the mid-19th century as a marshalling yard taking coal from the surrounding coalfields down to London. This became an important role during World War II when it became the main method of coal movement to the south. By the 1950s Toton was the largest marshalling yard in Europe.

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)[100] 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 land required for the Proposed Scheme falls within the Thrumpton Conservation Area (also a non-designated historic park and garden), of moderate value. The conservation area encompasses the former parkland associated with the Grade I listed Thrumpton Hall (NHLE 1242464) and the historic core of the village. Its significance lies in the survival of the historic structures, particularly the surviving hall, West Gateway (NHLE 1242433) and Ice House (NHLE 1242434) all of which form a comprehensive group within the parkland. The settlement itself represents a self-contained estate village of 18th and 19th century building, including a number of listed structures. There is a clear historic and evidential link between this and the Hall, with the village containing a uniformity of estate architecture; however, there is little appreciation of the village from within the parkland itself which extends to the west. Activities associated with the construction of the Redhill tunnel and operation of the Redhill main compound would physically impact on the conservation area. The land required for the construction of the Proposed Scheme would remove a linear section

[100] Supporting document: Draft Code of Construction Practice

of the park approximately 260m in width at its western boundary. This is to construct the Redhill tunnel; therefore, the land would be restored upon completion of the Proposed Scheme. Any trees lost would be replaced as part of the establishment of woodland habitat creation as part of the Proposed Scheme. The effect of these works on the historic significance of the park would be medium, affecting the ability to understand and appreciate the resource during the works and until the woodland habitat gains maturity. The effect on the listed buildings within the conservation area, however, would not be significant. The Hall would continue to be understood within its parkland setting, while the relationship with the village will be maintained. The effect on the Thrumpton Conservation Area would be moderate adverse.

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 effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.

9.4.8 The Roman site on Red Hill (NHLE 1003667) is a scheduled monument of high value. It comprises a substantial Roman settlement site, comprising a Roman town, temple and burials. It was likely to form a centre for trade, as indicated by high quality finds and imported pottery. The asset derives its significance from its archaeological and evidential value, including the information it contains about Roman settlement and religious activity, as well as possible information about trade links. The town is located on a prominent hill-top site, with views over the surrounding landscape, including those over the Soar and Trent junction. Although its setting has been degraded to the east by the construction of Ratcliffe-on-Soar Power Station, it survives to the west and south-west, and the visual connection with the Roman villa and enclosures north of Ratcliffe Lane (NHL 1003567) remains. Its setting is considered to contribute to its significance.

9.4.9 The Red Hill site would be physically affected by the Proposed Scheme. The Ratcliffe-on-Soar viaduct would be constructed over the monument, resulting in the removal of nationally important archaeological remains, due to the construction of the viaduct piers and the required working areas. In addition, the Ratcliffe-on-Soar viaduct would add a new element into the landscape of this area, and would reduce the visual connection with the Roman villa and enclosures north of Ratcliffe Lane to the west. Although there is a physical effect upon this asset, only approximately 10% of the scheduled monument would be physically affected. However, it is likely that the monument extends to the south, outside of the scheduled area, and this area lies entirely within the land required for construction. Nevertheless, the majority of the asset would be preserved and it would still be possible to understand its significance. This is therefore considered to constitute a low magnitude of impact and a moderate adverse effect.

9.4.10 To the south of the scheduled monument, there is an area of potential activity that would be an extension of the Red Hill Roman town. Excavations at Redhill Marina

(MNT11983), to the south-west of Red Hill, indicated that urban stratigraphy extends eastwards, into the area south of the town. This area is considered to have evidential value for the information it contains regarding the extent and nature of the Roman settlement. Remains in this area are likely to be of high value, as they are considered to be an extension of the scheduled Roman town. This site of archaeological potential would be physically affected by the Proposed Scheme. The Ratcliffe-on-Soar viaduct would be constructed over the monument, resulting in the removal of important archaeological remains, due to the construction of the viaduct piers and the required working areas. However, the Proposed Scheme will not totally remove remains in this area and it would still be possible to understand its significance. This is, therefore, considered to constitute a low magnitude of impact and a moderate adverse effect.

9.4.11 54 and 56 New Tythe Street (LL/61) are locally listed buildings of low value. They have evidential and historic value as surviving domestic structures of the 18th century. Although significantly altered, they retain physical evidence from this period and provide evidence for the growth of the town at the start of its industrial expansion. The buildings lie within the land required for the Proposed Scheme and would be demolished. This would constitute a high adverse impact and a moderate adverse effect.

9.4.12 Trent Cottages and Station House on Trent Lane (MDR12414 and MDR5713) are non-designated buildings of low value. The cottages were built as railway workers housing, alongside the larger Station House, built for the Stationmaster. Trent Station has since been demolished, but the surviving buildings retain historic interest as part of the railway network which played a key role in the development of the town. The buildings lie within the land required for the Proposed Scheme and would be demolished. This would constitute a high adverse impact and a moderate adverse effect.

9.4.13 The following non-designated buildings date from the later post-medieval period and illustrate the industrial development of Long Eaton. All are associated with the lace industry which played a key role in the expansion of the town and, as such, form an important group of assets. The buildings are of low value and fall within the land required for the construction of the Proposed Scheme. The demolition of the buildings would constitute a high magnitude of impact and result in a moderate adverse significance of effect:

- The Cottage, Meadow Lane (MDR5715; also known as 1A Meadow Lane), built for the office manager of the neighbouring mill; Meadow Mills, Meadow Lane (MDR5718);
- Former Foundry, New Tythe Street (MDR 5714);
- Former Lace Workshop, New Tythe Street (MDR 5712);
- Albion Mills, Nottingham Road (MDR5711);
- Phoenix Mills, Nottingham Road (MDR5706);
- Nottingham Road Mills (MDR5704); and

- Bush's Factory, Nottingham Road (MDR5705).

9.4.14 The following significant effects are currently expected to occur as a result of permanent impact on the setting of designated or non-designated heritage assets:

9.4.15 The Roman villa and enclosures north of Ratcliffe Lane (NHL 1003567) is a scheduled monument of high value, located approximately 415m to the west of the land required for the Proposed Scheme. Its significance is derived from its evidential value, although its association with the Red Hill scheduled monument (NHLE 1003667) to the north-east also contributes to its significance. The two assets were contemporary, as evidenced by the date of the Roman pottery at both sites, and they are located within each other's setting. The villa would have been set within an agricultural landscape, and this survives in the vicinity of the villa. Consequently, its setting contributes to its significance. Although views towards Red Hill Roman town have been affected by the construction of Ratcliffe-on-Soar Power Station, which now forms a backdrop to the scheduled villa, the appreciation of the relationship between the sites remain largely intact.

9.4.16 Both assets would have their setting changed by the Proposed Scheme, which would pass over the Red Hill asset on the Ratcliffe-on-Soar viaduct. The Ratcliffe-on-Soar viaduct would add a new element in the landscape and would reduce the visual connection of the Roman villa the scheduled Red Hill Roman town (NHL 1003667), and vice versa. In addition, the wider agricultural setting of the villa would also be changed. This would result in a reduction in the ability to understand the villa's landscape setting. This would constitute a low magnitude of impact and a moderate adverse effect.

9.4.17 The Canal Bridge at SK496 313 (NHLE 1204307) is a Grade II listed building of moderate value. The significance of the structure lies in its evidential value as part of the canal network and, while it shares no visual relationship with the Cranfleet Lock complex to the east, there remains an important connection. The short linear Cranfleet Canal retains its historic and evidential integrity with good survival. The bridge lies within the land required for the construction of the Proposed Scheme but will not be physically impacted. However, the Proposed Scheme would introduce a new element into the landscape and create a visual barrier between the bridge and the lock. This would impact the setting of the listed structure and affect the ability to understand it within its context. This would constitute a medium magnitude of impact resulting in a moderate adverse effect.

Other mitigation measures

9.4.18 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

9.4.19 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.

9.4.20 As no 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 CT-06 Map Series within the Volume 2: LA05 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 Thrumpton Conservation Area.

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 continue throughout 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 or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

9.5.6 It is currently anticipated that in relation to the following heritage assets that there would be no significant effects as a result of the operation of the Proposed Scheme and that therefore the significance of effect would remain as described for the permanent construction phase effect:

- the Roman site on Red Hill (NHLE 1003667);
- the Roman villa and enclosures north of Ratcliffe Lane (NHLE 1003567);

- potential archaeological remains associated with Red Hill Roman town; and
- the Grade II listed Canal Bridge at SK496 313 (NHLE 1204307).

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 Ratcliffe-on-Soar to Long Eaton 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), Leicestershire County Council (LeCC), North West Leicestershire District Council (NWLDC), Rushcliffe District Council (RDC), Erewash Borough Council (EBC), Broxtowe Borough Council (BBC), the Environment Agency, the Coal Authority, the Animal and Plant Health Agency (APHA), Derbyshire and Peak District RIGS Group, Leicestershire and Rutland RIGS Group, Geological Society Regional Group East Midlands, Nottinghamshire Biological and Geological Records Centre, Nottinghamshire RIGS Group and 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: LA05 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)[101].

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

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

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 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[102] 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 has been collected from a range of sources including Ordnance Survey mapping, the BGS, the Coal Authority, NCC, NoCC, DCC, LeCC, NWLDC, Public Health England (PHE), the Environment Agency, Natural England, APHA, as well as from local geological trusts.

[102] Defined in the SMR as "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)".

Geology

10.3.2 This section describes the underlying ground conditions within the Ratcliffe-on-Soar to Long Eaton area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[103,104].

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	Within the northern floodplain of the River Trent, and within and north of Toton Yard.	Artificial ground comprising variable deposits of reworked natural and man-made materials.	Not classified
Superficial			
Head deposits	Present in the Ratcliffe-on-Soar area; north of junction 24 of the M1, and to the east of the Toton Yard.	Typically gravel, sand and clay.	Secondary (Undifferentiated)
Alluvium	Associated with the River Soar to the west of Ratcliffe-on-Soar, the River Trent south of Long Eaton, and the River Erewash in the north and north-west of the study area.	Clay, silt, sand and gravel.	Secondary A
River terrace deposits	Associated with the Rivers Trent and Soar, from the southern extent of the study area to the south of Toton Yard, except at Ratcliffe-on-Soar Power Station.	Sand and gravel, locally with silt clay and organic muds.	Secondary A
Glacial till[105]	Located to the north of Ratcliffe-on-Soar Power Station.	Variable typically comprising sandy silty clay with pebbles.	Secondary (Undifferentiated)
Bedrock			
Mercia Mudstone Group - Branscombe Mudstone Formation	Located from the area north of junction 24 of the M1 near to Kegworth and the area south of the River Trent at Long Eaton.	Mudstones and siltstones.	Secondary B
Mercia Mudstone Group - Arden Sandstone Formation	Outcrops in an east to west trend across the south of the study area to the north of junction 24 of the M1 and to the north of Wood Hill near to Thrumpton.	Mudstones, siltstones and sandstones with localised conglomerates.	Secondary A
Mercia Mudstone Group - Sidmouth Mudstone Formation	Present to the west and north of Kegworth and junction 24 of the M1, and from north of the River Trent to north of junction 25 of the M1.	Mudstone and siltstone with thin beds of dolomitic siltstone and sandstone.	Secondary A (sandstone) Secondary B (mudstone and siltstone)

[103] British Geological Survey, (2008), *A Formational Framework for the Mercia Mudstone Group. Research Report RR/08/04*. Available online at: https://core.ac.uk/download/pdf/62895.pdf
[104] British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01.* Available online at: https://core.ac.uk/download/pdf/20539031.pdf
[105] Glacial till is sometimes described as "diamicton" in the BGS lexicon. This term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term "glacial till" refers to diamicton of glacial origin.

Geology	Distribution	Formation description	Aquifer classification
Mercia Mudstone Group - Tarporley Siltstone Formation	Present in the north of the study area between Toton and Sandiacre.	Sandstones, mudstones and siltstones.	Secondary A (sandstone) Secondary B (mudstone and siltstone)
Sherwood Sandstone Group – Chester Formation	Present within the northern part of the study area in the Sandiacre and Stapleford area.	Conglomerate, sandstone with mudstone.	Principal

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[106,107], including artificial ground mapping data, indicates two main areas of made ground within the study area. These are located at the northern floodplain of the River Trent, associated with marsh land and lakes created from former sand and gravel extraction, and within and north of Toton Yard. Other minor and localised areas of made ground that are defined by the BGS as "worked" and/or "made ground" within the study area include:

- locations in the vicinity of the East Midlands Parkway station junction on the A453 Remembrance Way, near Ratcliffe-on-Soar; and
- two locations to the south and south-east of Long Eaton at: Thrumpton, and north of the Cranfleet Canal, close to the Cranfleet Lock House.

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 Ratcliffe-on-Soar to Long Eaton area. The 2001 to 2002 FMD outbreak risk assessment map[108] identifies the Ratcliffe-on-Soar to Long Eaton study area to lie 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.

[106] BGS (2014), geological map sheet 125 (Derby) 1:50,000 scale (solid and drift) and BGS (2016) Geology – 1:50,000 (DIGMapGB-50) Artificial Version 8
[107] BGS (2001), geological map sheet 141 (Loughborough) 1:50,000 scale (solid and drift) and BGS (2016) Geology – 1:50,000 (DIGMapGB-50) Artificial Version 8
[108] 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 of accumulated material. Head deposits are present locally around Ratcliffe-on-Soar. 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 occurs along the courses of streams and rivers. Alluvium is present within the study area along the River Soar, the River Trent and the River Erewash and their associated tributaries and other smaller watercourses.

10.3.9 River terrace deposits that are primarily associated with the Rivers Trent and Soar, consist of sands, gravels, silts, clays and locally organic muds which are widespread across the study area.

10.3.10 The Hemington Member terrace deposits are associated with, and extensively distributed, along much of the Rivers Trent and Soar. The deposits are located between Kegworth in the south of the area and Long Eaton, north of the River Trent.

10.3.11 Other river terrace deposits that are primarily associated with the River Soar occur as the Wanlip Member and the Syston Member sand and gravel deposits between Kegworth and Ratcliffe-on-Soar. The Birstall Member sand and gravel deposits are also associated with this river and are located in the vicinity of Ratcliffe-on-Soar.

10.3.12 River terrace deposits that are primarily associated with the River Trent include the Holme Pierrepont Sand and Gravel Member which are sporadic between Thrumpton and Long Eaton and the Beeston Sand and Gravel Member which are present in the area of Toton and north of Long Eaton.

10.3.13 Glacial till deposits known as the Thrussington Till are present in the study area around Ratcliffe-on-Soar within areas of higher ground. Glacial tills typically comprise sandy, silty clay with pebbles.

Bedrock geology

10.3.14 The Mercia Mudstone group underlies the study area and comprises the Branscombe Mudstone Formation, the Arden Sandstone Formation, the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation.

10.3.15 The Branscombe Mudstone Formation provides the main shallow bedrock geology across the south of the study area, extending from junction 24 of the M1 to the River Trent. It comprises of mudstones and siltstones.

10.3.16 The route of the Proposed Scheme would cross narrow outcrops of the Arden Sandstone Formation in the south of the study area just north of junction 24 of the M1, and north of Wood Hill near Thrumpton. The Arden Sandstone Formation is described as mudstones with siltstones and sandstones.

10.3.17 The Sidmouth Mudstone Formation underlies much of the northern part of the study area. This formation comprises predominately mudstones and siltstones with occasional dolomitic siltstone and sandstone.

10.3.18 The Tarporley Siltstone Formation outcrops in the area of Sandiacre and generally has more sandstone content than the Sidmouth Mudstone Formation and is described as siltstones, mudstones and sandstones.

Radon

10.3.19 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[109].

10.3.20 Two sections of the Proposed Scheme lie within the following radon affected areas. This includes:

- the area between Kegworth and Ratcliffe-on-Soar; and
- the area to the west of Thrumpton.

10.3.21 In the areas between Kegworth and Ratcliffe-on-Soar, and to the west of Thrumpton it is stated that 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/m^3) for residential properties. For the remainder of the area between Kegworth and Sandiacre, less than 1% of homes are estimated at or above the radon action level.

Groundwater

10.3.22 Four aquifer designations have been identified within the study area, as defined by the Environment Agency[110]:

- the Chester Formation of the Sherwood Sandstone Group is designated as a Principal aquifer;
- the Arden Sandstone Formation, sandstones of the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation and the river terrace deposits and alluvium are designated as Secondary A aquifers;
- the mudstones and siltstones of the Sidmouth Mudstone Formation, the mudstones and siltstones of the Tarporley Siltstone Formation and the Branscombe Mudstone Formation, all of which are part of the Mercia Mudstone Group, are designated as Secondary B aquifers; and
- Glacial till and head deposits are designated as Secondary (Undifferentiated) aquifers.

10.3.23 The Environment Agency reports that there are three licensed private groundwater abstractions located within the study area. All three are located within the southern section of the study area to the south of Long Eaton and are described as follows:

- abstraction for industrial, commercial and public services located approximately 725m to the south-east of land required for the construction of

[109] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. 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

[110] Environment Agency (2017) New groundwater vulnerability mapping methodology mapping in England and Wales , Report SC040016/R

the Proposed Scheme in the north of Kegworth;

- abstraction for industrial, commercial and public services located approximately 1km to the west of the land required for the construction of the Proposed Scheme, north of junction 24a of the M1; and
- abstraction related to spray irrigation located approximately 680m to the west of the land required for the construction of the Proposed Scheme, south of Long Eaton.

10.3.24 It is recognised that other unlicensed abstractions may exist.

10.3.25 The northern extent of the study area lies within a groundwater source protection zone (SPZ) 3[111] at Sandiacre. The study area is not identified to lie within a groundwater drinking water safeguard zone.

10.3.26 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 by default provided with SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.27 Further information on the groundwater in the Ratcliffe-on-Soar to Long Eaton area is provided in Section 15, Water Resources and flood risk.

Surface water

10.3.28 The River Trent is a designated main river by the Environment Agency and is crossed by the route of the Proposed Scheme to the west of Thrumpton, south of Long Eaton. The River Soar and River Erewash are also designated main rivers. The route of the Proposed Scheme crosses the River Soar in the south of the study area, west of Ratcliffe-on-Soar, and it would cross the River Erewash in the north of the study area, south of Toton Yard. The River Soar and River Erewash are tributaries of the River Trent.

10.3.29 Other named watercourses which are crossed by the route of the Proposed Scheme include the following:

- New Sawley Brook and Golden Brook (a tributary of the River Erewash) are both designated main rivers and located to the south of Long Eaton and within Long Eaton, respectively; and
- Cranfleet Canal, which is designated an inland waterway and located to the west of Thrumpton.

[111] 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.

10.3.30 The Erewash Canal is designated an inland waterway and is located to the west of the route of the Proposed Scheme in the north of the study area. This canal joins with the River Trent at Trent Lock, but is not crossed by the route of the Proposed Scheme in the study area.

10.3.31 The Proposed Scheme would cross an unnamed surface watercourse which drains to the north of Kegworth, in the vicinity of the River Soar, west of Ratcliffe-on-Soar Power Station, between the River Trent and Cranfleet Canal and to the south of Toton Yard. The Proposed Scheme would also cross a pond located between the River Trent and the Cranfleet Canal.

10.3.32 Large lakes and ponds are located within the central part of the study area associated with the River Trent. The route of the Proposed Scheme would cross one of these surface water features (West Lake).

10.3.33 Other surface water features located within the study area include unnamed ponds, drains and unnamed surface watercourses in the vicinity of the areas of where the Ratcliffe Cut and River Soar join, at Ratcliffe-on-Soar Power Station and at Toton Yard. Fish ponds are located to the south of Long Eaton and a flood prevention lagoon is located to the south of junction 24 of the M1.

10.3.34 Surface water bodies in the Ratcliffe-on-Soar to Long Eaton area are described in more detail in Section 15, Water resources and flood risk.

10.3.35 The Environment Agency reports that there are three[112] licensed surface water abstractions located within the study area. Two relate to agricultural use either for spray irrigation or fish farming and pond through flow[113]. One abstraction relates to process water use for the production of energy at Ratcliffe-on-Soar Power Station. All three surface water abstractions are located to the west of the Ratcliffe-on-Soar Power Station, within the land required for the construction of the Proposed Scheme. The study area does not lie within a surface water Drinking Water Safeguard Zone.

Current and historical land use

10.3.36 Current potentially contaminative land uses within the study area include: two landfill sites, one mining/mineral site and 40 industrial and commercial sites. The key potentially contaminative sites are:

- Toton Yard (rail depot with sidings);
- Ratcliffe-on-Soar Power Station;
- four large and distinct industrial areas between the southern extent of Long Eaton, off Fields Farm Road and Station Road in Long Eaton; and
- four large industrial areas north of the A52 Brian Clough Way.

[113] Pond through flow is the supply of a continuous flow of water to maintain water quality.

10.3.37 Historical land uses identified within the study area with the potential to have caused contamination include six historic landfill sites, two mining/mineral sites and 77 industrial sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are:

- landfill at Cranfield Lock, and
- historical dye works and engineering works, iron foundries, gas works and printing works within the Ratcliffe-on-Soar to Long Eaton area.

10.3.38 Further details of these current and historical contaminative land uses within the study area are shown in Table 19, Table 20 and Table 21.

Table 19: Current and historic landfill sites located in the study area

Name and Area Reference	Location	Description
Ratcliffe-on-Soar Power Station Landfill (LA05-126).	Located to the south of Ratcliffe-on-Soar Power Station 140m south of the land required for the construction of the Proposed Scheme.	The Environment Agency records state that the now inactive landfill was operated by E.on UK Plc and was licensed to landfill wastes excluding inert material. The closure date and licence surrender date are not known. The landfill occupied an area of 38.01ha.
Winking Hill Gypsum Disposal Site, Ratcliffe-on-Soar Power Station (LA05-126).	This active landfill and waste management site is located south of Ratcliffe-on-Soar Power Station in the northern area of the inactive Ratcliffe-on-Soar Power Station Landfill and 140m south of the land required for the construction of the Proposed Scheme.	The Environment Agency records state that this active facility is operated by Uniper UK Ltd and licensed to receive wastes such as construction, demolition, and dredgings waste. The landfill occupies an area of 12.24ha.
Winking Hill Ash Disposal Site, Ratcliffe-on-Soar Power Station (LA05-126).	The active landfill and waste management site is located south of Ratcliffe-on-Soar Power Station in the location of the inactive Ratcliffe-on-Soar Power Station Landfill and 140m south of the land required for the construction of the Proposed Scheme.	Environment Agency records state that the facility is operated by Uniper UK Ltd and licensed to receive wastes, excluding inert waste. The licence is status is classified as "effective". The landfill occupies an area of 38.01ha.
Winking Hill, Ratcliffe-on-Soar Power Station (LA05-127).	Located to the south of Ratcliffe-on-Soar Power Station 60m to the east of the land required for the construction of the Proposed Scheme.	The Environment Agency records state that the inactive landfill was licensed to receive industrial waste from December 1968. It is currently unknown when material was last accepted or when the licence was surrendered. The landfill occupied an area of 10.45ha.
Disused Tip (LA05-128).	Located to the north of Ratcliffe-on-Soar Power Station 40m north and east of the land required for the construction of the Proposed Scheme.	Labelled on current Ordnance Survey map as a disused tip. It is potentially associated with Ratcliffe-on-Soar Power Station. No further information is known at this time. It is not listed within Environmental Agency records.
Sawley Road, Church Wilne Water Treatment Works (LA05-129).	Located to the south of Long Eaton at Church Wilne Water Treatment Works approximately 70m to the south of the land required for the construction of the Proposed Scheme.	Environment Agency records state that the inactive landfill was operated by Severn Trent Water Authority Eastern Division. No further details are currently available from Environment Agency records. The landfill occupied an area of 0.25ha.

Name and Area Reference	Location	Description
Fields adjacent to, and behind, the Lock House at Cranfleet Lock (LA05-72).	Located to the south-east of Long Eaton at Cranfleet Cut within the land required for the construction of the Proposed Scheme.	The Environment Agency records state that the inactive landfill was operated by British Waterways (Grand Union North Canals) and was licensed to receive industrial waste and liquid sludge between February 1994 and April 1994. The landfill occupied an area of 1.1ha.
Disused Canal, Long Eaton (LA05-133).	Located on Longmoor Lane, Long Eaton, to the west of Toton Yard approximately 200m to the south of the land required for the construction of the Proposed Scheme.	Environment Agency records state that the landfill was operated by DCC and received industrial and inert waste between June 1978 and February1982. The landfill occupied an area of 0.75ha.

Table 20: Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
Lockington Quarry (LA05-206)	West of Ratcliffe-on-Soar.	Large operational sand and gravel quarry located on land required for the construction of the Proposed Scheme.
Former Red Hill Mine (LA05-176)	Area north of Ratcliffe-on-Soar Power Station extending directly west and east of the Proposed Scheme within the land required for the construction of the Proposed Scheme.	Area has historically been worked for gypsum. Underground mining at the former Red Hill Mine dates back to at least 1750. Red Hill Mine is located approximately 50m west of the route of the Proposed Scheme. Gypsum mineral veins cross the Proposed Scheme north of Ratcliffe-on-Soar Power Station, with disused shafts noted to the north east of Ratcliffe-on-Soar Power Station. The depth or extent of the mining is unknown except that it described as "shallow".
Attenborough Quarry – Trent Farm (LA05-12)	South-east of Long Eaton within the land required for the construction of the Proposed Scheme.	Historic mineral extraction site for sand and gravel. The site and area has been reclaimed for agriculture and water sports lakes.

Table 21: Current and historical industrial and commercial sites located in the study area

Name and Area Reference	Location	Description
Ratcliffe-on-Soar Power Station (LQ05-04)	Located north of Ratcliffe-on-Soar and partially within the land required for the construction of the Proposed Scheme.	Current power station with associated sewage works and associated landfill (see Table 19, LA05-126, LA05-127 and LA05-128).
Industrial areas between the southern extent of Long Eaton and Station Road (LA05-19, LA05-21, LA05-33, LA05-35)	East of Field Farm Road, Long Eaton, 10m to the west of the land required for the construction of the Proposed Scheme.	Historically a wagon works and iron foundry with associated railway sidings. Currently this site is an industrial area with factories, works buildings, and depots including furniture manufacturing and a printing business.
	Meadow Brook Business Park, south of Meadow Lane, Long Eaton, within the land required for the construction of the Proposed Scheme.	Historically included a railway, lace factory and various undefined works buildings. Currently this site is an industrial site including furniture manufacturing.
	South of Station Road, east of New Tythe Street, Long Eaton, directly adjacent to the east of the land required for the construction of the Proposed Scheme.	Historically a silk factory, lace mills, upholstery works and printing

Name and Area Reference	Location	Description
		works. Currently an industrial area including shop fitting manufacturers and a printer.
	West of New Tythe Street, Long Eaton, within the land required for the construction of the Proposed Scheme.	Historically a silk factory, lace factory and works. Currently an industrial area including an upholstery factory and factory equipment supplier.
Former printing works (LA05-48)	Former printing works south of the A6005 Nottingham Road, Long Eaton and partially within the land required for the construction of the Proposed Scheme.	Part of site a former printing works south of the A6005 Nottingham Road also formerly other industrial premises including lace mills, hosiery works and garments factory. Currently a furniture and laboratory equipment manufacturers.
Former gas works (LA05-102)	Located to the north of the A6005 Nottingham Road in Long Eaton. The site is located within the land required for the construction of the Proposed Scheme.	Former gas works with gasometers, gas holders and tank. Also formerly a depot. Currently undergoing redevelopment as a small-scale gas fired power station (December 2017).
Toton Yard (LA05-54)	Located in Toton and within the land required for the construction of the Proposed Scheme.	Current and former railway depot with areas of extensive railway sidings, engine maintenance sheds, and a former wagon works.
Industrial areas north of A52 Brian Clough Way (LA05-59, LA05-60, LA05-64 and LA05-58)	Immediately to the north of the A52 Brian Clough Way. These sites are located within and adjacent to the land required for the construction of the Proposed Scheme.	Historically these areas have included a wagon works, gas and oil engine works, iron foundry, railway sidings, lace factory, screw works, cement depot, saw mill, scrap metal yard, works, depots and research laboratories. Currently, these areas are occupied by a number of land uses including a furniture manufacturing site, Progress Rail Services and a train repair company (DB Schenker), pet food production, packaging supplier, print finishers, precision engineers and a maintenance garage

10.3.39 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.

10.3.40 Contaminants commonly associated with 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

10.3.41 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 30 minor (Category 3) pollution incidents to controlled waters reported over a four-year period between 1995 and 1999. There was one significant (Category 2) pollution incident to controlled waters in 1998 which

occurred at a textile industry on Trent Lane, Long Eaton, and involved oil leaking from a tank.

10.3.42 There is one active lower tier Control of Major Accident Hazards (COMAH) site located at Ratcliffe-on-Soar Power Station, operated by Uniper UK Ltd. This relates to a building within the power station that is 90 m from the land required for the construction of the Proposed Scheme.

10.3.43 Three active fuel stations are located within the study area. These are located on Waverley Street in Long Eaton, 110m to the west of the land required for the construction of the Proposed Scheme; on Midland Street in Long Eaton, 50m to the west of the land required for the construction of the Proposed Scheme; and on Toton Lane, 230m to the north-east of the land required for the construction of the Proposed Scheme. One closed fuel station is located on Station Road, Long Eaton adjacent to the east of the Proposed Scheme.

10.3.44 There is one effective Integrated Pollution Prevention Control permit registered for Ratcliffe-on-Soar Power Station which is within the land required for the construction of the Proposed Scheme. There is also one Local Authority Integrated Pollution Prevention Control permit issued for Dartex Coatings Ltd for transfer coating processes which is located approximately 205m to the west of the land required for the construction of the Proposed Scheme in Long Eaton[114].

10.3.45 There are nine authorised environmental permits registered within the study area. The permits concern mineral processing at Ratcliffe-on-Soar Power Station, vehicle re-spraying at two premises, chair frame manufacturing, dry cleaning, two vehicle refuelling stations, waste oil burner processing and metal foundry processes at Progress Rail Services, north of Toton Yard. With the exception of Ratcliffe-on-Soar Power Station, none of these are within the land required for construction of the Proposed Scheme.

10.3.46 The Environment Agency reports that there is one consented discharge to groundwater and ten consented discharges to surface water within the study area. Further details on the groundwater in the Ratcliffe-on-Soar to Long Eaton study area can be found in Section 15, Water resources and flood risk.

10.3.47 There is one nationally significant ecological designated site as defined in the land quality section of the SMR[115]. This is the Lockington Marshes Site of Special Scientific Interest (SSSI). It is located in the Ratcliffe-on-Soar area in the floodplain of the River Trent and River Soar, approximately 80m west of the land required for construction of the Proposed Scheme.

10.3.48 Further information on ecological designated sites in the Ratcliffe-on-Soar to Long Eaton area is provided in Section 7, Ecology and biodiversity.

[114] There is the potential that these have been transferred to environmental permits.
[115] Sensitive ecological receptors are defined as national designations such as SSSI.

Mining/mineral resources

10.3.49 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 sand, gravel, and gypsum, 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).

Mineral Plans

10.3.50 LeCC, NCC and DCC are responsible for the overall mineral plans for the Leicestershire County, Nottinghamshire County and Derbyshire County, respectively.

10.3.51 The Minerals Local Plan (MLP) for Leicestershire[116] was adopted in 1995 and will be replaced with the Minerals and Waste Local Plan (MWLP), that is currently in draft and yet to be formally adopted. The new MWLP will set out the policies aimed at controlling mineral and waste related developments up to the year 2031. The current MLP and draft MWLP do not list any mineral extraction allocation sites within the study area. A consultation that ran in July and August 2015 identified additional sand and gravel extraction sites in LeCC[117] that were not subsequently included in the draft MWLP[118]. One of these sites included an extension to the north of Lockington Quarry, which if implemented, would be crossed by the route of the Proposed Scheme to the west of Ratcliffe-on-Soar.

10.3.52 The MLP for Nottinghamshire[119] was adopted in December 2005 and sets out the NCC policies aimed at controlling mineral related developments up to the year 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[120] has been published as part of the new plan preparation process. The 2005 MLP for Nottinghamshire does not list any mineral extraction allocation sites within the study area.

10.3.53 The MLP for Derby and Derbyshire[121], was adopted in April 2000 and amended in February 2002. DCC and Derby City Council are currently preparing a new MLP. The current MLP lists an active (from December 1997) mineral extraction site for sand and gravel at Attenborough, which is located to the south-east of Long Eaton and would be crossed by the route of the Proposed Scheme. Based on more recent supplementary planning guidance on the after-use of sand and gravel sites[122], dated

[116] Leicestershire County Council (1995), Leicestershire Minerals Local Plan Review
[117] Leicestershire County Council (2015), https://www.leicestershire.gov.uk/environment-and-planning/planning/minerals-and-waste-local-plan/draft-consultation ; Lockington Quarry Northern Extension – 2015 Consultation
[118] Leicestershire County Council, https://www.leicestershire.gov.uk/environment-and-planning/planning/minerals-and-waste-local-plan/policy-documents
[119] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan*
[120] Nottinghamshire County Council, (2005), *Nottinghamshire Minerals Local Plan* - Issues and Options Consultation
[121] Derbyshire County Council and Derby City Council, (2002), *Derby and Derbyshire Minerals Local Plan*
[122] Derbyshire County Council and Derby City Council, (2004), *Derby and Derbyshire Minerals Local Plan – Supplementary Planning Guidance on the After-Use of Sand and Gravel Sites*

December 2004, the extraction in this area was completed in 2004 and the site and surrounding area reclaimed for agriculture and water sports lakes.

10.3.54 The locations of specific mineral and mining resources within the study area are described below.

Sand, gravel and clay deposits

10.3.55 The LeCC Mineral and Waste Safeguarding document for North West Leicestershire District[123] includes a plan showing the proposed extent of minerals safeguarding area (MSA). The plan shows that there is a sand and gravel MSA within the study area The MSA would be crossed by the route of the Proposed Scheme in the area north of Kegworth. Lockington Quarry, referenced in Table 20, is located within this MSA.

10.3.56 The NCC issues and options consultation document includes a plan showing the proposed extent of a sand and gravel MSA within the study area The MSA would be intersected by the route of the Proposed Scheme around Ratcliffe-on-Soar and the southern area of Toton.

10.3.57 The MSA listed above are proposed and not within the adopted minerals plans for LeCC and NCC. They have therefore not been considered in the assessment.

10.3.58 The current Derby and Derbyshire MLP includes a plan of Mineral Consultation Areas (MCA) in the Derbyshire area. This plan shows a sand and gravel MCA south of Long Eaton that would be crossed by the route of the Proposed Scheme. The former Attenborough Quarry Trent Farm site, referenced in Table 3, is located within this MCA.

Gypsum

10.3.59 The NCC issues and options consultation document shows that there is one MSA within the study area for gypsum. The gypsum MSA would be crossed by the route of the Proposed Scheme around Ratcliffe-on-Soar.

10.3.60 An area between Ratcliffe-on-Soar Power Station and Thrumpton has historically been worked for gypsum (Redhill Mine). Records indicate that mining dates back to at least 1750 with the main entrance located to the west of Redhill tunnel. The BGS refers to mining in this area where neither the actual depth, nor the extent of the workings, is known except that they are "shallow" and some abandoned shafts have been located[124].

10.3.61 The gypsum MSA is proposed and is not within the adopted minerals plan. It has therefore not been considered in the assessment.

Petroleum exploration and development licence (PEDL/hydrocarbons)

10.3.62 There are two current licences for coal or coal bed methane exploitation[125]. The licences are provided by the Oil and Gas Authority and referred to as PEDL302 and 306. Both are currently extant with the licence start dates stated to be July 2016 and

[123] Leicestershire County Council (2015), *Minerals and Waste Safeguarding for North-West Leicestershire District, Document S6/2015*
[124] British Geological Survey (2009), The Engineering Geology of the Nottingham Area
[125] Whilst reference here is made to coal there is no evidence of underground coal mining within the study area.

with end dates of July 2046. The licence administrators are Warwick Energy Exploration Limited and Egdon Resources UK Limited, respectively. PEDL302 is for an area of 100km² with PEDL 306 covering an area of 191km². These licences extend across the study area, north of Ratcliffe-on-Soar.

10.3.63 The Proposed Scheme is located within a BGS Shale Prospective Area (shale gas), known as Bowland Prospective Area. This area incorporates the study area north of the A52 Brian Clough Way.

10.3.64 There are two historical conventional oil and gas wells included within the area under PEDL 302. One is located within the study area to the south of the A52 Brian Clough Way. This was an oil and gas exploration known as 'Stapleford 1' that was drilled and abandoned in 1966 by British Petroleum. This was advanced to a depth of 182m and proved approximately 89m of the Pennine Lower Coal Measures Formation.

Geo-conservation resources

10.3.65 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geo-conservation resources has been undertaken.

Receptors

10.3.66 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 and study centres.	High
		Employers and visitors at commercial areas, and retail parks and areas.	Moderate
		Industrial.	Low
	Groundwater	Principal Aquifer – Chester Formation	High
		Secondary A Aquifer – Tarporley Siltstone Formation (sandstones), Sidmouth Mudstone Formation (sandstone), Arden Sandstone Formation, river terrace deposits, alluvium.	Moderate
		Secondary B Aquifer – Sidmouth Mudstone Formation (siltstone and mudstone), Branscombe Mudstone Formation, and Tarporley Siltstone Formation (mudstones and siltstones). Secondary (Undifferentiated) aquifer – glacial till and head deposits.	Low
	Surface waters	River Trent, River Soar, River Erewash, Cranfleet Canal, Erewash Canal, Golden Brook (located within Long Eaton), New Sawley Brook, lakes and other unnamed surface water courses.	Moderate
	Built environment	Underground structures and buried services.	Low
	Natural environment	Lockington Marshes SSSI.	High
Impacts on mining/mineral and	Mining/mineral sites	Sand and gravel and gypsum proposed mineral safeguarding areas.	Moderate

Issue	Receptor type	Receptor description	Receptor sensitivity
petroleum (gas) sites (severance and sterilisation)		Sand and gravel mineral consultation area	Low
	Oil and gas	PEDL302 and 306 oil and gas exploration licence. Bowland Shale Prospective Area	Moderate

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)[126]. 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 (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 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 (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 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

[126] 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[127] and British Standards BS10175[128] and BS8576[129], Construction Industry Research and Information Association (CIRIA) SP32[130] 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[131]. 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, road infrastructure works and East Midlands Hub station. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA05 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, former and current industrial sites and railway 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:

[127] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[128] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.
[129] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*
[130] CIRIA (1983) SP32, Construction over abandoned mine workings.
[131] 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[132]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
On site[133]						
LA05-04, LA05-08, LA05-21, LA05-35, LA05-48, LA05-56, LA05-57, LA05-58, LA05-64, LA05-66, LA05-87, LA05-88, LA05-102, LA05-111, LA05-194 and LA05-215	Key sites include: Ratcliffe-on-Soar Power Station, current and former industrial areas and works including wagon works, iron foundry, furniture manufacturers, printing works, lace mills, train repair company, sewage works and gas works (Industrial/ commercial group)	Low to moderate	Low to moderate	Moderate/ low	Low	Low
LA05-10, LA05-18, LA05-193, LA05-197, LA05-210 and LA05-162	Pumping station, former rifle range, electricity sub-station, current depot and factory (Light industrial/ commercial group)	Low to very low	Low	Moderate/ low	Low	Low
LA05-12, LA05-206 and LA05-182	Former rifle range and Attenborough Quarry, extension to Lockington Quarry, and former possible spoil heap (Quarry group)	Low to very low	Low	Low	Low	Low

[132] Each potentially contaminated site is allocated a unique reference number.
[133] 'On site' is within the area of land required for construction of the Proposed Scheme.

Area reference[132]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA05-05, LA05-104, LA05-147, LA05-157, LA05-158, LA05-75, LA05-80 and LA05-81	Various former and current railway land (excluding Toton Yard) (Railway land group)	Low to moderate/ low	Low to moderate/ low	Moderate /low	Low	Low
LA05-116	Former dye works and engineering works	Very low to moderate/ low	Moderate/ low to moderate	N/A[134]	N/A	Low
LA05-54	Toton Yard	Low to moderate	Moderate/ low	Moderate/ low	Moderate/ low	Low to moderate/ low
LA05-72	'Fields adjacent and behind Lockhouse at Cranfleet Lock' historical landfill site	Moderate/ low	Low	Moderate/ low	N/A	Low to moderate/ low
LA05-187	Marshland	Low to very low	N/A	N/A	N/A	Low
Off site[135]						
LA05-100, LA05-105, LA05-106, LA05-108, LA05-109, LA05-111, LA05-115, LA05-118, LA05-119, LA05-120, LA05-123, LA05-13, LA05-144, LA05-145, LA05-15, LA05-151, LA05-16, LA05-178, LA05-19, LA05-20, LA05-203, LA05-204, LA05-209, LA05-22, LA05-222, LA05-223, LA05-224, LA05-227, LA05-228, LA05-229, LA05-23, LA05-233, LA05-234 to LA05-242, LA05-24 to LA05-26, LA05-29, LA05-32 to LA05-40, LA05-43, LA05-45,LA05-47, LA05-49, LA05-50 to LA05-52, LA05-60 to LA05-63, LA05-65, LA05-76, LA05-78, LA05-83, LA05-85, LA05-86, LA05-91, LA05-92, LA05-94, LA05-96, LA05-98 and LA05-99	Key sites include: current and former industrial areas including printing works, wagon works, iron foundries, gas works, upholstery works, textile works, furniture manufacturers, fuel terminal, lace and silk works, gas and oil engine works, dye works and fuel stations (Off site industrial/ commercial group)	Very low to moderate	Low to moderate	Moderate/ low	Low	Low
LA05-154, LA05-165, LA05-180, LA05-218, LA05-219, LA05-225, LA05-226, LA05-31, LA05-53	Telephone exchange, electricity sub-station, warehouse, former and current depots, former pumping station, potential	Low to very low	Low	Low	Low	Low

[134] N/A refers to the receptor being absent or a receptor being not applicable to the contaminant source being assessed.
[135] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it.

Area reference[132]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
	commercial/ industrial site, and a workshop (Off site light industrial/commercial group)					
LA05-126, LA05-127, LA05-129, LA05-133	Ratcliffe-on-Soar Power Station Landfill, Winking Hill Gypsum Disposal Site, Winking Hill Ash Disposal Site, Winking Hill historical landfill, Sawley Road historical landfill, and Disused Canal historical landfill (Off site landfill group)	Low to moderate/ low	Low to moderate/ low	Moderate/ low	Low	Low to moderate/ low
LA05-186, LA05-191, LA05-211	Marshland (Off site marshland group)	Low to very low	N/A	N/A	N/A	Low
LA05-03, LA05-122, LA05-149, LA05-150, LA05-159, LA05-164, LA05-74, LA05-77 and LA05-82	Various former and current railway land sites (Off site railway land group)	Low to moderate/ low	Low	Moderate/ low	Low	Low
LA05-59	Former iron foundry and lace factory site	Low to moderate/ low	Moderate/ low	Moderate/ low	Low	Low
LA05-181	Former possible spoil heap	Low to very low	Low	N/A	Low	Low
LA05-176	Former Red Hill mine	Very low to low	Low	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.

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
Off site				
LA05-176 Former Red Hill mine.	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	Minor to moderate adverse (significant)
	Controlled waters – groundwater	Low	Moderate	Moderate adverse (significant)
	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 are not regarded as significant in line with the methodology set out in the SMR.

10.4.18 The assessment has considered the extent of earthworks required together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issue has been identified which the draft CoCP would address.

10.4.19 Construction of the East Midlands Hub station and realignment of the existing Network Rail railway lines may result in temporary minor adverse effects. The area has a long history as a railway depot involved in railway maintenance and servicing, together with historical gravel extraction and infilled ground. Earthworks would have the potential to impact on water quality in the area including the River Erewash, the Erewash Canal and the underlying Secondary A aquifer. In addition, the proposed car park and East Midlands Hub station has the potential to generate large quantities of excavated material; some of which may require treatment to render it suitable for re-use.

10.4.20 Construction compounds located in this study area would 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

10.4.21 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.

10.4.22 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.

10.4.23 All of the sites set out in Table 23 have been assessed for a 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
LA05-04, LA05-08, LA05-21, LA05-35, LA05-48, LA05-56, LA05-57, LA05-58, LA05-64, LA05-66, LA05-87, LA05-88, LA05-102, LA05-111, LA05-194 and LA05-215 (CSM Group A industrial/ commercial sites) Key sites include: Ratcliffe-on-Soar Power Station, current and former industrial areas and works including wagon works, iron foundry, furniture manufacturers, printing works, lace mills, train repair company, sewage works and gas works.	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Moderate/ low to moderate	Very low to low	Minor to moderate beneficial (significant)
	Controlled waters – surface water	Moderate/ low	Very low to low	Minor to moderate beneficial (significant)
LA05-10, LA05-18, LA05-193, LA05-197, LA05-210 and LA05-162 (CSM Group B light industrial/ commercial sites) Pumping station, former rifle range, electricity sub-station, current depot and factory	Controlled waters – surface water	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
LA05-05, LA05-104, LA05-147, LA05-157, LA05-158, LA05-75, LA05-80 and LA05-81 (CSM Group D railway land) Various former and current railway land (excluding Toton Yard)	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (off-site))	Moderate/ low	Very low to low	Minor to moderate beneficial (significant)
	Controlled waters – surface water	Moderate/ low	Very low to low	Moderate beneficial (significant)
LA05-116 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)
LA05-54 Toton Yard	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Moderate/ low to moderate	Very low to low	Minor to moderate beneficial (significant)
	Controlled waters – groundwater (Secondary A, Secondary B, Secondary (undifferentiated))	Moderate/ low	Very low	Moderate beneficial (significant)
	Controlled waters – surface water	Moderate/ low	Very low to low	Minor to moderate beneficial (significant)
	Impact on property receptors – aggressive ground conditions	Moderate/ low	Very low	Moderate beneficial (significant)
	Impact on ecological/geological designations	Moderate/ low	Very low	Moderate beneficial (significant)
LA05-72 'Fields adjacent and behind Lockhouse at Cranfleet Lock' historical landfill site	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters and inhalation of ground gas (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)
	Impact on property receptors – exposure to explosive gases	Moderate/ low	Very low to low	Minor to moderate beneficial (significant)

10.4.24 Table 25 indicates that where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there would, in most instances, be overall moderate beneficial effects which are considered to be significant.

10.4.25 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.

10.4.26 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

10.4.27 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[136] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.28 There are no MSA defined in the adopted minerals plans for LeCC, NCC or DCC and all MSA discussed previously are proposed within the minerals plans under consultation. Therefore, these are not considered as part of the assessment. There is an MCA defined in the adopted Derby and Derbyshire MLP for sand and gravel to the south of Long Eaton that would be crossed by the route of the Proposed Scheme.

10.4.29 The operational Lockington Quarry site is located west of Ratcliffe-on-Soar.

10.4.30 There are two current licences for coal or coal bed methane exploitation; PEDL302 and 306. The Proposed Scheme is also located within the Bowland Prospective Area and a BGS Shale Prospective Area (gas).

Temporary effects

10.4.31 Temporary adverse effects may occur where construction compounds are proposed within an MSA or mineral designation. In such cases, there would be a temporary 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.

Sand, gravel and clay

10.4.32 The following construction compounds fall within the MCA defined in the adopted Derby and Derbyshire MLP:

- the Long Eaton main compound;
- Long Eaton satellite compound No. 1; and
- Long Eaton satellite compound No. 2.

10.4.33 The Lockington Quarry is just within the land required for the construction of the Proposed Scheme. The temporary effect of construction of the Proposed Scheme on

[136] 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.

the sand and gravel deposits within the MCA and the active quarry site would be negligible.

Petroleum exploration and development licences (PEDL)

10.4.34 The temporary effect of construction of the Proposed Scheme on the PEDL and Bowland Shale Prospect Area would be negligible.

Permanent effects

10.4.35 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.

Sand, gravel and clay

10.4.36 As a proportion of the total MCA, the strip of mineral sterilisation is less than 1% of the total MCA. The effect on the MCA is considered to be negligible and therefore not significant. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority.

10.4.37 The route of the Proposed Scheme would lie on the south-east boundary of the currently operational, Lockington Quarry site, but as located on the Proposed Scheme boundary, would not result in severance of the site. It may restrict the future exploitation potential of the resources and is considered to be a minor adverse effect. However, it is possible that mineral extraction could be undertaken in advance of Proposed Scheme construction works.

Petroleum exploration and development licences (PEDL)

10.4.38 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.

10.4.39 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)
MCA – sand and gravel	MCA	MCA for sand and gravel as defined by Derby and Derbyshire MLP	Low	Minor	Negligible (N)
Lockington Quarry	Operational quarry (Tarmac)	Sand and gravel quarry	High	Minor	Minor adverse (N)
PEDL302 and 306	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

10.4.40 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.41 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.

10.4.42 Mitigation of the effects on mineral resources within the proposed 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 mineral planning department, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MCA and active quarry.

Summary of likely residual significant effects

10.4.43 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 significant residual adverse 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 one auto-transformer feeder station and one auto-transformer station, located at Kegworth and Trent Junction respectively. An auto-transformer station and feeder 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 Ratcliffe-on-Soar to Long Eaton 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 Leicestershire County Council (LeCC), Derbyshire County Council (DCC), Nottinghamshire County Council (NCC), North West Leicestershire District Council (NWLDC), Rushcliffe Borough Council (RBC), 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: LA05 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)[137].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from August to September 2017 and winter surveys for the landscape and visual assessment were undertaken from January to February 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES.

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

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 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 the station and surrounding public realm associated with the Proposed Scheme will be subject to a high quality architectural and landscape design.

11.2.10 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 Ratcliffe-on-Soar to Long Eaton area extends between the A453 Remembrance Way and the A6 Derby Road (near Kegworth and the M1 junction 24) in the south; to the B5010 Derby Road (which links the settlements of Stapleford and Sandiacre) in the north. It comprises three different types of landscape; the lowland, rural floodplain landscape encompassing the River Trent and the River Soar, as well as the urban and urban fringe landscapes of the Long Eaton and Toton urban areas.

11.3.2 The terrain within the River Trent and River Soar valleys is predominantly flat, with occasional raised areas primarily associated with road corridors (such as the A453 Remembrance Way) within the landscape. A notable exception to this is the escarpment between Red Hill/ Wood Hill, which sits immediately south of the River Trent and forms a prominent ridgeline in an otherwise predominantly flat landscape. The prevailing land use in the floodplain of the River Trent and River Soar valleys is agricultural, with a mixture of both arable and pastoral farming. There are also recreational facilities, including the Redhill Marina, Trent Lock and the Cranfleet Canal (all of which are centres for boating activity), as well as occasional industrial and mineral activities, the most notable of which are the Ratcliffe-on-Soar Power Station and Lockington Quarry. Occasional small blocks of woodland occur within the floodplain, including March Covert which is located immediately north of the A453 Remembrance Way near the M1 junction 24. Trees more commonly occur along field boundaries and along the rivers.

11.3.3 Settlements within the River Trent and River Soar valleys are sparse, comprising isolated houses and farmsteads. This is due to relative inaccessibility, caused in part by obstacles to movement in the form of the rivers (with restricted numbers of crossings available over both the River Trent and the River Soar), flooding issues, and, more recently, the presence of transport infrastructure, such as the M1. Several key infrastructure routes cross the floodplain landscape and have both a visual and audible influence on its character. These include the M1 (junction 24), the A453 Remembrance Way, the A6 Derby Road and the Midland Main Line (MML), amongst other, more minor roads and conventional lines. A number of local public rights of way (PRoW) also provide access through the River Trent and River Soar valleys, including promoted walking routes[138] such as the Trent Valley Way and the Midshires Way, although the River Trent and the parallel Cranfleet Canal form a barrier to north-south connectivity. These PRoW and promoted routes have recreational value and connect the various communities within the River Trent and River Soar floodplains.

11.3.4 The character of the Long Eaton and Toton urban areas and urban fringe contrasts in character with the River Trent and River Soar floodplains. The main land use in the Long Eaton urban area is residential, with patches of industrial development in the south and a commercial heart in its centre (based around the A6005 Nottingham

[138] Promoted PRoW refers to those PRoW which are "promoted" destinations in their own right as a recreational resource.

Road, the B6540 Tamworth Road and Waverley Street). The urban area is relatively flat in the south, becoming slightly more undulating in the north. The River Erewash is a key waterway which falls on the eastern boundary of the Long Eaton urban area, separating it from the Toton urban area. In addition, the Erewash Canal runs through the central area of Long Eaton. Both waterways provide an important recreational resource, the Erewash Canal in particular offers opportunities for walking, cycling and fishing, as well as boating. The urban area contains public open spaces such as West Park and Toton Fields Local Nature Reserve (LNR), all of which add recreational value. There are very few woodland blocks in the urban area, apart from belts of woodland alongside watercourses; trees are commonly located within public open spaces, or along streets or in gardens.

11.3.5 The settlement within the Long Eaton urban area is of low to medium density[139]. Long Eaton comprises a mixture of older terraced housing in its centre and along the A6005 Nottingham Road, with more modern estate-style housing elsewhere (particularly in the south and west) originating in the mid to late 20th century and early 21st century. The older housing tends to be laid out in geometric grid-like streets, with the more modern housing on curved roads including a greater number of cul-de-sacs. The A52 Brian Clough Way forms a notable barrier to movement in the north of Long Eaton, however other local roads within the Long Eaton area such as the A6005 Nottingham Road/Derby Road and the B6540 Tamworth Road are easier for pedestrians and cyclists to cross. In addition, there are five conventional railway lines running through the settlement area; notably including the Long Eaton Low Level Line and Long Eaton High Level Line run north-south through the town, parallel to the route of the Proposed Scheme. The Long Eaton urban area contains over 10 local PRoW, as well as promoted walking and cycling routes, including the Erewash Valley Trail promoted route and the National Cycle Network (NCN) Route 67. The local PRoW and, in particular, the promoted routes have recreational value and connect the Long Eaton with surrounding settlements such as Toton, Sandiacre, Breaston, as well as linking to other recreational facilities such as Attenborough Nature Reserve.

11.3.6 The main land use in the Toton urban area is also residential; there is some commercial development and a barracks on its north-eastern edge. The urban area steadily rises from south to north with occasional undulations. The River Erewash is a key waterway on its western edge, separating it from the Long Eaton urban area and provides a recreational resource. Adjacent to the River Erewash, Toton Fields LNR and Manor Road Open Space are public open spaces within the Toton urban area. Trees are commonly located within public open spaces, or along streets or in gardens. In addition, there are very few woodland blocks, apart from belts of woodland alongside watercourses and within parts of the restored Toton Sidings in Toton Yard.

11.3.7 The settlement within the Toton urban area is generally of low density[140], comprising mostly modern estate-style housing originating in the mid to late 20th century and early 21st century. Housing tends to be laid out on curved roads including a number of

[139] Chartered Association of Building Engineers (2005) *Better Neighbourhoods: Making higher densities work*. Available online at: http://webarchive.nationalarchives.gov.uk/20110118185901/http://www.cabe.org.uk/files/better-neighbourhoods.pdf
[140] Chartered Association of Building Engineers (2005) *Better Neighbourhoods: Making higher densities work*. Available online at: http://webarchive.nationalarchives.gov.uk/20110118185901/http://www.cabe.org.uk/files/better-neighbourhoods.pdf

cul-de-sacs. To the north of the urban area, the A52 Brian Clough Way forms a notable barrier to movement. Other local roads within the Toton area such as the A6005 Nottingham Road/ Derby Road and the B6003 High Road/ Stapleford Lane/ Toton Lane are easier for pedestrians and cyclists to cross. Toton Yard, to the west of the Toton urban area includes Toton Sidings and has been used for rail and freight purposes since the 19th century. The Long Eaton Low Level Line and Long Eaton High Level Line run to the west of the Toton area where they join Toton Yard and form a barrier to movement between the Toton area and Long Eaton. The Toton urban area contains over five local PRoW, which add recreational value, as well as connecting the area to adjacent settlements such as Chilwell, Stapleford and Long Eaton.

11.3.8 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, as appropriate, upon review of available historic landscape characterisation data and 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[141], the Derbyshire Landscape Character Assessment[142] and the Nottinghamshire Landscape Character Assessment[143].

11.3.9 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.

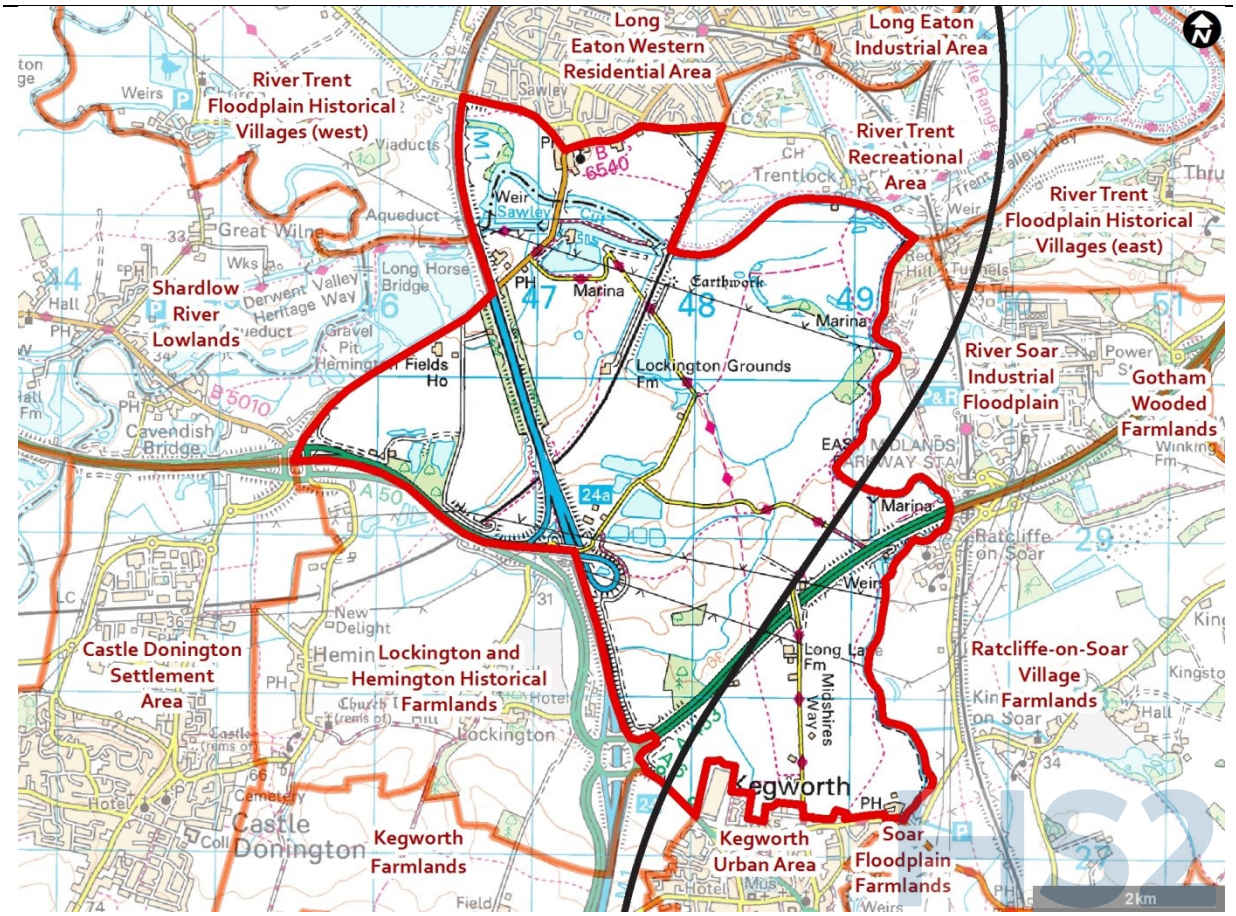
11.3.10 For the purposes of this assessment, the Ratcliffe-on-Soar to Long Eaton study area has been subdivided into 15 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

11.3.11 Ten of the LCAs would not be significantly affected by the Proposed Scheme on account of distance, landform and built urban form. Kegworth Farmlands LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report Coleorton to Kegworth (LA04) as it is located for the most part within the Coleorton to Kegworth area. A summary of the remaining five LCAs that would be significantly affected within the Ratcliffe-on-Soar to Long Eaton area is provided in Table 27.

[141] 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
[142] Derbyshire County Council (2014), *The Landscape Character of Derbyshire*. Available online at: https://derbyshire.gov.uk/environment/conservation/landscapecharacter/landscape-character.aspx
[143] Nottinghamshire County Council (2010), Nottinghamshire Landscape Guidelines. Available online at: http://cms.nottinghamshire.gov.uk/home/environment/landimprovements/landscapecharacter.htm

Table 27: Summary of significantly affected LCAs

River Soar Farmlands



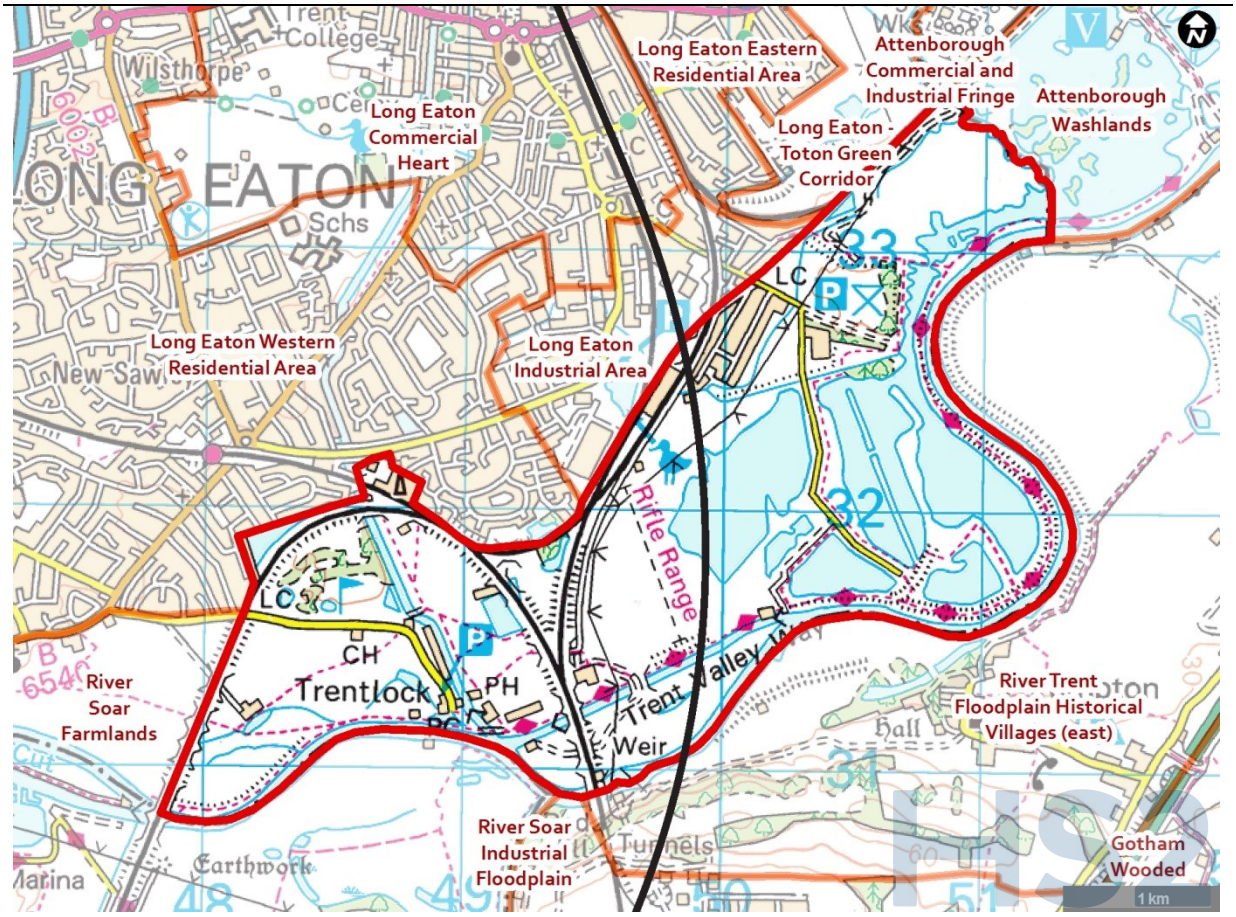
Flat floodplain landscape comprising the River Trent and River Soar, with the MML crossing in the background	Mineral extraction, pylons and the A453 Remembrance Way form detractors and contribute to the industrial feel of the landscape
	

The River Soar Farmlands LCA comprises a flat floodplain landscape with a mixture of arable and pastoral farmland. The LCA is flat and underlain by superficial deposits of alluvium, although there is occasional undulating landform on the outer fringes of the LCA due to the presence of mineral working and highway infrastructure. The River Soar and River Trent form the eastern and northern boundaries of the LCA respectively and have an influence on the LCA and its character – in particular contributing a sense of tranquillity. The area comprises a mix of valley floor, very large irregularly-shaped fields, and smaller fields to the south of the A453 Remembrance Way and east of Long Lane which are more rectangular. Mineral extraction and other activities have disrupted the historic field pattern and contributed to field boundary loss. Two scheduled monuments, south-east of Dunster Barn and the adjacent Roman villa and enclosure north of Ratcliffe Lane, are located within the LCA, however they have very little influence on the landscape character due to a lack of evidence at ground level. The immediate floodplain of the River Soar and River Trent provide areas of rich ecological habitat including the Lockington Marshes SSSI, lowland deciduous woodland (including that at March Covert) and non-designated grassland – particularly within the floodplain of the River Soar. Away from the rivers, there is a mix of agricultural land bounded by hedgerows and small woodland blocks that contribute to biodiversity.

The LCA is well served by local PRoW and recreational routes throughout its extent, including the Midshires Way. The River Soar and River Trent are both navigable within the LCA, facilitating boating throughout the area. However, there are few designated public open spaces or recreational facilities within the area. The LCA has a strong rural feel, especially in the north and east, where prominent elements in the landscape include the River Soar and River Trent and their associated vegetation. However, there are a number of elements both within and adjacent to the LCA, which affect the perceived tranquillity. These include infrastructure and noise associated with the A453 Remembrance Way and the M1, noise from aircraft at East Midlands Airport, mineral extraction, pylons and associated overhead power lines leading to and from Ratcliffe-on-Soar Power Station. The River Soar and River Trent and their immediate floodplains add scenic quality to the LCA due to the presence of waterside trees and meadows, as well as the openness and unsettled nature of the floodplain close to the rivers. However, the presence of highway and power infrastructure, as well as mineral extraction detract from the landscape character by introducing movement, noise and industrial scale vehicles and structures.

The River Soar Farmlands LCA exhibits a balance between the detractors associated with the presence of highway and power infrastructure and mineral extraction and the valued characteristics of the tranquillity, recreation and scenic quality of the River Soar and River Trent. The overall value of this LCA is low-medium based on the scenic and recreational quality obtained by the presence of the River Soar and River Trent balanced with detractors such as mineral extraction, overhead power lines and highway infrastructure such as the M1.

River Trent Recreational Area



View along the Cranfleet Canal showing the flat nature of the floodplain and recreational value	Industrial influence at the former gravel pits away from the River Trent and the Cranfleet Cut
	

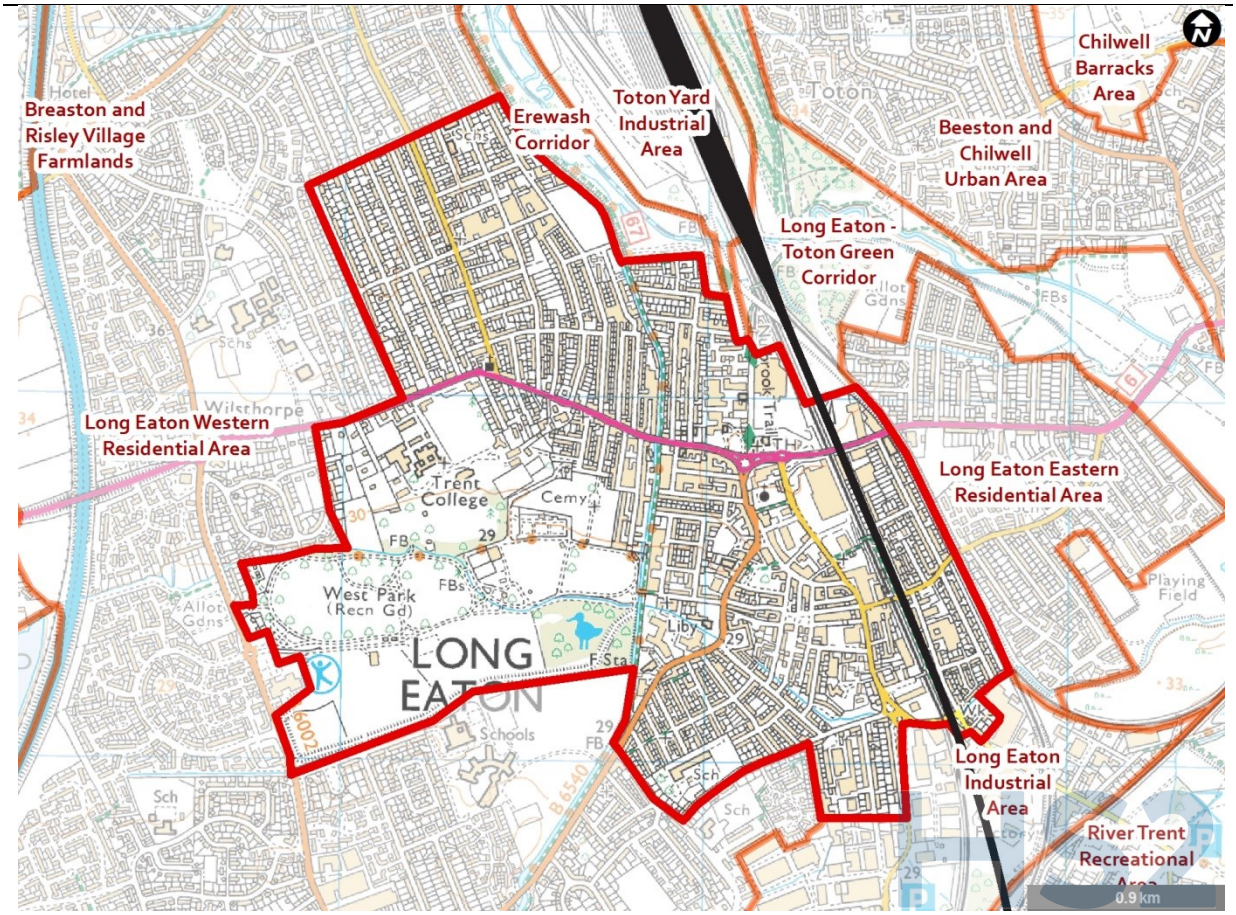
The River Trent Recreational Area LCA is predominantly influenced by the largely flat floodplain formed by the River Trent and comprises a mixture of waterways, areas of former mineral extraction, recreational facilities, historical and industrial buildings associated with the canal and railways, and pastoral farmland. The Erewash Canal, Cranfleet Canal and associated buildings, Long Eaton Sheet Stores Conservation Area, Grade II listed canal bridge to the east of Cranfleet Farm and Cranfleet Lock, and remnants of the historic field pattern add a sense of historical development within the landscape. The Erewash Canal was previously used for movement of goods (particularly coal) from the Erewash valley[144], whereas the Cranfleet Canal is a navigational cut which was built in the late 18th century[145] and allows boat traffic to avoid the Thrumpton Weir. Fields within the LCA tend to be large and pastoral, with geometric hedgerow boundaries. Habitats present within the LCA tend to be small and fragmented. Woodland is limited to small blocks; otherwise tree cover occurs along field boundaries.

The LCA is a hub for recreation uses including walking, cycling, boating, fishing and golfing. Trent Lock is a destination for recreational visitors, supported by amenities such as public houses and moorings. Rowing and sailing clubs are present within the LCA, as well as the Trent Windsurfing Club (using West Lake and East Lake, both of which are former gravel pits). There is a network of PRoW within the area, including the Trent Valley Way. The waterways add a sense of tranquillity. Whilst the LCA is adjacent to the southern edge of Long Eaton, there is a perceived sense of separation from the settlement due to the influence of scattered isolated houses, presence of trees and scrub vegetation adjacent to the main PRoW and limited road network which emphasise isolation. The existing conventional lines in the area detract slightly from the tranquillity and rural character within localised parts of the area, particularly as they cross the River Trent and the Cranfleet Canal. The waterways themselves add scenic quality to the LCA due to the presence of waterside trees and meadows and there are areas of unlit countryside within the LCA located away from the main settlement edge and protected from glare. Away from the river corridors, scenic quality is reduced in select locations by detractors such as the Long Eaton urban fringe, the presence of rail infrastructure and the post-industrial area around Trent Lane.

Key valued characteristics within the River Trent Recreational Area LCA include the number and diversity of recreational features, the sense of tranquillity and scenic quality provided by the River Trent, as well as the Erewash and Cranfleet Canals. These are offset in parts by detractors such as the presence of existing rail lines, the urban fringe of Long Eaton and the industrial elements associated with the former mineral workings. The overall value of this LCA is medium-high based on the scenic quality and considerable recreational value obtained by the presence of the River Trent and River Soar balanced with detractors such as overhead power lines and existing rail infrastructure.

[144] The Long Eaton & Sawley Archive (2018), *Trent Lock*. Available online at: http://www.long-eaton.com/trentlock.asp
[145] Sawley and District Historical Society (2018), *History of Sawley*. Available online at: http://www.sawleyhistoricalsociety.org.uk/history2.html

Long Eaton Commercial Heart



The busy A6005 Nottingham Road with adjacent brick factory building

West Park public open space, with Victorian Harrington Mills beyond

The Long Eaton Commercial Heart LCA comprises a mixture of commercial and residential buildings in the centre of the town. It is relatively flat and is divided by a number of watercourses including the Erewash Canal and the Golden Brook. There is a historical sense of place, contributed to by the age of buildings within the LCA from the 18th century to the present day. These buildings include a mixture of Victorian factories, houses originating in the 19th and 20th centuries and historical commercial and community properties.

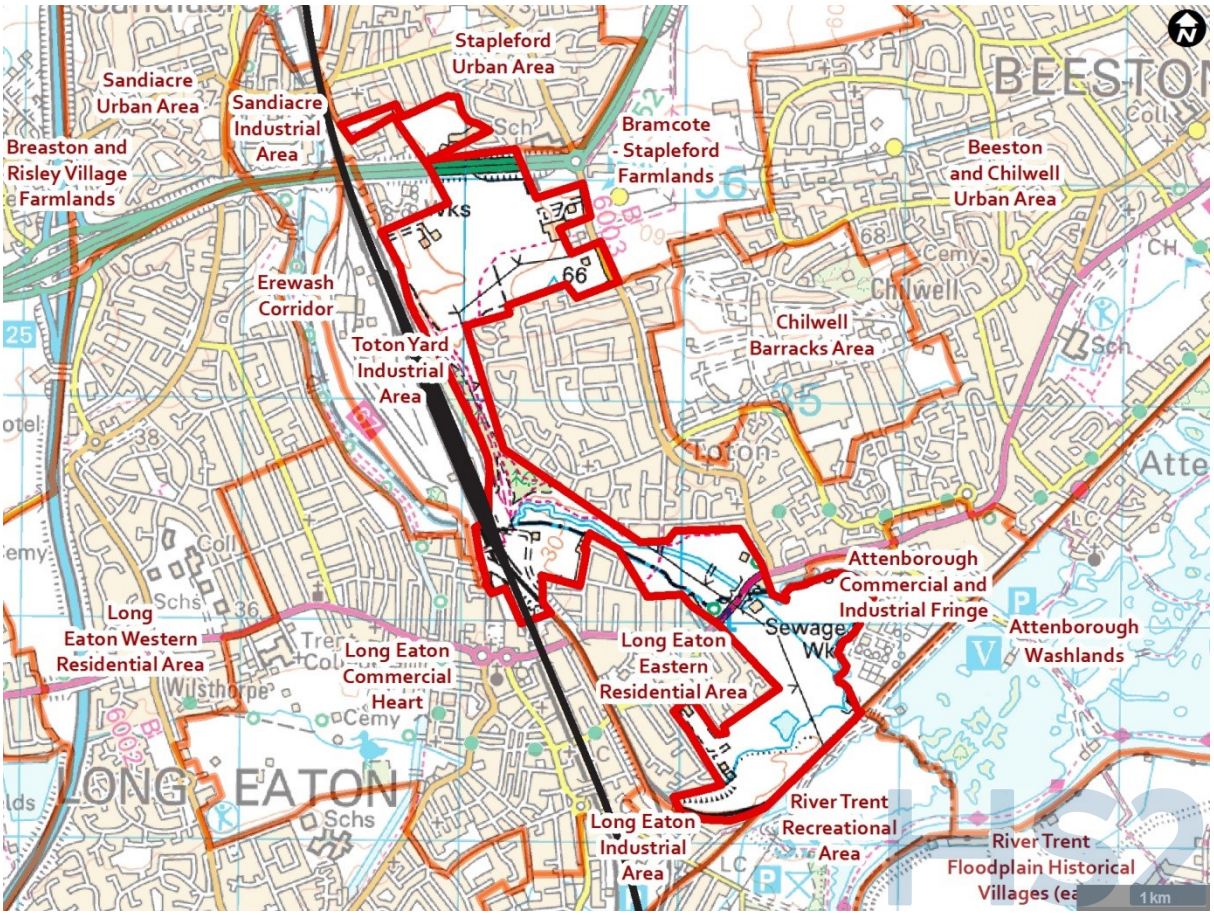
The west of the LCA has a regular street layout and built form pattern - buildings in this part of the LCA are of a similar size and form, distributed along straight geometric roads. Towards the east, buildings vary more in size and form, particularly in commercial areas and the roads are less geometric. There are several buildings with distinctive architectural features and many are recognised with listed status or as part of a conservation area.

The LCA contains three conservation areas: Derby Road Conservation Area, Long Eaton Town Centre Conservation Area and Long Eaton Lace Factories Conservation Area; and listed buildings including Long Eaton Lock on the Erewash Canal, and the Church of St. Laurence and St. James on Market Place. These designations and other historical but unlisted buildings contribute to a distinct sense of historical continuity within the LCA. Local PRoW and recreational routes exist throughout the LCA; including NCN Route 6, NCN Route 67, and the Nutbrook Trail (comprising Long Eaton Footpath 72

and Long Eaton Footpath 6). The Erewash Canal also provides a recreational feature for pedestrians, cyclists, anglers and narrowboats. West Park is a destination public open space containing numerous recreational features. The pedestrianised High Street within the town centre offers a well-used public space, including the Market Place. West Park offers a tranquil retreat in an otherwise busy LCA, as does the Erewash Canal. The A6005 Nottingham Road, the B6540 Market Place and Waverley Street/ Cross Street are all busy roads often congested by traffic. As expected for the commercial centre of a town, it is well-used by pedestrians, particularly around the Market Place. Several buildings within the LCA are distinctive and have special aesthetic qualities such as Bridge Mills on Derby Road and the New Central Building on Station Street. However, the scenic quality has been eroded by commercial development, particularly in the east of the area.

The LCA has a strong sense of place and a clear history and historical development within the landscape, as well as a number of popular recreational features. The tranquillity of the area is limited due to its busy nature. The overall value of this LCA is medium-high based on the valued characteristics presence such as the sense of place, recreational value and distinctive buildings, balanced with detractors such as large commercial buildings and busy roads.

Long Eaton / Toton Green Corridor



Relationship between houses at the western edge of Toton and the Toton Fields LNR

Archers Field Recreation Ground showing the well-vegetated A52 Brian Clough Way in the distance

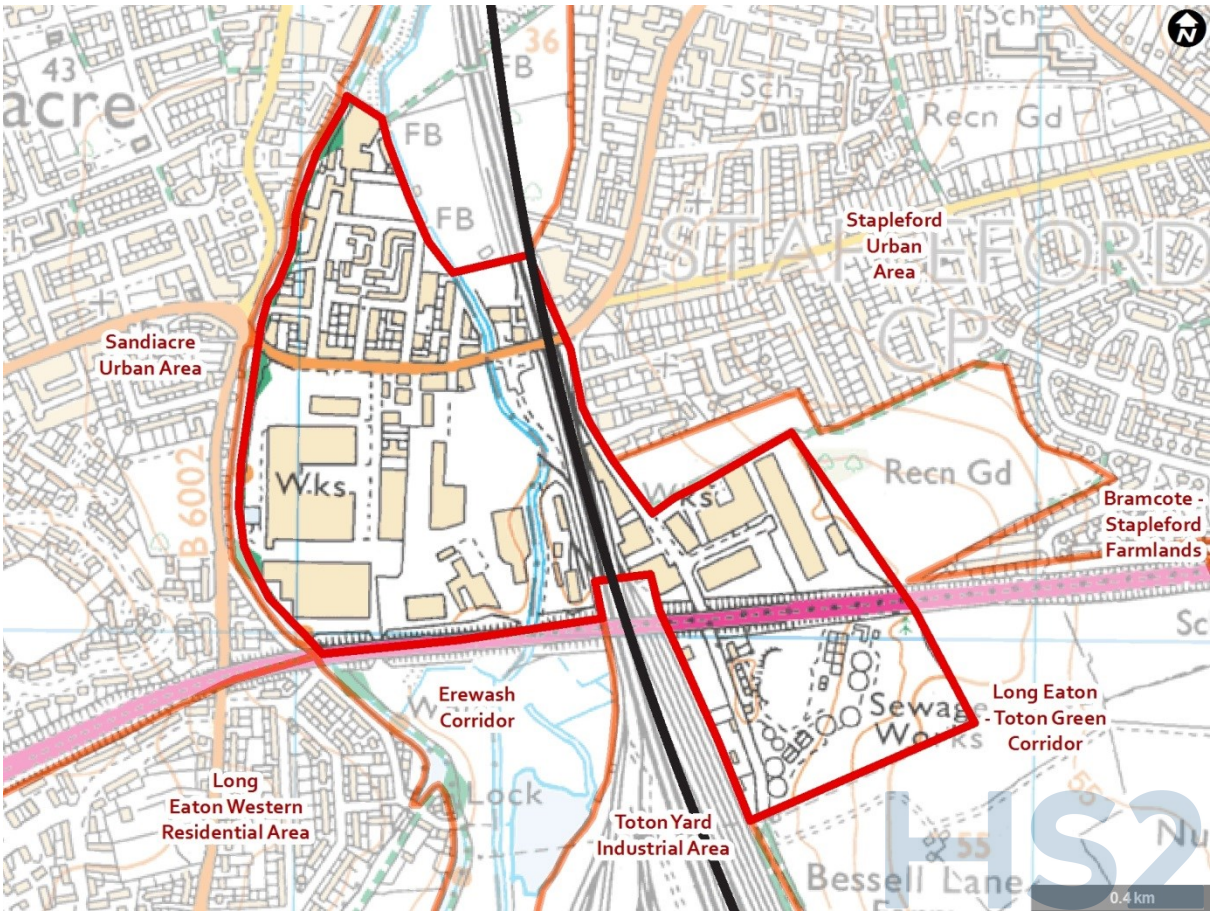
The Long Eaton/ Toton Green Corridor LCA comprises a mixture of public open space and other green space which is not publicly accessible and forms a green corridor along the River Erewash between Stapleford and the River Trent. It also serves to separate the settlements of Long Eaton and Toton. There is a varied terrain within the LCA, with an escarpment occurring in the far north-east, dropping off sharply to flatter terrain elsewhere. The River Erewash forms a key landscape feature in the area and has a positive influence on its surroundings through the adjacent riparian vegetation. Buildings in

the area are limited and generally originate in the mid to late 20th century. The large and interconnected nature of the public open space, which characterises the LCA, adds a distinct sense of place and offers a key community resource. The quality and condition of the open space varies across the LCA. Toton Fields LNR is a locally important ecological designation in the area, and is also used for recreational purposes.

The majority of the LCA is used for recreation; it contains a series of interconnected footpaths and bridleways, as well as play areas and formal recreation facilities. NCN Route 6 crosses the area towards its southern extent. Within the LCA, the prevalence of public open space and mature vegetation adds a distinct sense of tranquillity to the area. The main effects that detract from tranquillity are caused by adjacent infrastructure and industrial activities such as Toton Sidings / Toton Yard and sewage works at Bessell Lane and Barton Lane. Vegetation and public open space within the LCA are generally in good condition and add scenic qualities to the area. However, towards the north of the area, a lack of management and adjacent industrial influences reduce the aesthetic qualities.

Recreational value and tranquillity provide positive contributions to the area. However, the variable condition and presence of adjacent industry reduce the value. The overall value of this LCA is medium based on the scenic and recreational quality obtained by the presence of the Toton Fields LNR and River Erewash balanced with detractors such as areas of poor management, and adjacent infrastructure and industrial elements.

Sandiacre Industrial Area



Relationship of houses with adjacent pastoral farmland close to the River Erewash

Industrial buildings and vegetation along Bessell Lane

The Sandiacre Industrial Area LCA is urban fringe in character with a mixture of industrial and commercial use and residential buildings, varying in scale and density. An older industrial area is located within the north of the LCA adjacent to the River Erewash, with larger and more modern units further south on both sides of the Erewash Valley Line.

There is a small area of modern residential development off the B5010 Derby Road. This is a high density development of modern terrace brick built properties alongside the Grade II listed Springfield Mill, which has been converted into residential properties. The historic value of the Mill is reflected in its designation as part of the Canal Side Conservation Area. There are two streets of Victorian terraces alongside the Erewash Valley Line and the Erewash Canal which are integrated into the modern development, providing a varying grain and pattern to the LCA.

There is some recreational value associated with the Erewash Canal towpath / Sandiacre Footpath 19 (part of the Nutbrook Trail and the Erewash Valley Trail) and Stapleford Footpath 13. However, there are no other recreational facilities within the LCA.

The listed industrial heritage buildings converted into residential properties and the Canal Side Conservation Area provide elements of landscape value but otherwise the area includes large industrial units, with little recreational value and minimal scenic quality of note. The overall value of this LCA is medium based on the valued historical elements within it and recreational value balanced with detractors such as modern industrial and commercial development.

Visual baseline

11.3.12 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: LA05 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[146], 4: Transport, 5: Hotels/healthcare/education and 6: Employment (none within this area).

11.3.13 Views of the Proposed Scheme from residential locations are available from different settlement types within the Ratcliffe-on-Soar to Long Eaton area. These range from the urban settlements of Long Eaton and Toton, smaller rural villages such as Thrumpton and Ratcliffe-on-Soar and numerous individual properties and farmsteads, including those along the River Soar near Redhill Marina.

11.3.14 Views from within, and on, the edges of the larger settlements are typically filtered and framed by intervening buildings, infrastructure and mature trees. There are panoramic vantage points within Long Eaton including Archers Field Recreation Ground and Toton Fields LNR. Views from the smaller settlement edges are typically filtered and framed by intervening hedgerows, however, the low lying and relatively flat landform within the River Trent valley provides opportunities for open, localised panoramic views.

11.3.15 A range of recreational views are available from PRoW along the River Soar, River Trent and the Cranfleet Canal and its associated towpath, and also at locations including Redhill Marina and Trent Lock. Views from PRoW include those from the Trent Valley Way (Long Eaton Footpath 12 and Long Eaton Footpath 7) and local PRoW such as Leicestershire Footpath 63 adjacent to the River Soar near Redhill Marina and Sawley Footpath E16 adjacent to the River Trent near Trent Lock. All of these views provide generally long range and panoramic vantage points overlooking the flat agricultural land of the River Trent and River Soar valleys, albeit with some partial screening provided by a generally well-defined field pattern. Views from the

[146] 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.

majority of these, and other, PRoW in the area are low lying and partially restricted by woodland and hedgerows. Views from the Erewash Canal and the adjoining towpath are typically limited by canal side vegetation.

11.3.16 Users of rural roads and lanes generally experience partially restricted views, due to mature roadside hedgerows and trees. However, lanes located on more open ground within the River Trent valley, such as Trent Lane and the lane to Redhill Marina allow glimpsed long-distance views across the valley. Views from motorists/ road users travelling on the A453 Remembrance Way and the A52 Brian Clough Way are generally restricted due to mature roadside hedgerows and woodland belts that form barriers restricting views beyond the road corridor.

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 middle of 2025 and the end of 2031. 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)[147] 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[148];
- use of well-maintained hoardings and fencing;

[147] Supporting document: Draft Code of Construction Practice
[148] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

- 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: construction of the East Midlands Hub station; construction of viaducts; construction of embankments; excavation of cuttings and associated car park; addition of construction traffic routes; the removal of existing landscape elements including trees and hedgerows; and the closure and diversion of existing public highways and PRoW.

11.4.7 Other key changes include the construction of overbridges and underbridges and associated road and rail realignment works; construction of the Trent Junction auto-transformer station and the Kegworth auto-transformer feeder station; construction of a grid supply point in the River Soar valley; installation of overhead line equipment; utility diversions; the presence of transfer nodes and pre-cast yards; and demolition of buildings and structures.

Landscape assessment

11.4.8 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.

Table 28: Summary description and assessment of effects on LCAs

River Soar Farmlands	**Medium-low susceptibility and sensitivity**
Susceptibility to change: The level of tranquillity and the positive scenic quality afforded by the presence of the River Trent and River Soar offset industrial influences within this LCA and impart a medium to low susceptibility to change arising from the construction of the Proposed Scheme. The LCA would be directly impacted by construction of the Ratcliffe-on-Soar viaduct through the addition of uncharacteristic elements to the landscape. The landscape would also be directly impacted by the removal of trees and characteristic hedgerows to the south-west of the River Soar. This would increase the visibility of the construction works within the landscape - with features such as construction vehicles being uncharacteristic in the landscape – as well as removing the linear vegetation which forms part of the character of the LCA. Construction would introduce notable alterations to the existing flat landform and perceived scale of the landscape (particularly through the introduction of vertical elements such as cranes and works on the Ratcliffe-on-Soar viaduct as it is constructed. The presence of the A6 Derby Road and the A453 Remembrance Way satellite compound and the River Soar satellite compound to facilitate the construction of the Kegworth auto-transformer feeder station would introduce change into the landscape through the addition of noise, movement and construction works. This is on top of that	Level of effect: Moderate adverse (significant)

currently experienced within the LCA as a result of Lockington Quarry. In addition, this is compounded by the emerging structure and prominent design of the Proposed Scheme as it crosses the A453 Remembrance Way, as well as the presence of construction plant and movement of construction vehicles. Construction of the Proposed Scheme would affect approximately a third of the overall LCA area by addition of new features and uncharacteristic changes. Overall the construction of the Proposed Scheme would result in noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
River Trent Recreational Area	**Medium susceptibility and sensitivity**
Susceptibility to change: The River Trent, the Erewash Canal and the Cranfleet Canal provide a number of positive characteristics which are susceptible to change. These include: recreational value, tranquillity away from the existing rail lines in the LCA, and positive scenic qualities; together they have a medium susceptibility to change arising from the construction of the Proposed Scheme. The LCA would be directly affected by the construction of the Long Eaton and Toton viaduct and indirectly affected by the introduction of the Proposed Scheme in adjacent River Trent Floodplain Historical Villages LCA. Long Eaton satellite compound No. 1 and Long Eaton satellite compound No. 2 would form prominent additions in the form of temporary buildings, vehicular movement and soil storage to an area which is flat and largely unpopulated, with few vehicles currently accessing the area. The landscape would also be directly impacted by the removal of trees and hedgerows to the north of the River Trent that would open up views towards construction works, as well as removing characteristic elements from the LCA. The works would disrupt some of the recreational routes and facilities in the area by reducing the tranquillity and scenic quality experienced by recreational users. Construction of the Proposed Scheme would result in introduction of new and uncharacteristic elements to the LCA which would substantially alter its character and adversely affect the valued characteristics. Overall the construction of the Proposed Scheme would result in substantial alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which substantially alter the character. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Long Eaton Commercial Heart	**Medium susceptibility and sensitivity**
Susceptibility to change: There are a number of characteristic features within the LCA such as the sense of historical continuity associated with the industrial heritage adjacent to the Erewash Canal, distinctive buildings and the pattern of the townscape which have potential to be affected by the construction of the Proposed Scheme. Overall, the susceptibility of the landscape to change as a result of the construction activity is medium. The LCA would be directly impacted by the construction of the Long Eaton and Toton viaduct as well as the modifications to the Long Eaton Low Level Line and Long Eaton High Level Line, involving introduction of cranes and machinery, demolition of properties to facilitate the construction of the Long Eaton and Toton viaduct and landform modification. The urban pattern would be directly impacted by the demolition of residential properties and industrial and commercial buildings to facilitate construction of the Long Eaton and Toton viaduct, as well as the presence of the Long Eaton main compound near Trent Junction. This demolition and construction work would remove some of the characteristic terraced housing and alter the pattern of the townscape. Although in an urban context, large vertical structures such as cranes will affect the human-scale of the landscape in the LCA. Construction works would therefore adversely affect a localised part of the LCA. Overall the construction of the Proposed Scheme would result in a noticeable alteration to the key characteristics of the LCA and the addition of new uncharacteristic features to it, which form prominent elements of the character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Long Eaton/Toton Green Corridor	**Medium susceptibility and sensitivity**
Susceptibility to change: The semi-natural nature of the LCA, along with the open space and recreational opportunities and relatively high level of tranquillity within such an urban context are all characteristics within the Long Eaton / Toton Green Corridor which have a medium susceptibility to change arising from the construction of the Proposed Scheme. The LCA would be directly impacted by construction of the Long Eaton and Toton viaduct, the East Midlands Hub station and the Toton trough. The introduction of noise, construction vehicle movement and other construction works would diminish landscape character of the LCA as it would reduce the perceived tranquillity and scenic quality within it. In addition, the presence of the Long Eaton and East Midlands Hub station main compound and the East Midlands Hub station main compound, would introduce considerable adverse change in landscape character through the introduction of uncharacteristic features such as large vehicles, lighting and temporary buildings. Large vertical structures such as cranes and piling rigs would affect the human-scale of the landscape in the LCA. Removal of characteristic vegetation would open up views of the construction works, particularly the works associated with the East Midlands Hub station which would be extensive in scale. The works would also affect the recreational value of the LCA through the closure and diversion of PRoW, as well as the limited access to parts of Toton Fields LNR through the presence of the Long Eaton and East Midlands Hub station main compound and the East Midlands Hub main compound. Construction works would therefore adversely affect a substantial part of the LCA. Overall the construction of the Proposed Scheme would result in noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Sandiacre Industrial Area	**Medium-low susceptibility and sensitivity**
Susceptibility to change: Key characteristics in the LCA include historical and distinctive buildings such as Springfield Mill, and a number of recreational routes. These have a medium-low susceptibility to change arising from the construction of the Proposed Scheme. Parts of the LCA would be directly affected by construction of the B5010 Derby Road overbridge and the Toton embankment, which would introduce uncharacteristic construction elements to the landscape. The landscape would also be directly impacted by the removal of trees and hedgerows to the south of the River Erewash. This would open up views towards construction works including the presence of earthworks and stockpiles, introducing notable alterations to the existing landform, and overall alterations to the existing landscape pattern. The presence of the B5010 Derby Road satellite compound to facilitate the B5010 Derby Road realignment, construction plant and movement of construction vehicles would also introduce considerable adverse change to the landscape character. Construction of the Proposed Scheme would result in a high magnitude of change through the addition of new uncharacteristic features that would substantially alter the character of the landscape and would diminish valued characteristics. Overall the construction of the Proposed Scheme would result in substantial alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which substantially alter the character. There would therefore be an overall high magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Visual assessment

Introduction

11.4.9 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.

11.4.10 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.

11.4.11 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.

11.4.12 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: LA05 Map Book.

Table 29: Construction phase potentially significant visual effects

Views south-west to north-east available to recreational users of Leicestershire Footpath 63 adjacent to Ratcliffe Lock (VP 373-03-004) (Map number LV-03-373)	**Medium-high sensitivity receptors**
Users of Leicestershire Footpath 63 and Ratcliffe Lock / the River Soar would experience near distance views of large scale construction works associated with the Ratcliffe-on-Soar viaduct. The addition of construction activity and the process of removal of riparian vegetation within the middle ground and background of the view would stretch across the panorama and result in noticeable changes to the extent, content, skyline and character of views. Large scale construction vehicles would be visible within the middle ground of the view, as would the emerging structure of the Ratcliffe-on-Soar viaduct which would appear on the skyline. The view would also start to appear less rural in character as a result; although intervening vegetation would provide an element of screening in the foreground and left of the view. The proximity of the viewpoint to construction of the Proposed Scheme would result in a prominent adverse change in the existing view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View east available to recreational users of Ratcliffe-on-Soar Footpath 7 adjacent to Redhill Marina (VP 373-03-007) (Map number LV-03-373)	**Medium-high sensitivity receptors**
Users of Ratcliffe-on-Soar Footpath 7 and Redhill Marina would be affected by changes across the entire panorama as a result of the construction of the Proposed Scheme. Construction activity would occupy the near and middle distance and would introduce uncharacteristic elements such as large scale construction machinery/ cranes and vehicles, noise and movement, piling activity, temporary protective fencing and a construction traffic route. The introduction of these elements to the semi-rural view would alter its content, skyline and character as the Ratcliffe-on-Soar viaduct is constructed. The perceived openness of the view would be lost, particularly through the addition of construction vehicles and the emerging structure of the Ratcliffe-on-Soar viaduct to the skyline. Overall, the recreational users would experience a substantial alteration to the key characteristics of the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View east available to recreational users of Leicestershire Footpath 84 at the junction with Leicestershire Bridleway 60 (VP 374-03-001) (Map number LV-03-374)	**Medium-high sensitivity receptors**
Construction activity would be visible as a long distance view across much of the background of the panorama. Recreational users of Leicestershire Footpath 84 and Leicestershire Bridleway 60 would see construction activity which would alter its content and character. Additions to the view would include movement of large scale construction machinery/ cranes and vehicles, construction of the Ratcliffe-on-Soar viaduct, the Long Eaton and Toton viaduct and the Redhill tunnel. The changes would adversely affect the skyline where construction of the Long Eaton and Toton viaduct crosses the River Trent valley to the left of the view, and elsewhere would add uncharacteristic elements. In addition, removal of characteristic vegetation on Redhill to facilitate the Redhill tunnel would further alter the skyline of the view whilst also removing part of a key element within the view. Construction activity would alter some of the key characteristics of the view as experienced by recreational users of Leicestershire Footpath 84 and Leicestershire Bridleway 60. Construction of the	Level of effect: Moderate adverse (significant)

Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	
View east available to recreational users of Leicestershire Footpath 63 adjacent to the southern bank of the River Trent and western bank of the River Soar (VP 374-03-002) (Map number LV-03-374)	**Medium-high sensitivity receptors**
Much of the background of the panorama would be occupied by the construction of the Proposed Scheme affecting users of Leicestershire Footpath 63, as well as users of the River Trent and River Soar. The construction activity would affect the skyline through the introduction of large scale machinery, including cranes, vehicles and the Long Eaton and Toton viaduct as it is constructed. In addition, the content and character of the view will be altered from semi-rural river floodplain to a view containing construction and perceived industrial elements. The construction activity would also affect the perceived scale, openness and horizontal emphasis of the view through the introduction of large vertical elements. For recreational users the construction activity would form a noticeable uncharacteristic change and within the view. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View east available to recreational users of the Trent Valley Way (Long Eaton Footpath 12) adjacent to the northern bank of the Cranfleet Canal (VP 374-03-005) (Map number LV-03-374)	**High sensitivity receptors**
Recreational users of the Trent Valley Way (Long Eaton Footpath 12) and the Cranfleet Canal would experience changes within the full extent of the panorama in the near distance. Construction activity would include the presence of large scale construction machinery/ cranes and vehicles, piling activity, temporary protective fencing, the Long Eaton satellite compound No. 1, and the Long Eaton and Toton viaduct as it is constructed. These elements would reduce the openness of the view, as well as adding construction and industrial elements which would change the character of the existing rural panorama. The addition of construction activity would constitute a notable change to the character of the view, and the addition of elements to the skyline would add vertical elements in a view where there are very few at present. As a result of the construction of the Proposed Scheme, recreational users of the Trent Valley Way (Long Eaton Footpath 12 and Long Eaton Footpath 7) and the Cranfleet Canal would experience the addition of new infrastructure construction activity and machinery prominently in the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View south-west available to residents of Newbery Avenue (VP 375-02-003) (Map number LV-03-375)	**Medium-high sensitivity receptors**
Residents on Newbery Avenue and adjacent Junction Road would experience views of large scale construction works relating to the Long Eaton and Toton viaduct above the rooftops of the residential properties on Newbery Avenue. The residential properties in the foreground would screen the majority of the construction works and demolition activity, except for a section in the middle distance centre of the view where demolitions of residential properties would open up direct views to the construction activity. The construction works would be visible in the background of the panorama across much of its extent. The built form in the immediate foreground of the view would screen the emerging structure of the Long Eaton and Toton viaduct in places; however, uncharacteristic elements such as large scale construction machinery/ cranes and vehicles, as well as the emerging structure of the Long Eaton and Toton viaduct would be visible, particularly in the centre of the view. The addition of vertical elements such as cranes and piling rigs would add uncharacteristic elements to the skyline. Overall, the addition of construction activity would change the content and character of the panorama by construction activity detracting from the current quiet suburban character of the view. Construction activity would constitute a notable change to the view which is partially filtered by intervening built form. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)

View east available to residents, workers and highway users near the junction of Main Street, Fields Farm Road and Oakleys Road (VP 375-02-005) (Map number LV-03-375)	**Medium sensitivity receptors**
From this location, residents of Fields Farm Road, workers in buildings adjacent to the viewpoint and pedestrian and vehicular users of Main Street, Fields Farm Road and Oakleys Road would experience views of construction activity across the majority of the middle distance of the panorama. However, this activity would be somewhat screened from view by intervening built form and vegetation. The primary changes to the view would therefore occur within the skyline, once the construction activity is visible above the elements of intervening built form and vegetation. The construction activity would introduce uncharacteristic elements to the skyline of the view as well as removal of trees. The character of the view would be altered through the addition of construction elements. As a result of the construction of the Proposed Scheme, residents of Fields Farm Road and pedestrian and vehicular users of Main Street, Fields Farm Road and Oakleys Road would experience a notable change which would be only partially obstructed by intervening built form. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View west available to residents on New Tythe Street, near the junction with Main Road (VP 375-02-006) (Map number LV-03-375)	**Medium-high sensitivity receptors**
Demolition and construction activity would span the full extent of the panorama and would be fully visible in the near distance to the residents in the houses opposite, as well as pedestrians along New Tythe Street. The removal of properties and vegetation would be followed by the introduction of protective fencing, construction machinery/ cranes and vehicles, and noise and movement into the view. The demolition and construction activity would change the character and context of the view through providing openness which was absent prior to the construction, as well as introducing new and intrusive vertical elements to the skyline and the view as a whole. Demolition would cause existing views of houses and mature gardens to be opened up and replaced by views to the existing rail lines and buildings in the middle ground with a loss of perceived enclosure. These changes would be uncharacteristic within the context of the view. Construction activity, including demolitions, would result in total losses of some elements of the view, as well as substantial alterations within the panorama. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view (including the total loss of existing houses and mature gardens), as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View west available to residents on Albion Road, near the junction with Conway Street (VP 375-02-011) (Map number LV-03-375)	**Medium-high sensitivity receptors**
Demolition and construction activity in the middle ground would be visible to the residents in the adjacent houses, as well as pedestrians along Albion Street. Initially, the demolition of properties on Bonsall Street would be visible, although retained properties on Albion Street would help to screen some of these demolitions. This would constitute loss of these elements and add openness to the centre of the view which is not currently present. In addition existing views of houses and mature gardens would be opened up and replaced by views to the existing rail lines and commercial buildings in the centre of Long Eaton with a loss of perceived enclosure. Following the initial demolitions, the introduction of protective fencing, large scale construction machinery/ cranes and vehicles, and noise and movement into the middle ground would further change the character and context of the view through the addition of uncharacteristic features and elements. As the construction progresses, elements of the Long Eaton and Toton viaduct would start to be apparent above the rooftops, altering the skyline. Demolitions and construction activity would constitute a substantial change to the view (partially filtered by intervening built form) for residents and pedestrians on Albion Street. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View west available to residents near the junction of Albion Road and Bonsall Street (VP 375-02-015) (Map number LV-03-375)	**Medium-high sensitivity receptors**
The view of residents and pedestrians on Albion Road and Bonsall Street and to a lesser extent, those on Conway Street would be affected by both demolition and construction activity across the panorama, as the houses on Bonsall Street would be removed to facilitate construction of the Long Eaton and Toton viaduct and would open up views. The existing views of houses and mature gardens would be opened up and replaced by views to the existing rail lines and commercial buildings in the centre of Long Eaton with	Level of effect: Major adverse (significant)

a loss of perceived enclosure. Following the demolitions, construction activity would introduce new uncharacteristic elements to the view such as protective fencing, large scale construction machinery/ cranes and vehicles and the emerging structure of the Long Eaton and Toton viaduct. Changes would be extensive and would involve changes to the context, character and skylines of the view as uncharacteristic construction elements are added. For residents and pedestrians on Albion Road and Bonsall Street and to a lesser extent, those on Conway Street, demolitions and subsequent construction activity would constitute a total loss of houses and mature gardens and substantial alteration within the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view (including the total loss of existing houses and mature gardens), as well as the addition of new features which would be continuously visible across the view.	
View east available to highway users and workers on Waverley Street at the junction with A6005 Nottingham Road (VP 375-04-012) (Map number LV-03-375)	**Medium-low sensitivity receptors**
Pedestrians and vehicular users along the A6005 Nottingham Road and Waverley Street would experience changes in the middle distance of the view as a result of the construction activity. These changes would cover the extent of the panorama. Some of the construction activity would be screened by intervening vegetation in the foreground of the view, but as the Long Eaton and Toton viaduct is constructed, it would become visible above the vegetation. The introduction of large scale construction machinery/ cranes and vehicles, the emerging structure of the Long Eaton and Toton viaduct itself would constitute a change in the character, perceived scale and horizontal emphasis of the view through the addition of uncharacteristic construction activity, and large and vertical elements. The emerging viaduct structure and construction vehicles/ machinery would affect the skyline by adding vertical elements which are not characteristic of the baseline view. For pedestrians and vehicular users along the A6005 Nottingham Road and Waverley Street, construction of the Proposed Scheme would add new uncharacteristic features across the majority of the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a moderate adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Moderate adverse (significant)
View west available to residents, highway users and workers on A6005 Nottingham Road, near the junction with Conway Street (VP 375-02-014) (Map number LV-03-375)	**Medium sensitivity receptors**
Residents, workers and pedestrian and vehicular users of the A6005 Nottingham Road and Conway Street would experience views of construction activity across the majority of the middle distance of the panorama. This activity would be partially screened from view by the intervening built form in the left hand side of the near distance. Demolitions of industrial buildings would be apparent in the middle ground and background of the view and would open up views to the existing rail lines and commercial buildings on Waverley Street. The construction activity for the Long Eaton and Toton viaduct would include large scale construction machinery, cranes and vehicles, protective fencing and traffic management. The changes would affect the context and character of the view through the introduction of uncharacteristic construction activity, as well as a reduction in perceived enclosure. The skyline would be altered by the introduction of vertical elements such as cranes, as well as the removal of the industrial buildings. Demolition and construction activity would result in a substantial alteration to the view, with the addition of new and uncharacteristic features across the panorama. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View east available to recreational users of the Nutbrook Trail adjacent to the junction with Long Eaton Footpath 4 and Midland Street (VP 376-03-001) (Map number LV-03-376)	**Medium sensitivity receptors**
Recreational users of the Nutbrook Trail and Long Eaton Footpath 4 and, to a lesser extent, residents on Howard Close, Olive Avenue and Worrall Avenue would experience changes within the middle distance of the view as a result of construction activity. This activity would include the removal of existing mature vegetation which would alter the appearance of the skyline, as would the addition of large scale vertical elements such as construction machinery, cranes and vehicles and the emerging structure of the Long Eaton and Toton viaduct. Construction elements would appear across much of the panorama, behind the vegetation in the foreground, which would partially filter views for residents and footpath users. Recreational users of the Nutbrook Trail and Long Eaton Footpath 4, and to a lesser extent, residents on adjacent Howard Close, Olive Avenue and Worrall Avenue would experience the addition of new uncharacteristic features across the majority of the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration	Level of effect: Major adverse (significant)

to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	
View east available to recreational users of Long Eaton Footpath 3 (part of the Nutbrook Trail) parallel to Royal Avenue (VP 376-03-004) (Map number LV-03-376)	**Medium sensitivity receptors**
Construction activity would be visible across the majority of the background of the view, as experienced by recreational users of Long Eaton Footpath 3 (part of the Nutbrook Trail), and to a lesser extent, residents on adjacent Royal Avenue. Views would include the addition large scale construction machinery, cranes and vehicles, as well as the emerging structures of the Long Eaton and Toton viaduct and the East Midlands Hub station as they are constructed – these elements would be uncharacteristic within the context of the view and would result in changes to the character. Intervening vegetation would filter the view, particularly in the near distance, but the construction activity would still be visible on the skyline, adding large vertical elements such as cranes. As a result of the construction of the Proposed Scheme, a noticeable change would occur in the view which would be visible across much of the panorama. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View west available to recreational users of Beeston Footpath 116 within Toton Fields LNR (VP 376-03-006) (Map number LV-03-376)	**Medium-high sensitivity receptors**
Construction activity would be seen in the far distance of the view as the Long Eaton and Toton viaduct and the East Midlands Hub station are constructed. This activity would encompass much of the panorama and would affect recreational users of Beeston Footpath 116, as well as users of Toton Fields LNR. Views of construction activity would be filtered by intervening vegetation in the near distance. The emerging structures of the Long Eaton and Toton viaduct and East Midlands Hub station, as well as associated large scale construction machinery, cranes and vehicles would be visible on the skyline and would add vertical elements within the view. The character and context of the panorama would change as elements are added to the skyline. For recreational users of Beeston Footpath 116 and Toton Fields LNR, construction activity would form a noticeable, uncharacteristic change in the existing view. Construction of the Proposed Scheme would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View south-west available to recreational users from a vantage point on Beeston Bridleway 127 close to Beeston Footpath 17 (VP 376-03-011) (Map number LV-03-376)	**Medium-high sensitivity receptors**
Recreational users of Beeston Bridleway 127, adjacent to the northern edge of Toton Fields LNR, and Beeston Footpath 17 would experience elevated panoramic views across Toton Yard. Changes as a result of construction activity would occupy the entire middle distance of the view, as well as a smaller proportion of the near distance. Removal of the existing vegetation would be apparent within the foreground, as would the installation of protective fencing, the emerging structures of East Midlands Hub station, its associated car park, Toton embankment and Long Eaton and Toton viaduct, and the presence of large construction machinery, cranes and vehicles. This construction activity would change the context and character of the view from regeneration woodland and sidings to a construction site. Effects on the skyline would be limited. As a result of construction activity, recreational users of Beeston Bridleway 127 would be affected by changes in the view due to vegetation clearance and subsequent construction activity constituting a total loss and substantial alteration within the view. Construction of the Proposed Scheme would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View south available to workers on Bessell Lane to the north of the A52 Brian Clough Way (VP 377-06-001) (Map number LV-03-377)	**Low sensitivity receptors**
Both demolition and construction activity would be visible as a part of the overall construction process. Buildings in the foreground of the view would be demolished, opening up new views for the workers on Bessell Lane and, to a lesser extent, residents on Kelvin Close. In addition, the buildings in the centre of the middle ground of the view would be demolished, and the vegetation in the centre of the view associated with the A52 Brian Clough Way overbridge would be removed. This demolition and vegetation removal activity would open up existing views of industrial buildings and vegetation and reduce the sense of enclosure, as well as allowing views towards the middle ground and background of the panorama. Construction activity would introduce several new elements to the view such as protective fencing,	Level of effect: Moderate adverse (significant)

construction machinery, cranes and vehicles, and the emerging structure of the realigned A52 Brian Clough Way overbridge. The changes would alter the context and character of the view by removing much of the existing industrial context and replacing it with construction elements. Changes would occur across the panorama in the near and middle distance, including changes to the skyline where vertical elements such as cranes and the emerging structure of the A52 Brian Clough Way overbridge are introduced. Construction would result in loss of built form within the panorama and would also add new uncharacteristic features across the majority of the view. Demolition and construction activity would form a marked deterioration within the view for workers on Bessell Lane and, to a lesser extent, residents on Kelvin Close. Construction of the Proposed Scheme would result in a high magnitude of visual change and a moderate adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	

Other mitigation measures

11.4.13 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

11.4.14 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, and users of PRoW and roads within the study area.

11.4.15 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to one LCA;
- moderate adverse effects in relation to four LCAs;
- major adverse visual effects at two residential viewpoints;
- moderate adverse visual effects at four residential viewpoints;
- major adverse visual effects at five recreational viewpoints;
- moderate adverse visual effects at six recreational viewpoints;
- moderate adverse visual effects at one highway viewpoint; and
- moderate adverse visual effects at one employment viewpoint.

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 (2063) 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 currently being considered, but which are not yet part of the design and will be informed by engagement with relevant stakeholders, include:

- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), for example woodland planting to compensate for the partial loss of woodland at March Covert and Toton Fields LNR, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss such as various locations within the River Soar valley 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; and
- design of structures to integrate as far as possible with existing skyline features and making use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

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 the Ratcliffe-on-Soar viaduct; Ratcliffe-on-Soar cutting; Long Eaton and Toton viaduct; East Midlands Hub station and associated highway infrastructure earthworks; Toton embankment; Toton trough; 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

Soar Valley Farmlands	**Medium-low susceptibility and sensitivity**
Susceptibility to change: The level of tranquillity and the positive scenic quality afforded by the presence of the River Trent and River Soar offset industrial influences within this LCA and impart a medium to low susceptibility to change arising from the Proposed Scheme. **Year 1:** The Ratcliffe-on-Soar viaduct at up to 14m in height through the River Soar Valley would form a prominent addition to the flat floodplain landscape. 'In particular, the design of the overbridge as the Ratcliffe-on-Soar viaduct crosses the A453 Remembrance Way would appear a prominent addition within the rural floodplain landscape and would detract from its rural character. The linear feature of the Ratcliffe-on-Soar viaduct would also cut across the landscape pattern, and the pattern of the landscape altered as characteristic hedgerows would be lost. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Level of effect: Moderate adverse (significant)
Year 15: Mitigation planting would be maturing, however the Ratcliffe-on-Soar viaduct, and in particular the crossing of the A453 Remembrance Way, would remain prominent in the landscape. As the woodland/hedgerow planting matures, the former weakly defined landscape pattern would be strengthened by new woodland and hedgerows and the planting would soften the appearance of the Ratcliffe-on-Soar viaduct adjacent to it. Whilst the maturing planting would reduce the magnitude of the effect, it will not reduce enough to give the effect a low magnitude of change. Operation of the Proposed Scheme in Year 15 would continue to result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Moderate adverse (significant)
River Trent Recreational Area	**Medium susceptibility and sensitivity**
Susceptibility to change: The River Trent, the Erewash Canal and the Cranfleet Canal provide a number of positive characteristics which are susceptible to change. These include: recreational value, tranquillity away from the existing rail lines in the LCA, and positive scenic qualities; together they have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The introduction of the Long Eaton and Toton viaduct into the floodplain of the River Trent would result in the addition of a large uncharacteristic structure within a substantial area of the flat landscape. The Long Eaton and Toton viaduct would add height and reduce the sense of human scale within the landscape, as well as further eroding the historic landscape pattern and reducing perceived tranquillity and scenic value. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of change and major adverse effect due to the substantial alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which substantially alter the character.	Level of effect: Major adverse (significant)
Year 15: The landscape mitigation hedgerow and woodland habitat creation planting within the LCA would be maturing and reinstating the former landscape character as well as softening the Long Eaton and Toton viaduct. However, the Long Eaton and Toton viaduct would still form a prominent feature within the LCA and continue to adversely affect its character. Operation of the Proposed Scheme in Year 15 would continue to result in a high magnitude of change and major adverse effect due to the substantial alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which substantially alter the character.	Major adverse (significant)

Long Eaton Commercial Heart	**Medium susceptibility and sensitivity**
Susceptibility to change: There are a number of characteristic features within the LCA such as the sense of historical continuity associated with the industrial heritage adjacent to the Erewash Canal, distinctive buildings and the pattern of the townscape which have potential to be affected by the Proposed Scheme. Overall, the susceptibility of the landscape to change as a result of the Proposed Scheme is medium. **Year 1:** Due to the height of the Long Eaton and Toton viaduct as it crosses this LCA (between 15m and 19m in height in this area with noise fence barriers up to 4m in height), the addition of the viaduct would be an uncharacteristic element within the LCA and would change the scale of built form, sense of place and scenic qualities, particularly within the west of the area. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Level of effect: Moderate adverse (significant)
Year 15: In Year 15, the landscape mitigation would mature and soften the effect of the addition of the Long Eaton and Toton viaduct to the LCA. However, the viaduct would remain uncharacteristic and landscape mitigation would not fully mitigate these effects. Operation of the Proposed Scheme in Year 15 would continue to result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Moderate adverse (significant)
Long Eaton / Toton Green Corridor	**Medium susceptibility and sensitivity**
Susceptibility to change: The semi-natural nature of the LCA, along with the open space and recreational opportunities and relatively high level of tranquillity within such an urban context are all characteristics within the Long Eaton / Toton Green Corridor which have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The introduction of the Long Eaton and Toton viaduct, the East Midlands Hub station and the Toton trough would form an uncharacteristic addition to the north-west of the LCA. The scale of the Long Eaton and Toton viaduct, the East Midlands Hub station and the Toton trough would increase the perceived scale of built infrastructure in the area. The removal of PRoW (Beeston Bridleway 125, Beeston Bridleway 126, Beeston Bridleway 127 and Beeston Bridleway 128) would detract from some of the recreational value within the LCA and the East Midlands Hub station, as well as its associated traffic and passing trains would locally reduce tranquillity. The landscape mitigation adjacent to the Proposed Scheme would help to integrate it into the LCA. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Level of effect: Moderate adverse (significant)
Year 15: The Long Eaton and Toton viaduct, the East Midlands Hub station and the Toton trough would be of a scale such that mitigation – whilst further softening and integrating the effects of this infrastructure into the LCA – would not fully integrate these features into the landscape. Operation of the Proposed Scheme in Year 15 would continue to result in a medium magnitude of change and moderate adverse effect due to the noticeable alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which form prominent elements of the character.	Moderate adverse (significant)
Sandiacre Industrial Area	**Medium-low susceptibility and sensitivity**
Susceptibility to change: Key characteristics in the LCA include historical and distinctive buildings such as Springfield Mill, and a number of recreational routes. These have a medium-low susceptibility to change arising from the construction of the Proposed Scheme. **Year 1:** This LCA would be directly affected by the Proposed Scheme, including Toton trough and its retaining walls and the Toton embankment, which would pass through an existing industrial area alongside the Erewash Valley Line. The Toton trough and the associated loss of vegetation would change the pattern of the landscape and, alongside the existing Erewash Valley Line, would create an additional barrier to movement in an east-west direction. The impacts would be intensified by the presence of related infrastructure works, such as the realigned B5010 Derby Road, large retaining walls and balancing	Level of effect: Moderate adverse (significant)

ponds. Landscape mitigation woodland planting to the west of residential properties at Oakfield Road would have no beneficial effects in year 1, as planting would not be mature enough to provide screening. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of change and moderate adverse effect due to the substantial alteration to the key characteristics of the LCA and addition of new uncharacteristic features to it, which substantially alter the character.	
Year 15: Due to the maturing vegetation present in the LCA, effects would reduce to non-significant by year 15.	Non-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. Any general night-time effects on visual receptors arising from additional lighting are also identified.

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: LA05 Map Book.

Table 31: Operation phase significant visual effects

Views south-west to north-east available to recreational users of Leicestershire Footpath 63 adjacent to Ratcliffe Lock (VP 373-03-004) (Map number LV-03-373)	**Medium-high sensitivity**
Year 1 – winter and summer: At year 1, users of Leicestershire Footpath 63 and Ratcliffe Lock/the River Soar would experience large scale changes to near distance views during operation of the Proposed Scheme. Recreational users would experience views of the Ratcliffe-on-Soar viaduct (which would be up to 14m in height above ground level at this point), and of overhead line equipment. There would be substantial changes to the view as a result of the addition of the viaduct as an uncharacteristic element within the skyline throughout the panorama. The view of pastoral farmland in the middle ground would be affected by loss of hedgerows and mature trees which would in turn provide a greater sense of openness, as well as longer views across the farmland. Much of the view would contain the Ratcliffe-on-Soar viaduct, the overhead line equipment and passing trains. Landscape mitigation hedgerow planting would not provide any screening or landscape integration at this stage. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer Maturing landscape mitigation would soften the view of the Ratcliffe-on-Soar viaduct and provide limited screening of the viaduct. Operation of the Proposed Scheme in Year 15 would reduce to a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)

View east available to recreational users of Ratcliffe-on-Soar Footpath 7 adjacent to Redhill Marina (VP 373-03-007) (Map number LV-03-373)	**Medium-high sensitivity**
Year 1 – winter and summer: Recreational users of Ratcliffe-on-Soar Footpath 7 and Redhill Marina would experience changes across the entire panorama at year 1 as a result of operation of the Proposed Scheme. The Ratcliffe-on-Soar viaduct would be prominent across the extent of the view, at a height of approximately 14m, and would be uncharacteristic and add vertical elements on the skyline. In addition, overhead line equipment and moving trains would be visible on the viaduct, which would further compound the effect, as well as adding more uncharacteristic elements to the skyline. Mitigation hedgerow planting would not provide screening or landscape integration at this stage. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer The Ratcliffe-on-Soar viaduct would remain visible and prominent to recreational users of Ratcliffe-on-Soar Footpath 7 and Redhill Marina in summer year 15 across the entire panorama. Hedgerow planting would be visible in the foreground of the view and would soften the presence of the viaduct. Operation of the Proposed Scheme in Year 15 would continue to result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View east available to recreational users of the Trent Valley Way (Long Eaton Footpath 12) adjacent to the northern bank of the Cranfleet Canal (VP 374-03-005) (Map number LV-03-374)	**High sensitivity**
Year 1 – winter and summer Ratcliffe-on-Soar viaduct would be prominent across the extent of the panorama as viewed by recreational users of the Trent Valley Way (Long Eaton Footpath 12) and the Cranfleet Canal. It would sit on the skyline at a height of approximately 14m and would form a vertical element which would be uncharacteristic of the view. The presence of the viaduct, along with the associated overhead line equipment and moving trains would change the character of the view from a quiet, rural and recreational view to one with prominent transport infrastructure and reduced tranquillity. Landscape mitigation hedgerow planting would not provide screening or landscape integration at this stage due to the height of the viaduct. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer Whilst hedgerow planting would be visible in a small proportion of the view, it would not be of sufficient height or extent to screen views of the Ratcliffe-on-Soar viaduct from recreational users of the Trent Valley Way (Long Eaton Footpath 12) and the Cranfleet Canal. The landscape at this location is very open and further tree and hedgerow planting would also be uncharacteristic. Operation of the Proposed Scheme in Year 15 would therefore continue result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which would be continuously visible across the view.	Level of effect: Major adverse (significant)
View south-west available to residents of Newbery Avenue (VP 375-02-003) (Map number LV-03-375)	**Medium-high sensitivity**
Year 1 – winter and summer: At year 1, residents on Newbery Avenue and adjacent Junction Road in this location would have direct views of the Long Eaton and Toton viaduct, up to 20m in height above ground level, noise fence barriers and overhead line equipment, as well as movement from passing trains. The presence of these elements would be uncharacteristic in this suburban and residential context and would alter the character of the view as transport infrastructure becomes a notable element. The changes to the view would occur in the middle ground, with the Long Eaton and Toton viaduct and associated infrastructure visible on the skyline throughout the majority of the panorama adding vertical elements to it. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level **of effect:** Moderate adverse (significant)

Year 15 – summer By summer year 15, Long Eaton and Toton viaduct and its associated infrastructure would remain prominent in the view due to its position on the skyline, proximity to the viewer and extent across the panorama. Operation of the Proposed Scheme in Year 15 would continue to result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View east available to residents, workers and highway users near the junction of Main Street, Fields Farm Road and Oakleys Road (VP 375-02-005) (Map number LV-03-375)	**Medium sensitivity**
Year 1 – winter and summer: Residents of Fields Farm Road, workers at adjacent commercial buildings and pedestrian and vehicular users of Main Street, Fields Farm Road and Oakleys Road would obtain views of the Long Eaton and Toton viaduct in the middle ground of the panorama, as well as associated infrastructure such as noise fence barriers, overhead line equipment and passing trains. At a height of between 15m to 19m in this area (with noise fence barriers up to 4m in height) it would be visible on the skyline, adding vertical elements and height to the view. The presence of the viaduct would also change the content and character of the view through the increased presence of transport infrastructure. The new public open space and tree planting at the base of the viaduct would not aid screening at this stage but would start to aid landscape integration. These groups of people would experience substantial change in views, albeit partially filtered by intervening built form and vegetation within the panorama. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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 west available to residents on New Tythe Street, near the junction with Main Road (VP 375-02-006) (Map number LV-03-375)	**Medium-high sensitivity**
Year 1 – winter and summer: In year 1, views of the Long Eaton and Toton viaduct would be prominent to residents and pedestrians along New Tythe Street across the width of the panorama. The Long Eaton and Toton viaduct would between 15m to 19m in height in this area (with noise fence barriers up to 4m in height). The view would change within the entire foreground, with the Long Eaton and Toton viaduct visible on the skyline, and the mitigation (including tree planting) at the base of the viaduct. The viaduct would affect the skyline by introducing a large and uncharacteristic to the view which would appear above the head of the observer. To either side of the view, infrastructure associated with the Long Eaton and Toton viaduct (such as noise fence barriers and overhead line equipment) and passing trains would be visible, but views to these would be restricted in the centre of the view due to the angle of view. The content and character of the view would undergo a notable change as a result of the Proposed Scheme, with transport infrastructure becoming a prominent element of this residential view; the landscape mitigation in the form of the new public open space (including tree planting) at the base of the Long Eaton and Toton viaduct would not aid screening at this stage. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which are continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer The public open space and tree planting beneath the Long Eaton and Toton viaduct would provide a green space and maturing vegetation within the view which would be beneficial within the wider panorama, softening the viaduct and providing integration. The viaduct would still be prominent within the near distance of the view. Operation of the Proposed Scheme in Year 15 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate beneficial (significant)

View west available to residents on Albion Road, near the junction with Conway Street (VP 375-02-011) (Map number LV-03-375)	**Medium-high sensitivity**
Year 1 – winter and summer: The Long Eaton and Toton viaduct would be visible to residents as well as pedestrians along Albion Street in the background of the view, in parts above the rooftops of the properties. In addition, the associated infrastructure of the noise fence barriers, overhead line equipment and passing trains would add mass to the Long Eaton and Toton viaduct and increase its visibility, altering the skyline through the addition of vertical elements. The public open space (including tree planting) at the base of the Long Eaton and Toton viaduct would be visible in the centre of the view but would not aid screening at this stage. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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 west available to residents near the junction of Albion Road and Bonsall Street (VP 375-02-015) (Map number LV-03-375)	**Medium-high sensitivity**
Year 1 – winter and summer: In year 1, views of the Long Eaton and Toton viaduct would be prominent to residents on Albion Road and to a lesser extent, those on Conway Street across the width of the panorama –at this location, the Long Eaton and Toton viaduct would between 15m to 19m in height (with noise fence barriers up to 4m in height). The entirety of the foreground of the view would change with the introduction of the Long Eaton and Toton viaduct to the skyline, and the mitigation (including tree planting) below. Views of the infrastructure associated with the viaduct (such as noise fence barriers and overhead line equipment) and passing trains would be available at the sides of the panorama but restricted in the centre due to the angle of view. Notable changes would occur to the content and character of the view as a result of the Proposed Scheme, with vertical elements associated with the viaduct changing the skyline, and transport infrastructure becoming a prominent characteristic of the view. The new public open space at the base of the Long Eaton and Toton viaduct would not aid screening at this stage due to the overall height of the viaduct. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which are continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer The public open space and tree planting beneath the Long Eaton and Toton viaduct would provide a green space and maturing vegetation within the view which would be beneficial within the wider panorama, softening the viaduct and providing integration. The viaduct would still be prominent within the near distance of the view. Operation of the Proposed Scheme in Year 15 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate beneficial (significant)
View east available to highway users and workers on Waverley Street at the junction with A6005 Nottingham Road (VP 375-04-012) (Map number LV-03-375)	**Medium-low sensitivity**
Year 1 – winter and summer: Pedestrians and vehicular users along the A6005 Nottingham Road and Waverley Street would experience views towards the Long Eaton and Toton viaduct (which would be between 15m to 19m in height in this area) in the middle distance of the panorama. In addition, the infrastructure associated with the viaduct such as noise fence barriers (up to 4m in height), overhead line equipment would also be visible, adding to the height and massing of the viaduct in this location and adding vertical elements to the skyline. The Long Eaton and Toton viaduct and associated infrastructure would be visible across the extent of the panorama in the skyline and would change the content and character of the view through the addition of prominent rail infrastructure. For pedestrians and vehicular users along the A6005 Nottingham Road and Waverley Street, operation of the Proposed Scheme would add new uncharacteristic features into the view, although these would be partially screened by intervening vegetation.	Level of effect: Moderate adverse (significant)

Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	
Year 15 – summer The relative height of the Long Eaton and Toton viaduct between 15m to 19m in height in this area (with noise fence barriers up to 4m in height) and interaction with the A6005 Nottingham Road means that landscape mitigation would not be feasible in this location. Operation of the Proposed Scheme in Year 15 would continue to result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate adverse (significant)
View west available to residents, highway users and workers on A6005 Nottingham Road, near the junction with Conway Street (VP 375-02-014) (Map number LV-03-375)	**Medium sensitivity**
Year 1 – winter and summer: During year 1, residents of the A6005 Nottingham Road and pedestrian and vehicular users of the A6005 Nottingham Road and Conway Street would experience skyline views of the Long Eaton and Toton viaduct across the majority of the middle ground of the panorama. The viaduct would affect the skyline through the addition of uncharacteristic vertical elements, and the presence of the viaduct would also add prominent rail infrastructure, altering its character. This would be screened locally by the retained residential properties to the south of A6005 Nottingham Road. Above the Long Eaton and Toton viaduct would be additional infrastructure – namely noise fence barriers and overhead line equipment. These would add massing to the viaduct structure and increase its perceived height. Overall, the content and character of the view would be altered by the addition of the Long Eaton and Toton viaduct to the majority of the middle ground. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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: Moderate adverse (significant)
View east available to recreational users of the Nutbrook Trail adjacent to the junction with Long Eaton Footpath 4 and Midland Street (VP 376-03-001) (Map number LV-03-376)	**Medium sensitivity**
Year 1 – winter and summer: Changes would occur in the near distance across the majority of the middle ground of the view and would be visible to recreational users of the Nutbrook Trail and Long Eaton Footpath 4, and to a lesser extent, residents on adjacent Howard Close, Olive Avenue and Worrall Avenue. The Long Eaton and Toton viaduct (up to 15m in height in this area, with noise fence barriers up to 4m in height) would be visible on the skyline across the panorama, and above the viaduct, adding height and massing to the viaduct structure, its associated infrastructure (noise fence barriers and overhead line equipment) and passing trains would be seen. To the north of the viewpoint, the structure of the East Midlands Hub station is likely to be visible. Overall, the addition to the view of the Long Eaton and Toton viaduct and, to a lesser extent, the East Midlands Hub station would change the content and character of the view, particularly the skyline. The addition of vertical elements would alter the character of the skyline, and the intensification of rail infrastructure within the view would change its character. Proposed landscape mitigation in the form of public open space (including tree planting) would not perform a screening role. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which are continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer The public open space and tree planting adjacent to the Long Eaton and Toton viaduct would provide a green space and maturing vegetation within the view which would be beneficial within the wider panorama, softening the viaduct and providing integration. The viaduct would still be prominent within the middle distance of the view. Operation of the Proposed Scheme in Year 15 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Major Moderate beneficial (significant)

View north-west available to recreational users of and residents adjacent to Norfolk Road Recreation Ground, near the entrance from Doncaster Grove (VP 376-03-03) (Map number LV-03-376)	**Medium-high sensitivity**
Year 1 – winter and summer: During year 1, the Long Eaton and Toton viaduct (up to 15m in height in this area with noise fence barriers up to 4m in height) would be visible across much of the middle and far distance of the panorama, with the East Midlands Hub station visible towards the background of the view. These elements would be in the skyline and introduce uncharacteristic vertical elements which would affect recreational users of Norfolk Road Recreation Ground, as well as adjacent residents on Doncaster Grove and Norfolk Road. In addition, the affected recreational users and adjacent residents would experience views of infrastructure such as noise fence barriers, passing trains and overhead line equipment on top of the viaduct structure, all of which would increase the perceived height. The base of the Long Eaton and Toton viaduct would be partially screened by existing retained vegetation and woodland planting adjacent to the viaduct but would not screen the viaduct itself due to its height. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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 east available to recreational users of Long Eaton Footpath 3 (part of the Nutbrook Trail) parallel to Royal Avenue (VP 376-03-004) (Map number LV-03-376)	**Medium sensitivity**
Year 1 – winter and summer: Recreational users of Long Eaton Footpath 3, forming a section of the Nutbrook Trail, and to a lesser extent, residents on adjacent Royal Avenue would be subject to views across the skyline in the background of the panorama of the Long Eaton and Toton viaduct, as well as the East Midlands Hub station. The viaduct and its associated infrastructure (overhead line equipment and noise fence barriers) and passing trains would appear above the existing trees, as would the roof of the East Midlands Hub station, and would form prominent vertical elements within the skyline. Intervening landscape mitigation would but would not further screen the viaduct or station due to their relative height. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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 west available to recreational users of Beeston Footpath 116 within Toton Fields LNR (VP 376-03-006) (Map number LV-03-376)	**Medium-high sensitivity**
Year 1 – winter and summer: The Long Eaton and Toton viaduct and the roof of the East Midlands Hub station would be visible to recreational users of Beeston Footpath 116 on the skyline, as well as wider users of Toton Fields LNR. These elements would be notable additions to the skyline above the trees. The viaduct and station would occupy the majority of the panorama within the background; infrastructure associated with the viaduct (such as noise fence barriers and overhead line equipment) and passing trains would also be visible, and would add perceived massing and height to the viaduct as a whole. The bases of both the viaduct and the station would be partly filtered by a combination of the existing retained vegetation and woodland planting between those elements and the viewer. The vegetation would not fully screen either element due to their relative heights. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate adverse effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	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 south-west available to recreational users from a vantage point on Beeston Bridleway 127 close to Beeston Footpath 17 (VP 376-03-011) (Map number LV-03-376)	**Medium-high sensitivity**
Year 1 – winter and summer: During year 1, recreational users of Beeston Bridleway 127 adjacent to the northern edge of Toton Fields LNR and Beeston Footpath 17 would experience views directly towards the East Midlands Hub station, its associated car park and the Toton embankment, as well as the Long Eaton and Toton viaduct to a more limited extent. The car park associated with the East Midlands Hub station would be prominent in the middle ground of the view, comprising large hard-surfaced areas with landscape planting. The East Midlands Hub station would form a large built mass in the middle ground of the view, partially obstructing the existing long views towards Long Eaton. In addition to the Toton embankment and Long Eaton and Toton viaduct, infrastructure associated with these elements (such as noise fence barriers and overhead line equipment) and passing trains would be visible. Changes would take place across the entire panorama and the content and (to a lesser extent) character of the view would be altered through the addition of large built form and areas of hard standing. Operation of the Proposed Scheme in Year 1 would result in a high magnitude of visual change and a major adverse effect through the substantial alteration to key characteristics within the view, as well as the addition of new features which are continuously visible across the view.	Level of effect: Major adverse (significant)
Year 15 – summer The woodland habitat creation planting and tree planting within the public realm would soften the views and integrate the majority of the Proposed Scheme into the middle ground. Operation of the Proposed Scheme in Year 15 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate beneficial (significant)
View south available to workers on Bessell Lane to the north of the A52 Brian Clough Way (VP 377-06-001) (Map number LV-03-377)	**Low sensitivity**
Year 1 – winter and summer: Workers on Bessell Lane and, to a lesser extent, residents on Kelvin Close would experience views from this location of the access from the A52 Brian Clough Way to the East Midlands Hub station, as well as an open area to the side of the view where demolitions would have occurred as part of the construction process. This open area would result in more open views across the top of the Toton trough towards industrial properties and structures on Osmaston Street and a perceived reduction in enclosure. Overhead line equipment would also appear in the view as it extends past the top of the Toton trough. In the background, the realigned A52 Brian Clough Way would be visible. Landscape mitigation planting on the slopes of the embankment of the realigned A52 Brian Clough Way would not be mature, and therefore views to traffic on the A52 Brian Clough Way would also be possible. Overall, the content of the view would be altered across much of its panorama. Operation of the Proposed Scheme in Year 1 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate beneficial (significant)
Year 15 – summer In year 15, the landscape mitigation planting associated with the realigned A52 Brian Clough Way would be semi-mature and would screen the traffic on the road. Operation of the Proposed Scheme in Year 15 would result in a medium magnitude of visual change and a moderate beneficial effect through the noticeable alteration to key characteristics within the view, as well as the addition of changes which would be viewed as a series of components within the view.	Level of effect: Moderate beneficial (significant)

Other mitigation measures

11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors would be 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 public realm would be considered as part of the ongoing development of the 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:

- major adverse effects in relation to one LCA;
- moderate adverse effects in relation to three LCAs;
- moderate adverse visual effects at one residential viewpoint location;
- moderate beneficial visual effects at two residential viewpoint locations;
- major adverse visual effects at two recreational viewpoint locations;
- moderate adverse visual effects at three recreational viewpoint locations; and
- moderate adverse visual effects at one employment viewpoint location.

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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Erewash Borough Council (EBC) 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: LA05 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 Scope and Methodology Report (SMR)[149].

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

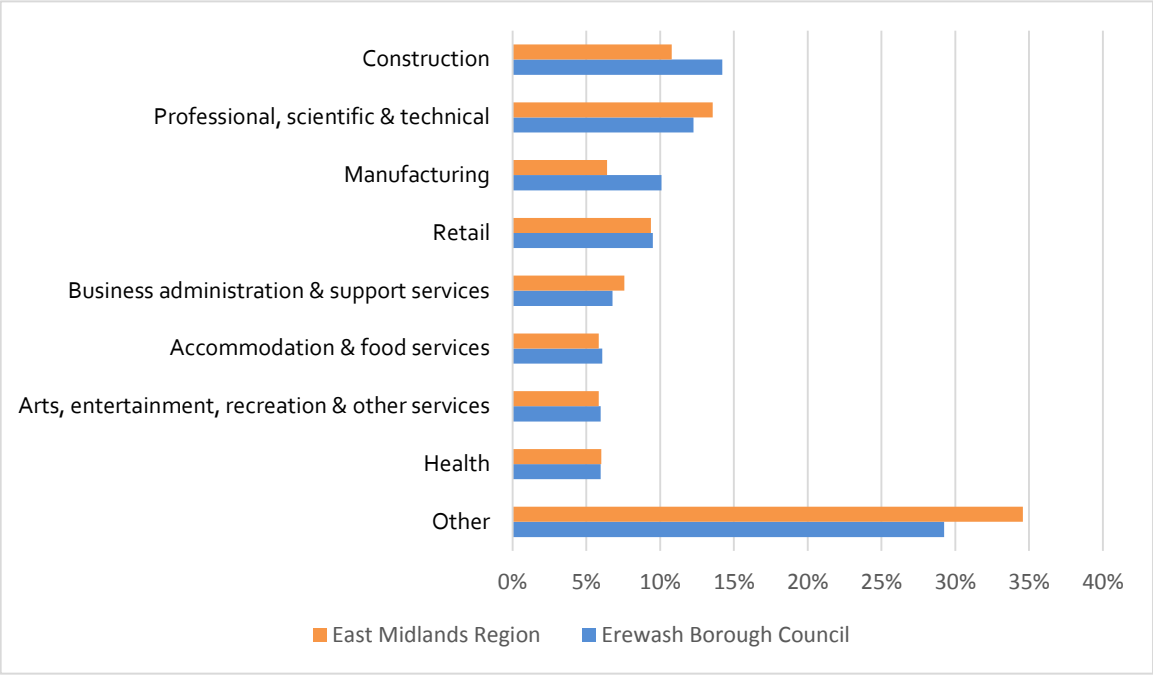
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Ratcliffe-on-Soar to Long Eaton area. The Ratcliffe-on-Soar to Long Eaton area lies within the administrative areas of EBC, North West Leicestershire District Council (NWLDC); Rushcliffe Borough Council (RBC) and Broxtowe Borough Council (BBC). However as it lies predominantly within the EBC administrative area the baseline will only be reported for EBC. The northern section of the Ratcliffe-on-Soar to Long Eaton area falls within the D2N2 Local Enterprise Partnership (LEP) area[150] and the East Midlands region.

[149] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[150] D2N2 Local Enterprise Partnership, (2014), *Strategic Economic Plan March 2014*.

Business and labour market

12.3.2 Within the EBC area, there is a wide spread of business types that reflects a diverse range of commercial activities. The construction sector accounts for the largest proportion of businesses (14%), with professional, scientific and technical the second largest (12%), followed by manufacturing (10%). This is shown in Figure 8. In comparison with the East Midlands region, the largest sectors were professional, scientific and technical (14%), followed by construction (11%) and retail (9%)[151].

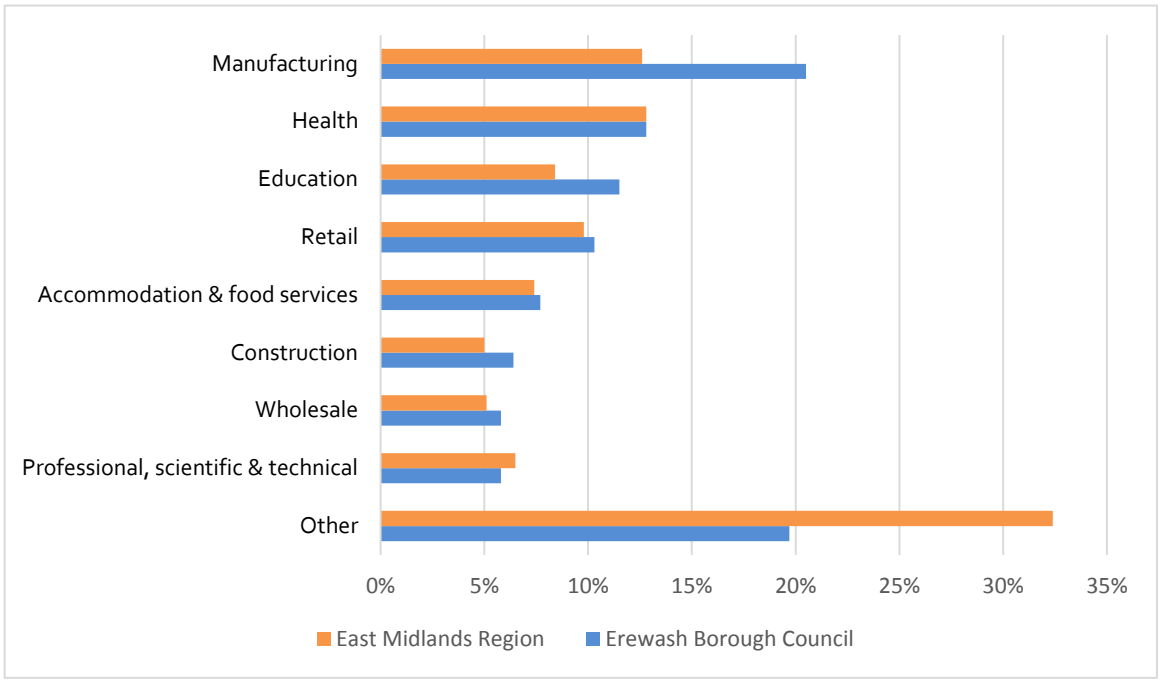
Figure 8: Business sector composition in the EBC area and the East Midlands [152]



12.3.3 In 2016[153], approximately 39,000 people worked in the EBC 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 EBC area were: manufacturing (21%), health (13%), education (12%), retail (10%), and accommodation and food services (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[154].

[151] Office for National Statistics; UK Business count – Local Units 2016; Available online at: https://www.nomisweb.co.uk
[152] "Other" includes: Wholesale; Information and Communication; Motor Trades; Transport and Storage; Property; Education; Agriculture, Forestry and Fishing; Financial and Insurance; Public Administration and Defence; and Mining, Quarrying and Utilities.
[153] 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 EBC who work within its boundaries.
[154] 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 EBC who work within its boundaries.

Figure 9: Employment by industrial sector in the EBC area and the East Midlands



12.3.4 According to the Annual Population Survey (2016)[155], the employment rate[156] within the EBC area was 87% (61,800 people), which is higher than that recorded for both the East Midlands (75%) and England (74%). In 2016, unemployment[157] in the EBC area was 3%, which was lower than that recorded both for the East Midlands (4.3%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[158], 28% of EBC 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 4% of residents had no qualifications, which was lower than that recorded both for East Midlands (7.5%) and England (8%).

Property

12.3.6 A review of employment land in 2015 identified a need for up to 0.2ha per year to 2033 for industrial land and up to 1,044m² per year to 2033 in office floor space in the EBC area[159].

[155] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[156] The proportion of working age (16-64 year olds) residents that is in employment.
[157] 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.
[158] Annual Population Survey, (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[159] NLP, (2015), *Nottingham Core HMA and Nottingham Outer HMA Employment Land Forecasting Study*. Figures based on total gross land requirements over the plan period 2011 to 2033. Up to 4.38ha of industrial employment land and up to 22,959m² of office floorspace required from 2011 to 2033.

12.3.7 The average vacancy rate for industrial and warehousing property in the EBC area has been assessed as 2.9% based on marketed space against known stock[160].

12.3.8 Based upon the latest available data from the Estates Gazette (March 2018) there is 1,912m² of office space available in the EBC area[161].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[162] 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

[160] 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).
[161] Based on marketed space identified from Estates Gazette data (EGi) (March 2018). Available at: https://www.egi.co.uk/Property/Availability/
[162] Supporting document: Draft Code of Construction Practice

- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 It is currently anticipated that there would be five main civil engineering compounds within the Ratcliffe-on-Soar to Long Eaton area. These would manage five civil engineering satellite compounds in the Ratcliffe-on-Soar to Long Eaton area, all of which would continue to be used as railway installation satellite compounds following the completion of civil engineering works at those compounds. These sites would result in the creation of up to 7,582 person years of construction employment opportunities[163], broadly equivalent to 758 full time jobs[164], 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 Proposed Scheme 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, 53 resources in the study area would experience direct impacts as a result of the Proposed Scheme. These are as follows:

- units on Meadow Brook Business Park (three resources);
- 32 New Thythe Street (one resource);
- Smiths Yard (two resources);
- Kingdom Hall of Jehovah's Witnesses (one resource);
- nine resources on Station Road, Long Eaton;

[163] 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.
[164] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

- Granville Works (one resource);
- Steed Building, Bonsall Street (one resource);
- Phoenix Mills (one resource);
- Mayfield Kennels (one resource);
- Greenwood Community Centre (one resource);
- Stapleford Sewage Treatment Works, Stapleford Boarding Kennels, Phoenix House, Bessell Lane Scrapyard and Serge Motors Scrapyard (five resources);
- Units 1-3 Palmer Drive (three resources);
- Maple Leaf Works, Kennelpak, Autoreel Ltd and Champion Hire, Sandiacre (four resources);
- Units 1 and3 Bessell Court (two resources);
- two resources on Bessell Lane;
- three resources on Bessell Lane;
- Megavaux scrapyard (one resource);
- four resources on Derby Road;
- Units 1, 7 and 8, and Units 2 and 6, Meadow Brook Business Park (one resource);
- The New Media Centre, Long Eaton (one resource);
- TecQuipment Buildings, Bonsall Street (one resource);
- Balfour Beatty rail yard, Toton Local Distribution Centre (one resource);
- UPS Customer Centre, Stapleford (one resource);
- Two resources on Station Road, Sandiacre; and
- One resource on Osmaston Street, Sandiacre.

12.4.8 Five 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.

12.4.9 Table 32 sets out the businesses which could potentially experience significant direct effects.

Table 32: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Units 1, 7 and 8, and Units 2 and 6, Meadow Brook Business Park, Meadow Lane, Long Eaton, Nottingham, NG10 2GD	Manufacture of mattresses

Resource	Description of business activity
The New Media Centre, 36-42 New Tythe Street, Long Eaton, Nottingham, NG10 2DL	Multiple businesses - telemarketing, accountancy, production equipment, building surveyors, upholsterers, computer equipment, electrician, commercial, software development
TecQuipment buildings, Bonsall Street, Long Eaton, NG10 2AN	Specialised design activities, management consultancy activities
Balfour Beatty rail yard, Toton Local Distribution Centre, Old Station Yard, Rear of Derby Road, Sandiacre, Nottingham, NG10 5AL	Railway maintenance
UPS Customer Centre, Palmer Drive, Stapleford, Nottingham, NG9 7BW	Courier and messenger services

Impact magnitude

12.4.10 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

12.4.11 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

12.4.12 Taking account of the sensitivity of the resource 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
Units 1, 7 and 8, and Units 2 and 6, Meadow Brook Business Park, Meadow Lane, Long Eaton, Nottingham, NG10 2GD	High	Low	Moderate adverse
The New Media Centre, 36-42 New Tythe Street, Long Eaton, Nottingham, NG10 2DL	High	Low	Moderate adverse
TecQuipment buildings, Bonsall Street, Long Eaton, NG10 2AN	High	Medium	Major adverse
Balfour Beatty rail yard, Toton Local Distribution Centre, Old Station Yard, Rear of Derby Road, Sandiacre, Nottingham, NG10 5AL	Medium	High	Major adverse
UPS Customer Centre, Palmer Drive, Stapleford, Nottingham, NG9 7BW	High	Low	Moderate adverse

12.4.13 The construction of the Proposed Scheme would require the demolition of some businesses along the route of the Proposed Scheme. An overview of the significant resources affected has been included below.

12.4.14 Meadow Brook Business Park results in a major adverse impact for one furniture company based across two groups of units (1, 7 and 8, and Units 2 and 6). The large number of employees creates a high impact magnitude. Overall this would result in a moderate adverse impact for the resource.

12.4.15 The New Media Centre features multiple businesses located at the resource. There is low sensitivity with the resource being a standard office block. The moderate adverse impact would arise from the number of employees affected and high impact magnitude.

12.4.16 The TecQuipment buildings would experience a major adverse impact from the construction of the Proposed Scheme. There is a high impact magnitude from the large number of employees at the resource. The combination of office, factory and distribution elements of the resource gives the resource a medium sensitivity. This would result in a significant moderate adverse impact.

12.4.17 The Balfour Beatty rail yard would be major adversely affected by construction of the Proposed Scheme. This is a highly specialised resource used for railway maintenance. It is based across multiple buildings and requires direct access to the rail network, resulting in high sensitivity. This resource is separate from the DB Schenker sidings which would be unaffected by the land required for the construction of the Proposed Scheme.

12.4.18 The UPS Customer Centre is a parcel distribution resource located within the land required for the construction of the Proposed Scheme. The supporting infrastructure for the East Midlands Hub station would impact this resource. The road connecting the eastbound carriage of the A52 Brian Clough Way to the station would pass through this resource, along with a balancing pond. The high number of employees would lead to a moderate adverse impact on the resource.

12.4.19 Across all of the employment areas reviewed, it is currently anticipated that an estimated 1,004 jobs[165] would either be displaced or possibly lost within the Ratcliffe-on-Soar to Long Eaton 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 EBC authority area

[165] 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.

(approximately 62,000 jobs) and the scale of economic activity and opportunity in the area.

Other mitigation measures

12.4.20 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.

12.4.21 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

12.4.22 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.

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 Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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[166]; and
- 'non-residential receptors'[167] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[168]; 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[169], planning policy, planning practice guidance on noise (PPGN)[170] and EIA Regulations as described in the Scope and Methodology Report[171] (SMR).

13.1.3 Engagement has been undertaken with North West Leicestershire District Council (NWLDC); Rushcliffe Borough Council (RBC); Erewash Borough Council (EBC); and Broxtowe Borough Council (BBC) 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 Ratcliffe-on-Soar to Long Eaton 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

[166] '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.
[167] 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.
[169] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[170] Planning Practice Guidance – Noise, (2014) Department for Communities and Local Government (DCLG). Available online at: https://www.gov.uk/guidance/noise--2
[171] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

(Map series SV-01), can be found in the Volume 2: LA05 Map Book. Map series SV-01 also presents key 'non-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 southern section of the Ratcliffe-on-Soar to Long Eaton area is predominantly rural, interspersed with woodland, farms, small villages, marina facilities associated with the River Soar, the River Trent and the industrial activities associated with Ratcliffe-on-Soar Power Station. The northern section of the areas is more urban from the point where the route of the Proposed Scheme enters the town of Long Eaton, comprising residential, commercial, light industrial and recreational uses. The sound environment varies across the area from rural to urban areas. The sound environment in the rural part of is generally dominated by distant road traffic and sound from

railways and overflying aircraft associated with East Midlands Airport. In the urban part of the area the sound environment is generally dominated by local and distant road traffic plus local neighbourhood sources with some areas also affected by sound from railways and overflying aircraft associated with East Midlands Airport.

13.3.3 Several main roads and railways contribute to the sound environment within the Ratcliffe-on-Soar to Long Eaton area, including the M1 to the west, the A453 Remembrance Way, A52 Brian Clough Way, Midland Main Line and Erewash Valley Line. In the more urban areas and away from major roads, local sources of sound such as local road traffic and rail lines are more dominant.

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[172], Roads[173] or Railways[174]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA05 Map Book) shows any noise Important Areas in the Ratcliffe-on-Soar to Long Eaton 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)[175]. 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 Ratcliffe-on-Soar to Long Eaton area.

13.4.3 The Long Eaton and Toton viaduct would require construction works in proximity to Long Eaton and Toton, including construction of the piling platform and pile caps, and

[172] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[173] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[174] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[175] Supporting document: Draft Code of Construction Practice

installation of beams and concreting. These would require 24hr working for reasons of safety, engineering practicability or to reduce the impact on existing transport.

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.

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[176];
- 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; and
- 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.

[176] Including local businesses and quiet areas designated by the local authority.

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. 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: LA05 Map Book):

- Long Eaton, arising from construction activities such as viaduct construction, underbridge construction works, and station construction works;
- Toton, arising from construction activities such as viaduct construction, overbridge and underbridge construction works, and station construction works; and
- Stapleford, arising from construction activities such as viaduct construction, overbridge construction works and station construction works.

13.4.9 Map Series SV-01 (Volume 2: LA05 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, Long Eaton Baptist Church and Trinity Methodist Church are 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:

- Fields Farm Road, Main Street, Meadow Lane and Trent Lane;
- Bostock's Lane, the B6002 Wilsthorpe Road/ Petersham Road/ Longmoor Road; and
- the B5010 Derby Road on the boundary with the Stapleford to Nuthall area.

13.4.12 The magnitude and extent of effect will depend on the level of construction traffic using the road. 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 Ratcliffe-on-Soar to Long Eaton 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 10 trains per hour south of East Midlands Hub Station and 11 trains per hour to the north in each direction. From the south, a small number of trains would divide into two separate trains for their continued journey northwards, with the reverse occurring in the southbound direction. 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. The trains will operate at speeds of up to around 280kph throughout this area however the majority of trains which are calling at the station will be slower on the approaches to the station. 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[177].

13.5.6 The Proposed Scheme would incorporate noise 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: LA05 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. 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.

13.5.8 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[178] 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[179] or the maximum noise level criteria[180] 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.

13.5.9 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, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

13.5.10 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

13.5.11 Map Series SV-01 (Volume 2: LA05 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) 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

[177] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014.
[178] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[179] Night time Noise Guidelines for Europe (2010) World Health Organization
[180] Dependent on the number of train passes.

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.

13.5.12 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.

13.5.13 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.14 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.15 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

13.5.16 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: LA05 Map Book) and Map Series CT-06 (Volume 2: LA05 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.

13.5.17 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:

- Long Eaton: occupants of residential properties in the vicinity of Newbery Avenue and Owen Avenue, located closest to the Proposed Scheme, identified by LA05-C01 on Map SV-01-366 (Volume 2: LA05 Map Book);
- Long Eaton: occupants of residential properties in the vicinity of Main Street, Station Street and Nottingham Road, located closest to the Proposed Scheme, identified by LA05-C02 on Map SV-01-366 (Volume 2: LA05 Map Book);
- Long Eaton: occupants of residential properties in the vicinity of Willow Avenue, Hemlock Avenue and Royal Avenue, located closest to the Proposed Scheme, identified by LA05-C03 on Map SV-01-367a (Volume 2: LA05 Map Book);

- Toton: occupants of residential properties in the vicinity of Lonsdale Drive and Banks Road, located closest to the Proposed Scheme, identified by LA05-C04 on Map SV-01-367a (Volume 2: LA05 Map Book); and
- Stapleford: occupants of residential properties in the vicinity of Bessell Lane, Kelvin Close and Midland Avenue, located closest to the Proposed Scheme, identified by LA05-C05/LA06-C01 on Map SV-01-367a (Volume 2: LA05 Map Book).

13.5.18 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 in the vicinity of Bessel Road, Stapleford. These properties are identified on Map SV-01-367a (Volume 2: LA05 Map Book).

13.5.19 Map Series SV-01 (Volume 2: LA05 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. 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.

13.5.20 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.21 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

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

13.5.23 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.

13.5.24 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 Ratcliffe-on-Soar to Long Eaton area.

14.1.2 Engagement with Highways England, Nottinghamshire County Council (NCC), Nottingham City Council (NoCC), Derbyshire County Council (DCC), Derby City Council (DCiC), Leicestershire County Council (LeCC) 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, LA05 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)[181].

14.2.2 The study area for traffic and transport includes Ratcliffe-on-Soar, Long Eaton and Toton.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. Strategic roads include: the M1 between junctions 24 and 25; the A453 Remembrance Way and the A52 Brian Clough Way.

14.2.4 Local roads include: the A6005 Nottingham Road/Derby Road; the B5010 Derby Road; the B6002 Wilsthorpe Road/Petersham Road/Longmoor Road; the B6003 High Road/Stapleford Lane/Toton Lane); Fields Farm Road; Meadow Lane; Main Street; Main Street; Cross Street; Waverley Street; Midland Street; Station Road; Station Street; New Tythe Street; Ratcliffe Lane; Trent Lane; Trent Cottages; Trent Street; Beech Avenue; Mayfield Grove; Bessell Lane; Bonsall Street; and Bostock's Lane.

14.2.5 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.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

[181] 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, DCC and LeCC (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, DCC and LeCC. Assessment of the 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 strategic routes that pass through the area are: the M1 between junctions 24 and 25; the A453 Remembrance Way between M1 junction 24 and Wilford; and the A52 Brian Clough Way between M1 junction 25 and the Bramcote roundabout. The strategic road network in and around Long Eaton and Toton 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 A6005 Nottingham Road; the B5010 Derby Road; the B6002 Wilsthorpe Road/Petersham Road/Longmoor Road; Bostock's Lane; Fields Farm Road; Meadow Lane; Main Street; Station Road; Station Street; New Tythe Street; Ratcliffe Lane; Trent Lane; Trent Cottages; Trent Street; Beech Avenue; Mayfield Grove and Bonsall Street. 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[182]. Data for the three year period (January 2014 – 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.

14.3.7 Twelve accident clusters were identified within the Ratcliffe-on-Soar to Long Eaton area:

[182] Department for Transport; Crashmap.co.uk. Available online at: www.crashmap.co.uk CrashMap provides accident data for the UK.

- the M1 junction 24 (18 accidents, including two with serious casualties);
- the M1 junction 24a (13 accidents, including one with serious casualties and one with fatalities);
- the M1 between junctions 24a and 25 (12 accidents including one with serious casualties);
- the M1 junction 25 (20 accidents including two with serious casualties);
- the A52 Brian Clough Way between the M1 junction 25 and Bardills roundabout (11 accidents but none with serious casualties or fatalities);
- the A52 Brian Clough Way at Bardills roundabout (16 accidents including one with serious casualties);
- the A52 Brian Clough Way between Bardills roundabout and Bramcote roundabout (11 accidents including one with serious casualties);
- the A52 Brian Clough Way at Bramcote roundabout (20 accidents including three with serious casualties);
- the A6005 Nottingham Road between the A6005 Nottingham Road /B6002 Longmoor Lane junction and A6005 Nottingham Road/ Marketplace roundabout (23 accidents including six with serious casualties);
- the A6005 Nottingham Road between the A6005 Nottingham Road/ Waverley Street junction and the A6005 Nottingham Road/Station Road junction (10 accidents including one with serious casualties and one with fatalities);
- the B5010 Derby Road between the B5010 Derby Road/ Brookhill Street junction and the B6003 Stapleford Lane/ B5010 Derby Road junction (nine accidents including three with serious casualties); and
- Attenborough Lane between the A6005 Nottingham Road/ Attenborough Lane junction and A52 Brian Clough Way at Bramcote roundabout (18 accidents including three with serious casualties).

14.3.8 The route of the Proposed Scheme would cross four roads with footways within the Ratcliffe-on-Soar to Long Eaton area. These are: the A6005 Nottingham Road; the B5010 Derby Road; Main Street; and Station Road/Station Street.

Parking and loading

14.3.9 Approximately 750 car parking spaces are currently provided at East Midlands Parkway station located in two parking areas accessed from the station access road connecting to the A453 Remembrance Way. A further 125 spaces are currently provided at Long Eaton station car park located off the B6002 Wilsthorpe Road, and 1,400 spaces are currently provided at the Toton Lane Nottingham Express Transit (NET) Park-and-Ride site off the B6003 Toton Lane. These car parks also provide disabled parking spaces and taxi drop-off/pick-up bays within the station forecourt areas.

14.3.10 Additionally, public car parking is available in council operated car parks in Long Eaton, providing a total of 473 existing spaces in eight locations within the town centre. There is designated on-street parking in Long Eaton town centre, including a number of disabled spaces. On-street parking in Long Eaton is largely uncontrolled.

Public transport network

14.3.11 Eighteen bus routes operate on five roads that are crossed by the route of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area. There are also bus stops primarily located to serve the main built-up area. The bus routes that could be affected by the Proposed Scheme include:

- the A453 Remembrance Way: service 865 (Clifton Park-and-Ride – Normanton-on-Soar); Megabus services MP1, MP2X and MP3 (London St. Pancras – Hull); and Railink service (East Midlands Airport – East Midlands Parkway station);
- the A6005 Nottingham Road: Indigo service (Derby – Draycott – Long Eaton – Nottingham); Skylink Nottingham (Nottingham – East Midlands Airport); service 12 (Derby – Long Eaton – Sawley); and service 12A (Derby – Long Eaton – Sawley); service 460 (Borrowash – Wilsthorpe School); and service Y5 (Derby – Nottingham);
- the A52 Brian Clough Way: Red Arrow (Derby – Nottingham);
- the B5010 Derby Road: service i4 (Derby – Sandiacre – Nottingham); services 14 (Ilkeston – Sandiacre); service 15 (Rise Park – Nottingham); service 111 (Ilkeston – Friesland School); and service my15 (Ilkeston – Sandiacre – Long Eaton – Old Sawley); and
- Main Street (Long Eaton): service 29 (Long Eaton – New Sawley – Sandiacre).

14.3.12 National and local rail services are accessible via East Midlands Parkway station and local services are accessible via Long Eaton station. East Midlands Parkway station provides access to national services to London, Cardiff, Lincoln, Liverpool and Manchester. East Midlands Parkway and Long Eaton stations provide access to local services to Derby, Nottingham, Leicester, Loughborough, Attenborough, Beeston and Spondon. There are two NET park-and-ride stops located within the study area at Toton Lane and at Clifton South, adjacent to the A453 Remembrance Way. Toton Lane provides tram services to/from Hucknall via Nottingham city centre. Clifton South provides tram services to/from Phoenix Park via Nottingham city centre.

Non-motorised users

14.3.13 There are pedestrian footways adjacent to many of the roads in the built up areas of Long Eaton and Toton. 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.

14.3.14 The route of the Proposed Scheme would cross the route of 13 PRoW within the Ratcliffe-on-Soar to Long Eaton 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 routes with the greatest usage recorded during the survey day were Station Road footway which was used by 981 pedestrians and 194 cyclists, Beeston Bridleway 125 used by 55 pedestrians and 15 cyclists and Beeston Bridleway 127 used by 77 pedestrians and 11 cyclists.

14.3.15 In the Ratcliffe-on-Soar to Long Eaton area, National Cycle Network (NCN) Route 6 would be crossed by the route of the Proposed Scheme. NCN Route 67 passes through the area along the Erewash Canal.

Waterways and canals

14.3.16 There are four navigable waterways in the Ratcliffe-on-Soar to Long Eaton area. The River Trent is located to the south of Long Eaton, between Sawley and Attenborough. The Cranfleet Canal provides a navigable waterway, by-passing a weir situated on the River Trent, to the south of Long Eaton. The River Soar, situated to the south-west of Long Eaton connects with the River Trent at Trent Junction. The Erewash Canal runs through Long Eaton between Trent Lock on the River Trent and Sandiacre. All four waterways meet at Trent Lock Junction. Redhill Marina is located along the River Soar at Ratcliffe-on-Soar and has capacity for up to 108 boats. The Cranfleet Canal provides mooring for up to 58 boats in the vicinity of Nottingham Yacht Club.

Air transport

14.3.17 East Midlands Airport is located approximately 3.8km to the south-west of the Ratcliffe-on-Soar to Long Eaton area, in the Coleorton to Kegworth area (LA04). The airport is primarily accessed from the strategic road network via the M1 junction 24 and the A453 Ashby Road. However, it is not expected that there will be any effects on air transport in the Ratcliffe-on-Soar to Long Eaton area and 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)[183] 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.

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

[183] Supporting document: Draft Code of Construction Practice

framework travel plan that would require construction workforce travel plans[184] 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[185] 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 Ratcliffe-on-Soar to Long Eaton area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW;
- possessions on the conventional rail network; and
- restrictions on users of the Cranfleet Canal and River Soar due to construction works.

14.4.9 The construction assessment has also considered any impacts in the Ratcliffe-on-Soar to Long Eaton 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.

[184] 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.

[185] Possession is a period of time during which one or more rail lines are blocked to trains to permit work to be carried out on or near the rail lines.

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: LA05 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 24 and junction 25;
- the A52 Brian Clough Way between the M1 and Bramcote Roundabout;
- the A453 Remembrance Way between the M1 junction 25 and the Ratcliffe-on-Soar Power Station;
- the A6065 Derby Road between Midland Street and Petersham Road;
- the B5010 Derby Road on the border with the Stapleford to Nuthall area;
- the B6002 Wilsthorpe Road/ Petersham Road/ Longmoor Road;
- Bostock's Lane;
- Midland Street;
- Fields Farm Road;
- Main Street;
- Meadow Lane; and
- Trent Lane.

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 also result in disruption to highway users. In the Ratcliffe-on-Soar to Long Eaton area temporary diversions are required as part of all permanent diversions.

14.4.14 Permanent changes to highway 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.

Parking and loading

14.4.18 It is currently expected that construction of the Proposed Scheme could have impacts on parking and loading. Some roads that could be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

14.4.19 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 12, 12A, 14, 15, 29, 111, 460, 865, i4, Indigo; MP1, MP2X, MP3, my15, Railink, Red Arrow, Skylink and Y5. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the Midland Main Line (MML) and the Erewash Valley Line running through Long Eaton and Toton Yard. The majority of the rail possessions would have little or no impact on the operation of rail services as they would be relatively minor localised works, such as work on and adjacent to track when not in use. Rail possessions would be required to undertake localised works, including construction of the Proposed Scheme crossing over the MML. Rail realignments to facilitate the East Midlands Hub station could cause disruption to passenger services passing through the area and freight services operating from Toton Yard. However, 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

14.4.21 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.

14.4.22 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:

- Leicestershire Footpath 61 where it passes under the route of the Proposed Scheme to the west of Ratcliffe Lock;
- Leicestershire Bridleway 101 where it passes under the route of the Proposed Scheme to the west of Ratcliffe Cut;
- Ratcliffe-on-Soar Footpath 7 where together with access to Redhill Farm it passes under the route of the Proposed Scheme;

- Long Eaton Footpath 12 running along Cranfleet Canal as it passes under the route of the Proposed Scheme;
- Long Eaton Footpath 6 where it crosses the route of the Proposed Scheme on New Tythe Street; and
- Long Eaton Footpath 123 adjacent to the land required for the construction of the Proposed Scheme in Toton.

14.4.23 Permanently diverted PRoW are reported under operation, although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.24 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

14.4.25 It is currently expected that the construction of the Proposed Scheme could have an effect upon users of the waterways and towpaths on the River Trent, Cranfleet Canal and River Soar in the Ratcliffe-on-Soar to Long Eaton area where the proposed route would cross these waterways. The assessment of these will be reported in the formal ES.

Permanent effects

14.4.26 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

14.4.27 The implementation of the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.28 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

14.4.29 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 24 and 25; the A453 Remembrance Way between M1 junction 24 and the Ratcliffe-on-Soar Power Station; the A52 Brian Clough Way between M1 junction 25 and Bramcote roundabout; the A6065 Derby Road; the B5010 Derby Road; the B6002 Wilsthorpe Road/ Petersham Road/ Longmoor Road; Midland Street; Fields Farm Road; Meadow Lane; Main Street; Trent Lane; and Bostock's Lane. 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.

14.4.30 Construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments. These are expected to affect the A52 Brian Clough Way between the M1 junction 25 and the B6003 Toton Lane Bardills roundabout, the B5010 Derby Road and Long Lane.

14.4.31 There could be impacts on on-street parking in Long Eaton.

14.4.32 Bus services 12; 12A; 14; 15; 29; 111; 460; 865; i4; Indigo; MP1; MP2X; MP3; my15; Railink; Skylink; and Y5 would be affected by temporary diversions.

14.4.33 Rail possessions would be required on the MML and the Erewash Valley Line running through Long Eaton and Toton Yard.

14.4.34 It is expected that the following PRoW would be subject to temporary closure or diversion/realignment: Leicestershire Footpath 61, Leicestershire Bridleway 101, Ratcliffe-on-Soar Footpath 7, Long Eaton Footpath 12, Long Eaton Footpath 6 and Long Eaton Footpath 123.

14.4.35 Construction works at the River Soar, River Trent and Cranfleet Canal crossing points may result in temporary closures of the waterways or towpaths.

14.4.36 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:

- East Midlands Hub station would include provision for access by sustainable modes, including walking and cycling to promote non-car access and dedicated facilities for bus, taxi, a drop-off and pick-up area and car parking;
- Changes to the highway and public transport network to accommodate users of the HS2 services;
- 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 station 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 Ratcliffe-on-Soar to Long Eaton area with the construction of the East Midlands Hub station providing for both high speed and conventional rail services. These benefits would include improved journey times between East Midlands Hub station and major cities in the north, the Midlands and to the south of England, increases to rail capacity in the Greater Nottingham and Derby area, and reduced pressure and lower crowding on the conventional rail network.

14.5.5 The operation of the Proposed Scheme could result in impacts within this area due to increased traffic associated with 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 major benefits arising from improved public transport provision together with traffic associated with 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:

- the realignment of Long Lane north of the A453 Remembrance Way;
- the realignment of the A52 Brian Clough Way between the M1 junction 25 and the B6003 Toton Lane Bardills roundabout to accommodate the proposed access to the East Midlands Hub station; and
- the realignment and raising of the B5010 Derby Road to accommodate the route of the Proposed Scheme.

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 Ratcliffe-on-Soar to Long Eaton area. This could result in changes to traffic movements in the Ratcliffe-on-Soar to Long Eaton area and affect, in particular, the M1 junction 25, the A52 Brian Clough Way, the B6003 Toton Lane; and the B5010 Derby Road.

14.5.10 The permanent highway changes are not expected to result in significant changes in travel distances. 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.

Parking and loading

14.5.12 Long-stay and short-stay car parking would be provided for the East Midlands Hub station.

14.5.13 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This would include on street parking in the Long Eaton area. There could also be increased pressure from users of East Midlands Hub station on local parking in the vicinity of the station. Where car parking is lost that serves facilities that are displaced by the Proposed Scheme this is not considered a material effect.

Public transport network

14.5.14 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 and from the introduction of the HS2 services;
- significantly improved journey times between the East Midlands Hub station and the North, Midlands and South of England; and
- released capacity on the existing rail network easing pressure and reducing crowding on other passenger rail services creating significant major beneficial effects to both local commuters and potentially freeing up space for freight.

14.5.15 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 Ratcliffe-on-Soar to Long Eaton area.

Non-motorised users

14.5.16 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Leicestershire Footpath 60 would be extended to run under the route of the Proposed Scheme extending east towards Long Lane;
- Long Eaton Footpath 72 would be diverted to run under the route of the Proposed Scheme behind properties in New Tythe Street;
- Long Eaton Footpath 4 would be realigned to cross-over the Long Eaton Low Level and Long Eaton High Level Lines on an existing footbridge;
- Beeston Bridleway 125 would be permanently closed. Pedestrians would be diverted to Long Eaton Footpath 17 to the east of the route of the Proposed Scheme;
- Beeston Bridleway 126 would be permanently closed. Pedestrians would be diverted to Long Eaton Footpath 17 to the east of the route of the Proposed Scheme;

- Beeston Bridleway 127 would be permanently closed. Pedestrians would be diverted to Long Eaton Footpath 17 to the east of the route of the Proposed Scheme; and
- Beeston Bridleway 128 would be permanently closed. Pedestrians would be diverted to Long Eaton Footpath 17 to the east of the route of the Proposed Scheme.

14.5.17 No PRoW diversions are expected to result in additional travel distance in excess of 500 metres.

14.5.18 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.

14.5.19 It is expected that East Midlands Hub station would generate additional pedestrian movements particularly in the morning and evening peak hour. These pedestrian movements would then be dispersed to access onward travel modes and nearby destinations, increasing use of footways and crossings in the local area. The effect of these changes will be reported in the formal ES.

Waterways and canals

14.5.20 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Ratcliffe-on-Soar to Long Eaton area.

Other mitigation measures

14.5.21 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.

14.5.22 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

14.5.23 The Proposed Scheme would generate significant benefits for rail passengers in the Ratcliffe-on-Soar to Long Eaton area. This would include improved journey times between East Midlands Hub station and major cities in the north, the Midlands and the south of England, increases to rail capacity in the Greater Nottingham and Derby area, and reduced pressure and lower crowding on the existing network.

14.5.24 Operation of the Proposed Scheme would require the permanent diversion or realignment of the A52 Brian Clough Way, the B5010 Derby Road and Long Lane however these are unlikely to result in permanent significant effects.

14.5.25 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 Ratcliffe-on-Soar to Long Eaton area. This could result in changes to traffic and the potential for increased delays particularly at the M1 junction 25, the A52 Brian Clough Way, the

B6003 Toton Lane and the B5010 Derby Road. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in an increase in accident risks.

14.5.26 There is likely to be an impact on parking in the residential areas surrounding East Midlands Hub station.

14.5.27 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including: Leicestershire Footpath 60, Long Eaton Footpath 72, Long Eaton Footpath 4, Beeston Bridleway 125, Beeston Bridleway 126, Beeston Bridleway 127 and Beeston Bridleway 128.

14.5.28 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

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

14.5.30 A station travel plan would detail monitoring of travel associated with operation of the East Midlands Hub station.

14.5.31 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Ratcliffe-on-Soar to Long Eaton 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 Ratcliffe-on-Soar to Long Eaton 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, the Canal & River Trust (CRT), Leicestershire County Council (LeCC), Nottinghamshire County Council (NCC) and Derbyshire County Council (DCC), which are the Lead Local Flood Authorities (LLFA), North West Leicestershire District Council (NWLDC), Rushcliffe Borough Council (RBC), Erewash Borough Council (EBC), Broxtowe Borough Council (BBC); and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. 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: LA05 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)[186].

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)[187].

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

[186] National Planning Policy Framework, DCLG, 2015.
[187] 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 Soar, River Trent and River Erewash (including the Golden 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 it 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, and Soar management catchments of the Humber river basin district (RBD).

15.3.2 The river basin management plan[188] identifies the chemical[189] and ecological[190] status of surface water bodies, and the quantitative[191] and chemical[192] 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

[188] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[189] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[190] 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.

[191] 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.
[192] 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[193]	**Designation**	**Q95 value (m^3/s)**[194]	**Receptor value**	**Parent WFD water body name and identification number**[195]	**Current WFD status / Objective**[196]
Tributary of the Lockington Brook (1) WR-01 356 B5	Ordinary watercourse	<0.002	High	Hemington Brook catchment (tributary of the River Soar) GB104028047410	Bad / Good by 2027
Tributary of the Lockington Brook (2) WR-01-356 B5	Minor ditch	0.006	Low		
Tributary of the River Soar (1) WR-01-356 C6	Minor ditch	<0.002	Low	River Soar from Long Whatton Brook to Trent GB104028047212	Bad / Good by 2027
River Soar WR-01-356 C6	Main river	3	Very high		
Ratcliffe-on-Soar Power Station Drain WR-01-356 D6	Main river	<0.002	High		
Tributary of the River Soar (2) WR-01-356 D6	Minor ditch	0.002	Low		
River Trent WR-01 -356 E6	Main river	26	Very high	River Trent from Soar to The Beck GB104028053110	Moderate / Moderate by 2015
Tributary of the River Trent (1) WR-01 -356 E6	Minor ditch	<0.002	Low		

[193] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA05 Map Book figure (in this case WR-01).
[194] The Q95 value is the flow within the watercourse that is exceeded for 95% of the time.
[195] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[196] Status and objectives are based on those set out in the 2015 River basin management plan.

Cranfleet Canal WR-01 -356 E6	Canal	N/A	Very high	Erewash Canal GB70410071	Moderate/Good by 2027
West Lake WR-01- 356 F6	Static water body	N/A	Moderate	River Trent from Soar to The Beck GB104028053110	Moderate / Moderate by 2015
New Sawley Brook WR-01-356 F6	Main river	0.002	High	River Erewash from Gilt Brook to River Trent GB104028052480	Poor / Moderate by 20215
Golden Brook WR-01-356 G5	Main river	0.02	High		
Tributary of the River Erewash (1) WR-01-356 H4	Ordinary watercourse	<0.002	High		
River Erewash WR-01-356 H4	Main river	0.5	Very high		
Tributary of the River Erewash (2) WR-01-356 I3	Minor ditch	<0.002	Low		

Abstractions and permitted discharges (surface water)

15.3.6 There are four licensed surface water abstractions in the study area. Three of these are located within the land required for the construction and operation of the Proposed Scheme. These are considered high value receptors.

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 surface water 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 39 consented discharges to surface waters within the study area, three 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[197]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status [198]	WFD status objective[199]	Receptor value
Superficial deposits						
Head deposits	Present in the Ratcliffe-on-Soar area; north of junction 24 of the M1, and to the east of the Toton Yard.	Clay, silt, sand and gravel	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Alluvium	Associated with the River Soar to the west of Ratcliffe-on-Soar, the River Trent south of Long Eaton, and the River Erewash in the north and north-west of the study area.	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River terrace deposits (including Holme Pierrepont, Beeston, Eggington Common, Hemington, Syston, and Wanlip Members)	Associated with the Rivers Trent and Soar, from the southern extent of the study area to the south of Toton Yard. Absent at Ratcliffe-on-Soar Power Station.	Sand and gravel, locally with silt clay and organic muds.	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacial till	Present in small areas to the north of Ratcliffe-on-Soar Power Station.	Variable typically comprising sandy silty clay with pebbles.	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Mercia Mudstone Group – Branscombe	Present from the area north of junction 24 of the M1 near	Mudstones and siltstones	Secondary B	Soar Secondary Combined- (GB40402G990600)	Good by 2015	Moderate

[197] 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.
[198] As stated in the 2015 River basin management plan.
[199] As stated in the 2015 River basin management plan.

Geology[197]	**Distribution**	**Formation description**	**Aquifer classification**	**WFD body (ID) and current overall status** [198]	**WFD status objective**[199]	**Receptor value**
Mudstone Formation	to Kegworth and the area south of the River Trent at Long Eaton.			Good		
				Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	Moderate
Mercia Mudstone Group – Arden Sandstone Formation	Outcrops in an east to west trend across the south of the study area to the north of junction 24 of the M1 and to the north of Wood Hill near to Thrumpton.	Mudstones, siltstones and sandstones with localised conglomerates.	Secondary A	Soar Secondary Combined- (GB40402G990600) Good	Good by 2015	Moderate
				Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	Moderate
Mercia Mudstone Group – Sidmouth Mudstone Formation	Present to the west and north of Kegworth and junction 24 of the M1, and from north of the River Trent to north of junction 25 of the M1.	Mudstone and siltstone with thin beds of dolomitic siltstone and sandstone.	Secondary A (sandstone of Cotgrave Member) Secondary B (mudstone and siltstones of Branscombe, Gunthorpe, Edwalton and Radcliffe Members)	Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	Moderate
				Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	Moderate
Mercia Mudstone Group – Tarporley Siltstone Formation	Present in the north of the study area between Toton and Sandiacre.	Sandstones, mudstones and siltstones.	Secondary A (sandstone) Secondary B (mudstone and siltstone)	Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	Moderate
Sherwood Sandstone Group – Chester Formation	Present in the north of the study area in the Sandiacre and Stapleford area.	Conglomerate, sandstone with mudstone.	Principal	Lower Trent Erewash– Secondary Combined – (GB40402G990300) Poor	Good by 2027	High

Superficial deposit aquifers

15.3.11 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 the 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
- other superficial deposits, such as the glacial till and head deposits are both classified as Secondary (undifferentiated) that would be crossed by the route of the Proposed Scheme, may supply baseflow to watercourses or store and yield limited amounts of groundwater. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.12 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:

- where sandstone is present in the Mercia Mudstone Group the Tarporley Siltstone Formation, Arden Sandstone Formation and Cotgrave Sandstone Member of the Sidmouth Mudstone Formation), it is classified by the Environment Agency as a Secondary A aquifer, which 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. These are all therefore assessed as moderate value receptors;
- where mudstone and siltstone predominate in the Mercia Mudstone Group (locally comprising the Sidmouth Mudstone Formation and Tarporley Siltstone Formation), it is classified by the Environment Agency as a Secondary B aquifer, which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are therefore assessed as moderate value receptors; and
- the Sherwood Sandstone Group - Chester Formation is classified as a Principal aquifer by the Environment Agency. It can also provide an important component of baseflow to rivers, and has therefore been assessed as a high value receptor.

WFD status of groundwater bodies

15.3.13 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.

15.3.14 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)

15.3.15 There are no groundwater abstractions licensed for public water supply located in the study area. A source protection zone (SPZ) 3 area is intersected by the Proposed Scheme at Sandiacre in the north of the study area. The closest abstraction associated with this SPZ is for public water supply and is located 10km north-west of the Proposed Scheme.

15.3.16 There are no[200] private groundwater abstraction licences registered in the study area.

15.3.17 Records of private unlicensed groundwater 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 also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.18 There are two consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

Groundwater – surface water interactions

15.3.19 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified two features within the study area that had potential to be springs. Access was not possible to inspect any of these features at this stage. The potential spring features are assumed to be high value receptors on a precautionary basis.

15.3.20 There are 16 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 The following nature conservation sites within the study area are potentially groundwater dependent:

- Lockington Marshes Site of Special Scientific Interest (SSSI) contains groundwater fed marsh and is located approximately 80m west of the land required for the Proposed Scheme on the west bank of the River Soar;
- Attenborough Gravel Pits SSSI and Local Wildlife Site (LWS) is designated for its lowland eutrophic open waters, which are connected to groundwater. The SSSI is located on the River Trent approximately 1km east of the land required for the Proposed Scheme; and
- Forbes Hole Local Nature Reserve (LNR) is located to the south-east of Long Eaton along the edge of the New Sawley Brook, supporting open water habitat

[200] Note that the number of consents listed in Section 10, Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises land within 1km of the centreline of the Proposed Scheme, whereas the Land quality study area comprises all land within 250m from the boundary of the Proposed Scheme. The default study areas may be extended where the potential for wider pathways exists.

which is likely to be groundwater fed.

15.3.22 The following nature conservation sites are potentially dependent on surface water flows, for example periodic flooding from a watercourse:

- Lockington Marshes SSSI is located within the floodplain of the River Soar and River Trent. It supports a diverse complex of wetland habitat (including marshy meadow and pools) connected to surface water flows;
- Attenborough Gravel Pits SSSI and LWS is designated for its lowland eutrophic open waters, wet floodplain woodland, floodplain grassland, and lowland open waters which are all connected to surface water flows;
- Forbes Hole LNR includes an area of willow carr, which may be dependent on surface water flows, as well as open water and wet woodland which are connected to surface water flows;
- Manor Farm LNR is located approximately 180m to the east of the land required for the Proposed Scheme, between the A6005 Nottingham Road and Doncaster Grove in Long Eaton. The LNR is located along the River Erewash and supports habitats including running water with a connection to surface water flows;
- Toton Fields LNR is partially located within the land required for the Proposed Scheme, along the southern edge of Toton. The LNR is located alongside the River Erewash and supports habitats including wetland and wet grassland connected to surface water flows; and
- Toton Sidings Pond LWS is located within the land required for the Proposed Scheme. It is designated for standing open water which 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)[201] 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[202] 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[203]. The BGS Groundwater

[201] Environment Agency, (2018), Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[202] Gov.uk, (2018), *Risks of Flooding from Reservoirs.* Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[203] Gov.uk, (2018), *Risks of Flooding from Reservoirs.* Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

flooding susceptibility data set[204], 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:

- LeCC Local Flood Risk Management Strategy (LFRMS)[205];
- DCC LFRMS[206];
- NCC LFRMS[207];
- NWLDC Strategic Flood Risk Assessment (SFRA)[208];
- Greater Nottingham SFRA Addendum[209];
- DCC SFRA[210];
- LeCC Preliminary Flood Risk Assessment (PFRA)[211];
- DCC PFRA[212]; and
- NCC PFRA[213].

River flooding

15.3.27 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Soar, River Trent, Golden Brook and River Erewash. 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.

Table 36: River flood risk sources and receptors

Source	Location description and figure/coordinate[214]	Receptor potentially affected	Receptor value / sensitivity to flooding
River Soar	Ratcliffe-on-Soar WR-01-356 B6	Agricultural land	Moderate
		Residential property	High
	Ratcliffe-on-Soar WR-01-356 C6	Residential property	High
		Agricultural land	Moderate
	Ratcliffe-on-Soar WR-01-356 C7	Residential property	High
River Trent	Long Eaton	Agricultural land	Moderate

[204] British Geological Survey, (2017), *Susceptibility to Groundwater Flooding*. Available from: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[205] Leicestershire County Council Local Flood Risk Management Strategy (LFRMS) (2015) Leicestershire County Council
[206] Derbyshire County Council Local Flood Risk Management Strategy (LFRMS) (2015) Derbyshire County Council
[207] Nottinghamshire County Council Local Flood Risk Management Strategy (LFRMS) (2016) Nottinghamshire County Council
[208] North West Leicestershire District Council Strategic Flood Risk Assessment (2008) Atkins
[209] Greater Nottingham Strategic Flood Risk Assessment Addendum (SFRA) (2017) AECOM
[210] Derbyshire County Council Strategic Flood Risk Assessment (SFRA) (2012) Derbyshire County Council
[211] Leicestershire County Council Preliminary Flood Risk Assessment (PFRA) (2011) URS Scott Wilson
[212] Derbyshire County Council Preliminary Flood Risk Assessment (PFRA) (2011) Derbyshire County Council
[213] Nottinghamshire County Council Preliminary Flood Risk Assessment (2011) JBA Consulting
[214] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA05 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[214]	Receptor potentially affected	Receptor value / sensitivity to flooding
	WR01-356 E6		
	Long Eaton WR-01-356 F5	Commercial property	Moderate
		Residential property	High
		Primary schools	High
	Long Eaton WR01-356 F6	Agricultural land	Moderate
		Commercial property	Moderate
		Trent rifle range	Low
	Long Eaton WR-01- 356 G4	Fire station	High
		Residential property	High
		Commercial property	Moderate
	Long Eaton WR-01-356 G5	Residential property	High
		Commercial property	Moderate
	Long Eaton WR-01-356 G6	Commercial property	Moderate
River Erewash	Long Eaton WR-01- 356 J2	Residential property	High
		Commercial property	Moderate

Surface water flooding

15.3.28 There are numerous 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[215]	Receptor potentially affected	Receptor value
Surface water flow path that drains the area around Archers Field recreation ground	Stapleford WR-01-356 J3	Sewage treatment works	Low
		Commercial property	Moderate
		Archers Field recreation ground	Low
		Residential property	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, Cranfleet Canal and 17 reservoirs located at varying distances from the Proposed Scheme which have inundation extents within the study area as shown in the Environment Agency's Reservoir Inundation map. The Erewash Canal flows through Long Eaton and joins the River Trent at Trent Lock. The Cranfleet Canal is a short navigational channel that by-passes

[215] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA05 Map Book figure (in this case WR-01).

a short section of the River Trent, immediately downstream of Trent Lock. Neither canal is raised above the adjacent floodplain, therefore the risk of flooding is considered negligible. Of the 17 reservoirs identified from the Environment Agency's Reservoir Inundation map, five are located within 3.5km of the Proposed Scheme (Soar Ash Lagoons, 0.4km; West Park and Harrington Drain FSR, 1.7km; Osbourne's Pond, 2.1km; Breaston FSR, 2.6km; and Church Wilne, 3.4km). The remaining 12 reservoirs are located between seven and 70km from the Proposed Scheme. As these reservoirs are subject to the requirements of reservoir safety legislation[216], the inundation risk posed by them is considered negligible.

Groundwater flooding

15.3.30 Information relating to historical incidents of groundwater flooding in the Ratcliffe-on-Soar to Long Eaton area is provided within the DCC SFRA and NWLDC SFRA. The DCC SFRA does not include any specific history of groundwater flooding in the study area, but does identify some risk of groundwater flooding due to the underlying geological strata. The NWLDC SFRA states that the risk of groundwater flooding is considered to be relatively low, and there is no specific reference to history of groundwater flooding in the study area.

15.3.31 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur along most of the route of the Proposed Scheme in the Ratcliffe-on-Soar to Long Eaton area.

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)[217] includes a range of mitigation measures that aim to reduce construction impacts as far 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.

[216] Department for Environment Food and Rural Affairs and the Environment Agency; Reservoirs: owner and operator requirements. Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements
[217] Supporting document: Draft Code of Construction Practice.

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 will avoid passing along river or stream valleys and their associated floodplains. Instead it would pass over 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.

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: LA05 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 A watercourse realignment is proposed at the tributary of the River Erewash (2) east of the East Midlands Hub station. The aim will be to design this with equivalent hydraulic capacity to the existing channel. 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 aim will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[218].

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

[218] 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.

impacts on the natural hydromorphology of watercourse channels, as far 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;
  - 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 A permanent culvert is proposed on a smaller watercourse crossing within the study area at the tributary to the River Erewash (2) east of the East Midlands Hub station. The detailed design of this culvert 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 siphons have been avoided;
- culvert length has been reduced as far 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 the culvert, and how its 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 as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[219] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- 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 will be refined and method of mitigation will 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 temporary works shown on Map Series CT-05 in the Volume 2: LA05 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 would 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

[219] Impermeable barrier preventing water flow

for climate change based on latest guidance issued by the Environment Agency[220];

- 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;
- 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 as far 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;

[220] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- 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 Toton trough and Redhill tunnel would intersect the Mercia Mudstone Group Sidmouth Formation, and Tarporley Siltstone Formation Secondary B aquifers and the alluvium 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 Excavation and dewatering for the Ratcliffe-on-Soar viaduct and Long Eaton and Toton viaduct pier construction could result in localised and controlled impacts on groundwater flows and levels. Implementation of the draft CoCP measures would ensure that groundwater levels are controlled with minimal lowering of water levels within the aquifer system and therefore, and changes would not be significant.

15.4.23 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.24 There are no abstractions with the potential to be impacted located within the study area.

Groundwater - surface water interactions

15.4.25 The dewatering required for the construction of the Toton trough has the potential to have local moderate impacts on baseflows to the River Erewash, as the river is located 15m from the proposed structure. The River Erewash is a very high value receptor, and the assessment therefore identifies a temporary major adverse effect, which would be significant. If it can be confirmed that the River Erewash in this area is in a concrete-lined channel and not receiving flow from the superficial deposits in the area, then the magnitude of the impact and the effect would be negligible and not significant.

Water dependent habitats

15.4.26 The closest point of construction to the Lockington Marshes SSSI would be 80m to the east of the SSSI. There is potential for temporary minor, localised changes in groundwater levels and surface water flow associated with the construction of the pier footings in the River Soar floodplain. These changes are anticipated to be localised within the vicinity of the piers and are anticipated to result in a negligible impact on groundwater levels or surface water flows at the SSSI.

15.4.27 The Attenborough Gravel Pits SSSI is located 1km from the nearest of point of construction, and localised, temporary changes to groundwater levels and surface water flows as a result of constructing viaduct piers are not anticipated to result in any change within the groundwater or surface water regime at the SSSI.

15.4.28 The closest point of construction to the Forbes Hole LNR would be 20m east of the LNR and on the opposite side of the Long Eaton Low Level Line. The Proposed Scheme may impact the LNR indirectly through temporary dewatering required for construction of viaduct piers within the superficial deposits, this may result in a temporary lowering of shallow groundwater levels, resulting in a minor adverse impact on the on groundwater levels within the LNR.

15.4.29 Manor Farm LNR is located to the south of the Erewash, south of the proposed East Midlands Hub station. Construction of the Proposed Scheme is not anticipated to alter surface water flows or drainage in this location, therefore, there are no hydrological impacts anticipated to the LNR.

15.4.30 Toton Fields LNR is located within the land required for the Proposed Scheme to the south-east of the proposed East Midlands Hub station. Measures within the draft CoCP would ensure that surface water flows to the LNR would not be materially altered and would result in negligible impact on the surface water regime of the LNR.

15.4.31 Toton Sidings Pond LWS is located within the land required for the Proposed Scheme with the potential for changes in surface water drainage supporting the surface water habitat. Temporary drainage measures within the draft CoCP would minimise the impact to the surface water drainage regime to negligible.

15.4.32 Further details of the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Temporary effects - flood risk and land drainage

15.4.33 Construction of the Ratcliffe-on-Soar viaduct, Long Eaton and Toton viaduct, the Toton trough and associated flood mitigation measures would require temporary working within flood zones. Construction sequencing and temporary works design would be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works would be undertaken would be produced by the nominated undertaker in consultation with the Environment Agency. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

15.4.34 Temporary access roads and construction compounds would cross ordinary watercourses and land drainage routes, including the Long Eaton and East Midlands Hub station main compound located across a drain to the east of East Midlands Hub station. Construction sequencing and temporary works design would be carefully considered and assessed in terms of potential impacts on flood risk. 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

15.4.35 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

15.4.36 The Long Eaton and Toton viaduct may require placement of a pier within the River Trent channel. This has the potential to alter the hydromorphological regime through alteration of flow patterns and changes in sediment erosion and deposition. The impact on hydromorphology of the river would be localised and therefore minor, and would result in a moderate adverse effect, which is significant.

15.4.37 The tributary of the River Erewash (2) east of the proposed East Midlands Hub station requires a minor realignment to ensure the culvert has sufficient head-room through the embankment. The realignment and culvert have the potential to alter the hydromorphology of the watercourse through alterations in flow patterns, changes in channel length and gradient and subsequent changes in sediment erosion and deposition. The changes would affect short sections of the watercourse and would not result in a large degree of change in watercourse length or gradient, therefore the resulting impact would be localised and hence minor. This would result in a negligible effect, which is not significant.

15.4.38 An earthworks causeway across West Lake, south of Long Eaton, would result in a change of lake morphology. This would result in a minor impact on the artificial water body, resulting in a minor adverse effect, which is not significant.

Groundwater

Aquifers

15.4.39 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 Toton trough on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impact of the cutting 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 in the following sections.

Abstractions

15.4.40 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.41 The Proposed Scheme would result in the possible permanent loss of a potential spring feature at the Toton trough, east of Long Eaton. Until the nature of this feature has been confirmed by a site survey, it is assumed to be a high value receptor. The assessment therefore identifies the loss as a moderate impact, potentially resulting in a permanent moderate adverse effect, which is significant.

Water dependent habitats

15.4.42 The presence of viaduct piers is unlikely to result in changes in permanent surface water flow regime, or groundwater flow or level changes at Lockington Marshes SSSI or Attenborough Gravel Pitts SSSI.

15.4.43 The closest permanent feature of the Proposed Scheme to the Forbes Hole LNR would be viaduct piers approximately 20m east of the LNR and on the opposite side of the Long Eaton Low Level Line. The presence of the piers would be unlikely to change groundwater flow to the LNR on a permanent basis as the LNR is likely to be located up hydraulic gradient with groundwater flow to the east or south-east towards the River Trent, therefore no permanent impacts are anticipated.

15.4.44 Construction of the Proposed Scheme is not anticipated to permanently alter surface water flows or drainage to Manor Farm LNR or Toton Fields LNR, therefore, there are no permanent hydrological impacts anticipated.

15.4.45 Changes in the surface water drainage regime would result in a negligible impact on surface water levels in the Toton Sidings Pond LWS located within the land required for the Proposed Scheme.

15.4.46 Further details of the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Permanent effects - flood risk and land drainage

15.4.47 Hydraulic modelling of the River Erewash, indicates the potential for an increase in peak flood level and flood extent to commercial receptors in Sandiacre between the A52 Brian Clough Way and the B5010 Derby Road, associated with the M1 realignment, proposed flood defences to protect the Proposed Scheme through the

Toton trough, and the effect of Stanton Gate viaduct piers, located in LA06: Stapleford to Nuthall. The impact is assessed as major, resulting in a moderate adverse effect on the commercial property receptors, which is significant.

15.4.48 Proposed access to East Midlands Hub station would affect a surface water flow path. This has the potential to result in a minor impact on the Stapleford Sewage Treatment Works and a residential property on Bessell Lane. The sewage treatment works is a low value receptor, and the effect is therefore assessed as being negligible. The residential property is a high value receptor, and the impact is therefore assessed as having a moderate adverse effect, which would be significant.

15.4.49 Initial outputs from hydraulic modelling of the River Trent and River Soar indicate that there would not be an increase in the extent of flooding as a result of the Proposed Scheme, but there would be a potential increase in peak flood level in areas already at flood risk. The increase in peak flood level is associated with the placement of the piers for the Ratcliffe-on-Soar viaduct and Long Eaton and Toton viaduct in the River Trent and River Soar floodplains. The increase in peak flood levels would range in impact magnitude from negligible to moderate.

15.4.50 Modelling of the River Trent impacts and mitigation will be undertaken for the formal ES. However, at this stage the impact on the fire station in Long Eaton is considered major adverse which is significant. The impact on residential properties is considered moderate adverse, which is significant. The impact on commercial properties and agricultural land is considered minor adverse, which is not significant.

15.4.51 Modelling of the River Soar impacts and mitigation will be finalised for the formal ES, however, at this stage, the impact on residential properties is considered moderate adverse, which is significant and the impact on agricultural land near Ratcliffe-on-Soar is considered minor adverse, which is not significant.

Other mitigation measures

15.4.52 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

15.4.53 The positioning of piers for the Ratcliffe-on-Soar viaduct and the Long Eaton and Toton viaduct within the River Trent and River Soar floodplains would be carefully managed to maximise the distance between watercourse banks and piers, with the exception of the crossing of the River Trent where it may be necessary to locate a pier within the channel. Where necessary, scour protection mitigation would be developed to manage erosion. Hydromorphological mitigation would be considered up and downstream of the pier locations to enable erosion patterns to re-stabilise as a result of any scour protection.

15.4.54 The design of any piers required within the River Trent channel for the Long Eaton and Toton viaduct would be developed further in consultation with the Environment Agency, including proposals to facilitate habitat creation and minimise adverse

hydromorphological change. Monitoring will be undertaken to ensure the successful establishment of the mitigation proposals developed.

Groundwater

15.4.55 A survey of the potential spring feature at the Toton trough will be undertaken to determine its value and to identify whether further mitigation is required. If this spring feature is confirmed to be a spring, measures will be implemented to re-establish this nearby in a manner that ensures any adverse impacts would be mitigated.

Groundwater-surface water interactions

15.4.56 Additional mitigation measures for the management of groundwater baseflows to the River Erewash during construction of the Toton trough may be required. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation would potentially take the form of:

- a wider buffer strip, or shallower batter on the excavations;
- installation of a groundwater cut-off;
- creation of a temporary section of lined channel on the River Erewash;
- adoption of wet working techniques that avoid the need for dewatering; and
- recirculation of treated water to the River Erewash at an appropriate rate and location.

15.4.57 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.58 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 replacement flood storage, raising flood defences, managing flood conveyance, and relocating existing flood defences to increase floodplain storage.

15.4.59 Alternative mitigation measures are currently being considered for piers located within in the River Trent and River Soar floodplain. Measures to improve or alter flood conveyance will be considered to mitigate for changes in flood flow conveyance and pathways associated with the piers. These measures will be developed further in consultation with the Environment Agency.

15.4.60 Hydraulic modelling is currently being undertaken for a proposed access road to the East Midlands Hub station and its interaction with a surface water flow path draining Archers Field. Any requirement for mitigation identified from the modelling will be developed in consultation with the LLFA.

Summary of likely residual significant effects

15.4.61 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a major adverse effect on the hydrology of the River Erewash during construction of the Toton trough due to loss of flow input from the superficial deposits aquifer, which is significant. Should it be confirmed that the river is concrete lined in this area, the effect would be negligible and not significant;
- a moderate adverse effect on flood risk on the River Trent floodplain and at residential properties in Long Eaton, which is significant;
- a major adverse effect on flood risk on a fire station in Long Eaton, which is significant. Should it be confirmed that this fire station is not operational during flooding; the effect would be moderate adverse, which is still significant;
- a moderate adverse effect on flood risk on the River Soar floodplain and at residential properties in Ratcliffe-on-Soar, which is significant;
- a moderate adverse effect on the hydromorphology of the River Trent associated with the placement of a pier in the river channel, which is significant;
- a moderate adverse effect related to the loss of potential spring feature at the Toton trough, which is significant;
- a moderate adverse effect on flood risk on the River Erewash floodplain and at commercial properties in Sandiacre, which is significant; and
- a moderate adverse effect on surface water flow paths at residential property in Stapleford, which is significant.

15.4.62 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 shows 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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