

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA10: Tibshelf to Shuttlewood

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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: MMLo1 Danesmoor to Brierley Bridge and MMLo2 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 MMLo1 Danesmoor to Brierley Bridge and MMLo2 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.

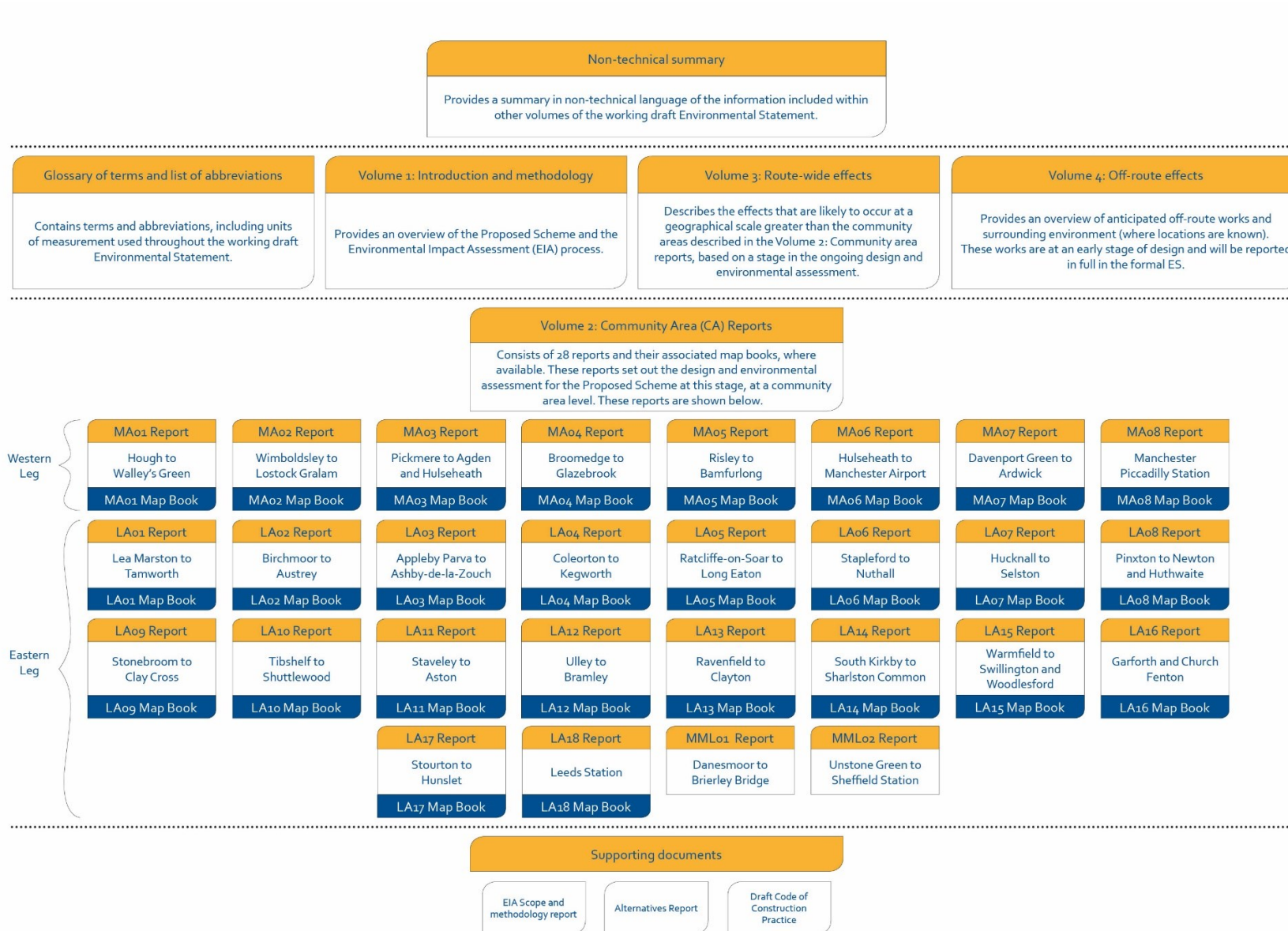
Volume 4: Off-route effects

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

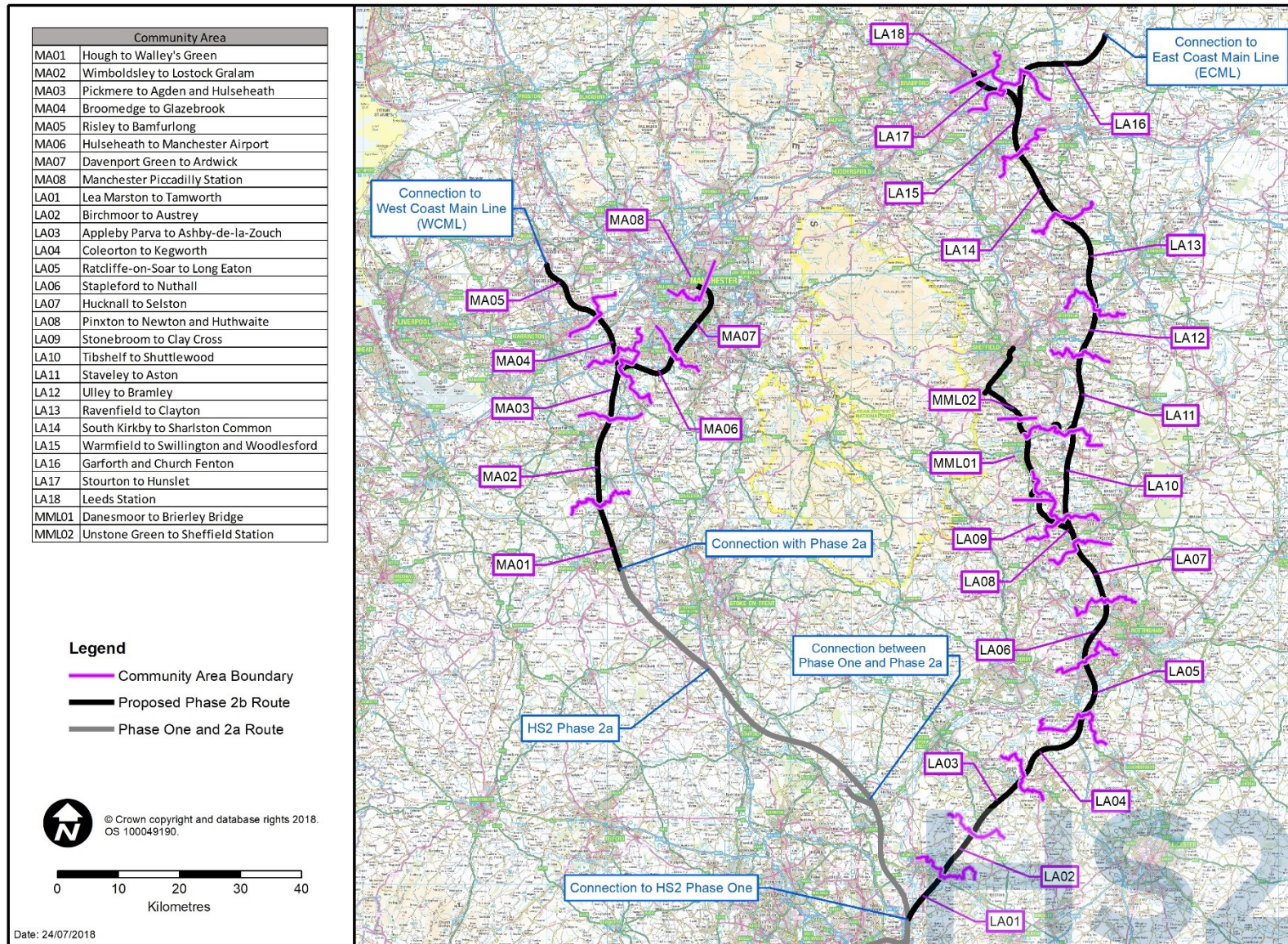


1 Introduction

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 Tibshelf to Shuttlewood area (CA number LA10) which is located on the eastern leg of the Proposed Scheme.

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



1.2 Purpose of this report

- 1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point-in-time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Tibshelf to Shuttlewood 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.

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- 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 (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 Tibshelf to Shuttlewood area are provided in a separate corresponding document entitled Volume 2: LA10 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: LA10 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

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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

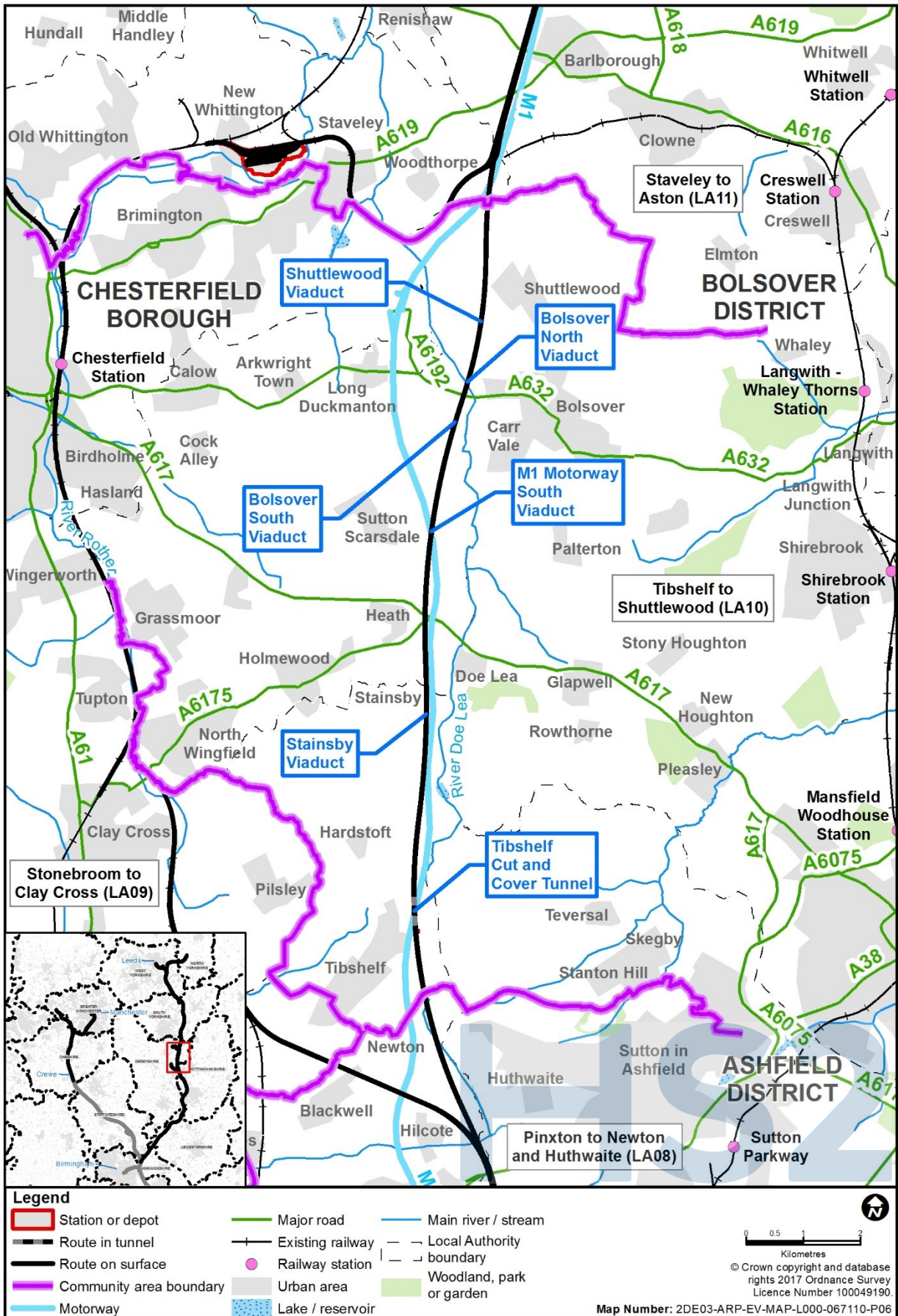
- 2.1.1 The Proposed Scheme through the Tibshelf to Shuttlewood area (LA10) would be approximately 14km in length, and lies within the local authority areas of Bolsover District Council (BDC) and North East Derbyshire District Council (NEDDC), which both lie within the Derbyshire County Council (DCC) area.
- 2.1.2 The Proposed Scheme would pass through the parishes of Tibshelf, Ault Hucknall, Heath and Holmewood, Sutton cum Duckmanton, Old Bolsover and Scarcliffe. The boundary between Blackwell parish and Tibshelf parish forms the southern boundary of this section. The northern boundary of this section broadly follows the boundary between Old Bolsover and Staveley parishes.
- 2.1.3 As shown in Figure 3, the Pinxton to Newton and Huthwaite area (LA08) lies to the south, and the Staveley to Aston (LA11) lies to the north of the Tibshelf to Shuttlewood area. The Stonebroom to Clay Cross area (LA09) is located to the east of this area.

Settlement, land use and topography

- 2.1.4 The Tibshelf to Shuttlewood area is predominantly semi-rural in character, with agriculture being the main land use. This is interspersed with areas of industrial and commercial land use and settlements including Tibshelf, Heath, Bolsover, Astwith, Stainsby, Doe Lea, Palterton and Shuttlewood. There are a range of commercial land uses, as well as areas of former industrial areas, including significant areas that have been restored to agriculture from former open cast coal mines.
- 2.1.5 The majority of the Tibshelf to Shuttlewood area comprises undulating lowland landscapes, with mixed arable and pastoral farming, interspersed with woodland, including three areas of ancient woodland close to the route of the Proposed Scheme. Across the Tibshelf to Shuttlewood area there are several villages, with a scattering of isolated dwellings and farmsteads. The National Trust property of Hardwick Hall and its extensive park lie within this area, east of the M1, to which the route of the Proposed Scheme would run parallel. To the south of the area is Sawpit Lane Industrial Estate and to the north of Bolsover there are former industrial areas, now the subject of major redevelopment proposals. To the south of the M1 junction 29, there is an ambulance station and highway maintenance depot.
- 2.1.6 The topography of much of the Tibshelf to Shuttlewood area is characterised by the valley of the River Doe Lea, with prominent ridges of higher land to east and west. The high point on the west side is approximately 194m AOD, to the north of Tibshelf, near Biggin Farm; and on the east side of the valley, it is at around 184m AOD, south of Palterton. To the north of Bolsover, the character of the area changes, with more undulating higher ground around Shuttlewood.

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Figure 3: Community area context map



Key transport infrastructure

- 2.1.7 The M1 passes through the Tibshelf to Shuttlewood area in a south-north alignment. The A617/ Mansfield Road, runs from west to east via the M1 junction 29, providing links between Chesterfield and Mansfield. The A6175 Heath Road, runs south-westwards from M1 junction 29 towards Clay Cross, and the A632 Chesterfield Road provides links between Chesterfield and Bolsover.
- 2.1.8 Local roads include the B6014 Mansfield Road, Deep Lane, Hawking Lane, Astwith Lane, Mill Lane, Palterton Lane, Woodhouse Lane, The B6418 Chesterfield Road/Buttermilk Lane, and the B6419 Woodthorpe Road.
- 2.1.9 The route of the Proposed Scheme would run alongside the M1 for approximately 8.5km in the southern half of the Tibshelf to Shuttlewood area and cross it twice, via a tunnel near Tibshelf and a viaduct north of Heath. The route of the Proposed Scheme would also pass under the M1 junction 29.
- 2.1.10 The route would cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide links between scattered dwellings and surrounding villages.

Socio-economic profile

- 2.1.11 Within the BDC area, the construction sector accounts for the largest proportion of businesses (12%) followed by professional, scientific and technical (12%) and business administration and support services (11%). In the NEDDC area, the construction sector accounts for the largest proportion of businesses (15%) followed by professional, scientific and technical (12%) and agriculture, forestry and fishing (9%).
- 2.1.12 According to the Annual Population Survey (2016)⁴, the employment rate⁵ within the BDC area was 75% (36,600 people) and within the NEDDC area 77% (45,100). The unemployment rate in both the BDC and NEDDC areas was 4%.
- 2.1.13 According to the Annual Population Survey (2016)⁶, 22% of BDC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 8% of residents had no qualifications. In the NEDDC area, 32% of residents aged 16-64 were qualified to NVQ4 and above, with 5% of its residents having no qualifications. In the Chesterfield District Council area, 31% of residents aged 16-64 were qualified to NVQ4 and above, with 6% of its residents having no qualifications.

Notable community facilities

- 2.1.14 The main concentrations of community facilities in the Tibshelf to Shuttlewood area are in the towns of Tibshelf, Holmewood and Bolsover. Some community facilities are also available in the villages of Heath, Doe Lea, Bramley Vale, Palterton and Shuttlewood.
- 2.1.15 Tibshelf is a village, with community facilities including a medical practice, Tibshelf Infant and Nursery School, Tibshelf Community School, St John the Baptist parish

⁴ Annual Population Survey, (2016), NOMIS; Available online at: <http://www.nomisweb.co.uk>

⁵ The proportion of working age (16-64 year olds) residents that is in employment.

⁶ Annual Population Survey, (2016), NOMIS; Available online at: <http://www.nomisweb.co.uk>

church, High Street Methodist Church, Tibshelf Village Hall, and three public houses and hotels (The Crown Hotel, The King Edward VII Hotel and the White Hart). Tibshelf is served by a mobile library.

- 2.1.16 Community facilities in Heath and Holmewood include a medical practice, Heath Primary School, All Saints Church Heath, St Alban's Church, Abundant Life Christian Centre, Heath Old Church and burial ground, Heath Village Hall and The Elm Tree Inn. Heath and Holmewood are served by Holmewood library.
- 2.1.17 Doe Lea and Bramley Vale villages include with two medical practices, Bramley Vale Primary School and St John the Baptist Church.
- 2.1.18 Palterton is a village with community facilities including Palterton Primary School and the Palterton Miners Welfare centre.
- 2.1.19 Bolsover is a town with community facilities including three medical practices, Bolsover hospital, New Bolsover Primary School, Bolsover Church of England Junior School and Bolsover Infant and Nursery School, The Bolsover School. There are two community centres (Bainbridge Hall and Bolsover Assembly Hall), and the town is also served by Bolsover library. There are six places of worship in Bolsover, at least five public houses and at least six restaurants, cafes or take-away establishments.
- 2.1.20 Shuttlewood is a village with community facilities including Brockely Primary and Nursery School, a village shop, and is served by a mobile library.
- 2.1.21 The communities of Hardstoft, Astwith, Stainsby and Sutton Scarsdale include a limited number of local facilities.

Recreation, leisure and open space

- 2.1.22 The Tibshelf to Shuttlewood area is a predominantly semi-rural area, with open space, woodland and farmland. Several PRoW and other paths open to the public cross the area. Hardwick Hall is a National Trust site with associated registered park and garden. Stainsby Mill is also a National Trust site open to the public, located to the north of Hardwick Hall and east of the route of the Proposed Scheme. Sutton Scarsdale Hall is a listed building lying to the east of the route of the Proposed Scheme. The house and grounds are an English Heritage visitor site open to the public. Bolsover Castle, located to the north of the area, is also an English Heritage visitor site with an associated registered park and garden. Open spaces in the Tibshelf to Shuttlewood area include Carr Vale Flash Nature Reserve, Peter Fidler Nature Reserve, Snipe Bog Nature Reserve, and Castle Leisure Park.

Policy and planning context

Planning framework

- 2.1.23 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.
- 2.1.24 The following adopted local plan documents have been considered and referred to where appropriate to the assessment:

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- Saved policies of the Bolsover District Local Plan (2000)⁷;
- Saved policies of the North East Derbyshire Local Plan (November 2005)⁸;
- Chesterfield Borough Council Local Plan: Core Strategy (2013)⁹;
- Chesterfield Borough Council Local Plan Proposals Map (2013)¹⁰;
- Saved policies of the Replacement Chesterfield Borough Local Plan (2006)¹¹;
- Saved policies of the Ashfield Local Plan Review (2002)¹²;
- Saved policies of the Derby and Derbyshire Minerals Local Plan (April 2000) and First Alteration to the Plan (November 2002)¹³;
- Saved policies of the Derby and Derbyshire Waste Local Plan (March 2005)¹⁴;
- Saved policies of the Nottinghamshire Minerals Local Plan (2005)¹⁵;
- Nottinghamshire and Nottingham Replacement Waste Local Plan Part 1 Waste Core Strategy (2013)¹⁶;
- Saved policies of the Nottinghamshire and Nottingham Waste Local Plan (2002)¹⁷;
- Sheffield City Region (SCR) Transport Strategy and Implementation Plan (2011-2026)¹⁸;
- Derbyshire Local Transport Plan Three (2011-2026)¹⁹;
- Nottinghamshire Local Transport Plan (2011-2026)²⁰; and

⁷ Bolsover District Council, (2000), Saved policies of the Bolsover District Local Plan. Available online at:

<http://www.bolsover.gov.uk/LocalPlan/statement.htm>

⁸ North East Derbyshire District Council (2005), Saved policies of North East Derbyshire Local Plan. Available online at: <http://www.ne-derbyslocplan.net/>

⁹ Chesterfield Borough Council, (2013), Chesterfield Borough Council Local Plan Core Strategy. Available online at:

<https://www.chesterfield.gov.uk/media/148999/adopted-local-plan-core-strategy.pdf>

¹⁰ Chesterfield Borough Council, (2013), Chesterfield Borough Council Local Plan Proposals Map. <https://www.chesterfield.gov.uk/planning-and-building-control/local-plan-and-strategic-planning/current-local-plan.aspx>

¹¹ Chesterfield Borough Council, (2006) Saved policies of the Replacement Chesterfield Borough Local Plan. Available online at:

<https://www.chesterfield.gov.uk/media/151290/replacement-chesterfield-borough-local-plan-2006.pdf>

¹² Ashfield District Council (2002), Saved policies of the Local Plan Review. Available online at: <https://www.ashfield.gov.uk/residents/planning-and-building-control/forward-planning/local-plan-review-2002/>

¹³ Derby City Council and Derbyshire County Council, (2002), Saved policies of the Derby and Derbyshire Minerals Local Plan (April 2000) and First Alteration to the Plan. Available online at: https://www.derbyshire.gov.uk/images/DD%20MLP%20Part%201_tcm44-189489.pdf

¹⁴ Derby City Council and Derbyshire County Council, (2005), Saved policies of the Derby and Derbyshire Waste Local Plan. Available online at: https://www.derbyshire.gov.uk/images/D%26D%20WLP_tcm44-189473.pdf

¹⁵ Nottinghamshire County Council, (2005), Nottinghamshire Minerals Local Plan. Available online at:

<http://www.nottinghamshire.gov.uk/planning-and-environment/minerals-local-plan/adopted-minerals-local-plan>

¹⁶ Nottinghamshire County Council, (2013), Nottinghamshire and Nottingham Replacement Waste Local Plan Part 1 Waste Core Strategy.

Available at: <http://www.nottinghamshire.gov.uk/planning-and-environment/waste-development-plan/part-1-waste-core-strategy>

¹⁷ Nottinghamshire County Council, (2002), Nottinghamshire and Nottingham Waste Local Plan. Available at:

<http://www.nottinghamshire.gov.uk/planning-and-environment/waste-development-plan/adopted-waste-local-plan>

¹⁸ Sheffield City Region (2011), Sheffield City Region Transport Strategy (2011-2026). Available online at: <http://www.syltj>

¹⁹ Derbyshire County Council (2011), Derbyshire Local Transport Plan 2011-2026. Available online at:

http://www.derbyshire.gov.uk/transport_roads/transport_plans/ltp3/default.asp?VD=localtransportplan

²⁰ Nottinghamshire County Council (2011), the Nottinghamshire Local Transport Plan 2011-2026. Available online at:

- Teversal, Stanton Hill and Skegby Neighbourhood Plan (2017)²¹.

2.1.25 Emerging policies are not generally included within this report unless a document has been submitted for examination to the Secretary of State. This is the case with the Emerging Ashfield District Local Plan²², which was submitted to the Secretary of State on 24 February 2017.

Committed development

- 2.1.26 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme.
- 2.1.27 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.
- 2.1.28 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.
- 2.1.29 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

Ongoing design development

- 2.1.30 Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting from this will be reported in the formal ES. The main areas of design development being considered include:
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
 - review of structural types and assumed construction methods for the M1 Motorway Southern viaduct and the Bolsover Southern viaduct;
 - review of noise mitigation features;
 - development of temporary and permanent utility diversions;
 - refinement of the realignment of roads and PRoW crossing the Proposed Scheme;

²¹ Teversal, Stanton Hill & Skegby Neighbourhood Forum (2017)

²² Ashfield District Council (2016), Ashfield Publication Local Plan. Available online at: <https://www.ashfield.gov.uk/residents/planning-and-building-control/forward-planning/the-emerging-local-plan/>

- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- refinement of landscape proposals for the Proposed Scheme;
- refinement of accommodation works and crossings of the route for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station locations.

2.2 Description of the Proposed Scheme

- 2.2.1 The following section describes the main features of the Proposed Scheme in the Tibshelf to Shuttlewood 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.
- 2.2.3 In general, features are described from south to north along the route, and east to west for features that cross the Proposed Scheme.

Overview

- 2.2.4 The Proposed Scheme through the Tibshelf to Shuttlewood area would be approximately 14km in length. The route would extend from east of Tibshelf in the south towards Heath and on to Bolsover and Shuttlewood in the north.
- 2.2.5 This section of route is illustrated on maps CT-06-451 to CT-06-460 in the Volume 2: LA10 Map Book.
- 2.2.6 All dimensions in the sections below are approximate.
- 2.2.7 In the Tibshelf to Shuttlewood area, the route of the Proposed Scheme would be carried on the following features:
- viaducts for a total length of 1.7km (Stainsby, M1 Motorway South, Bolsover South, Bolsover North, Shuttlewood viaducts);
 - cuttings for a total length of 6.8km (Tibshelf, Hardstoft South, Hardstoft North, Astwith, Heath South, Heath Central, Heath North, Bolsover and Shuttlewood cuttings);
 - embankments for a total length of 4.7km (Hardstoft South, Hardstoft North, Stainsby South, Stainsby North, Heath, Bolsover South, Carr Vale, Bolsover North, Shuttlewood and Stanfree embankments); and

- cut and cover tunnel for a total length of 0.5km (Tibshelf cut and cover tunnel).

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

2.2.9 In general, features are described along the route of the Proposed Scheme from south to north and from the eastern to the western side of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA10 Map Book.

Newtonwood Lane to Hardstoft South embankment

2.2.10 The route of the Proposed Scheme would enter the Tibshelf to Shuttlewood area from the Pinxton to Newton and Huthwaite area (LA08) at Newtonwood Lane. The route would continue in Tibshelf cutting, before crossing under the M1 via the Tibshelf cut and cover tunnel. It would continue to the west of the M1 in the Hardstoft South cutting and then transfer on to the Hardstoft South embankment.

2.2.11 This section of route is illustrated on maps CT-06-451 to CT-06-453 in the Volume 2: LA10 Map Book.

2.2.12 Key features of this approximately 2.7km section would include:

- a section of Tibshelf cutting, 1.1km in length, up to 27m in depth, and 189m in width continuing from the Pinxton to Newton and Huthwaite area (LA08). There would be areas of landscape mitigation planting adjacent to both sides of the cutting, and woodland habitat creation to the east to provide visual screening to properties along Overmoor View and Meadow Close, Tibshelf, and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-451, E5 to J7 and Map CT-06-452, A5 to D6);
- Tibshelf Services retaining wall, 100m in length and up to 8m in height, located to the west of the route of the Proposed Scheme, to provide structural support to Tibshelf Service Station (see Volume 2: Map CT-06-451, E5);
- diversion of Tibshelf Footpath 46 approximately 60m west of its current alignment for 230m, crossing the route of the Proposed Scheme on Newtonwood Lane (see Volume 2: Map CT-06-451, E5 to F5);
- Tibshelf overbridge, 126m in length, to provide access to land to the west of the route of the Proposed Scheme (see Volume 2: Map CT-06-451, G5 and G6);
- diversion of Tibshelf Bridleway 21 approximately 90m north-west of its current alignment for 550m, crossing the route of the Proposed Scheme on B6014 Mansfield Road overbridge (see Volume 2: Map CT-06-451, G4 to J5);
- the B6014 Mansfield Road overbridge, 182m in length, crossing at existing ground level and 23m above track level (see Volume 2: Map CT-06-452, B6);
- diversion of Tibshelf Footpath 35 approximately 160m east of its current alignment, for a distance of 210m, joining the B6014 Mansfield Road (see Volume 2: Map CT-06-452, B7 to C7);

- three ecological mitigation ponds to the east of the route of the Proposed Scheme, north of the B6014 Mansfield Road, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-452, D6, C7, D7 and D9);
- a balancing pond for railway drainage, located 130m east of the Proposed Scheme with access from Mansfield Road to the south (see Volume 2: Map CT-06-452, D7 to E8 and Map CT-06-452-R1, B1 to E2);
- a porous portal 100m in length at the southern end of Tibshelf cut and cover tunnel (see Volume 2: Map CT-06-452, D6);
- Tibshelf cut and cover tunnel, 300m in length and up to 13m in depth, continuing into Hardstoft South cutting (see Volume 2: Map CT-06-452, D6 to F6);
- realignment of Tibshelf Footpath 33 for a distance of 850m to the south of the current alignment to cross the route of the Proposed Scheme via the Tibshelf Footpath 33 overbridge (see Volume 2: Map CT-06-452, G1 to G6);
- diversion of Tibshelf Footpath 32 for a distance of 1km to the south of the current alignment to cross the route of the Proposed Scheme via the Tibshelf Footpath 33 overbridge (see Volume 2: Map CT-06-452, H7 to G2);
- Tibshelf Footpath 33 overbridge 126m in length (see Volume 2: Map CT-06-452, F5 and F6);
- a porous portal 100m in length at the northern end of Tibshelf cut and cover tunnel. There would be landscape mitigation planting to the west to provide visual screening for residents of Tibshelf (see Volume 2: Map CT-06-452, F6);
- Lane End drop inlet culvert, 60m north of Tibshelf Footpath 33 overbridge, for diversion of an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-452, F5 and F6);
- Hardstoft South cutting, 880m in length, up to 37m in depth and 151m in width with adjacent landscape mitigation planting to both sides of the cutting to provide visual screening to Biggin Farm, and to help integrate the Proposed Scheme into the surrounding landscape. Planting to the east of the cutting would be in the area between the route of the Proposed Scheme and the M1 (see Volume 2: Map CT-06-452, F5 to J6 and Map CT-06-453, A5 to C6);
- Tibshelf East retaining wall 76m in length and up to 6m in height, located to the east of the route of the Proposed Scheme to the west of the M1, to provide support to the space for the northern portal building and rescue area for Tibshelf cut and cover tunnel (see Volume 2: Map CT-06-452, F6 and G6);
- Tibshelf West retaining wall 415m in length and up to 8m in height, located to the west of the route of the Proposed Scheme to the north of the Tibshelf cut and cover tunnel, to provide structural support to Hardstoft South cutting (see Volume 2: Map CT-06-452, F6 and H6);

- diversion of Tibshelf Bridleways 31 and 35 to the west of its existing alignment using Deep Lane overbridge to cross the route of the Proposed Scheme (see Volume 2: Map CT-06-453, B5 to D5);
- Hardstoft South embankment, 174m in length and up to 8m in height. There would be areas of landscape mitigation planting to both sides of the route of the Proposed Scheme to provide visual screening and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-453, C5 to D6); and
- Ridlocks Wood culvert, 250m south of Deep Lane, for diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-453, C5 to C6).

2.2.13 This section of the route of the Proposed Scheme would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would be maintenance access routes, hedgerow planting and minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.14 Construction of this section would be managed from the Tibshelf cutting satellite compound and Hardstoft South cutting satellite compound, which are described in Section 2.3, and shown on maps CT-05-451, and CT-05-452 in Volume 2: LA10 Map Book.

Hardstoft North cutting to Heath South cutting

2.2.15 This section of the Proposed Scheme lies to the west of the M1. The route would continue into the Hardstoft North cutting, onto the Hardstoft North embankment and continuing in Astwith cutting. The route of the Proposed Scheme would then continue on Stainsby South embankment and then onto Stainsby viaduct and Stainsby North embankment, before transferring into Heath South cutting.

2.2.16 This section of route is illustrated on maps CT-06-453 to CT-06-455 in the Volume 2: LA10 Map Book.

2.2.17 Key features of this approximately 3.7km section would include:

- Hardstoft North cutting, 830m in length, up to 36m in depth and 194.1m in width, with adjacent landscape mitigation planting to both sides of the route of the Proposed Scheme to provide visual screening to users of footpaths 17,18 and 19, to help integrate the Proposed Scheme into the surrounding landscape and to provide visual screening to Hardwick Hall (see Volume 2: Map CT-06-453, D5 to H6);
- Deep Lane overbridge, 136m in length, crossing at existing ground level and 18m above track level (see Volume 2: Map CT-06-453, D5 to E6);
- diversion of Ault Hucknall Footpath 17 and 18 650m to the south of its current alignment and crossing the route of the Proposed Scheme on Deep Lane overbridge (see Volume 2: Map CT-06-453, E1 to F10 and Map CT-06-453-L1, E6 to D10);

- realignment of a section of Hawking Lane to the west of the M1 by 1.4km to a new junction on Deep Lane. The land in the 'island' between the realigned Hawking Lane and the route of the Proposed Scheme would be used for landscape mitigation planting, to provide visual screening and help integrate the Proposed Scheme in to the surrounding landscape (see Volume 2: Map CT-06-453, E4 to J5 and Map CT-06-454, A5 to G5);
- Great Pond auto-transformer station, 49m by 24m, on the eastern side of the route of the Proposed Scheme, within an area of landscape mitigation planting zoom south of the existing Hawking Lane. Access would be provided from the existing section of Hawking Lane. The auto-transformer station would lie in an area of landscape mitigation planting to provide screening for Hardwick Hall (see Volume 2: Map CT-06-453, G6);
- closure of Hawking Lane where it would cross the route of the Proposed Scheme at the Hardstoft North embankment. A turning head would be provided to facilitate vehicle access on the retained section of Hawking Lane on the east of the route of the Proposed Scheme (see Volume 2: Map CT-06-453, H6);
- Cockshutt Woods drop inlet culvert, 550m north of Deep Lane overbridge, for diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-453, G6);
- Hardstoft North embankment, 237m in length and up to 6m in height. There would be areas of landscape mitigation planting to both sides of the route of the Proposed Scheme to provide visual screening to Hardwick Hall and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-453, H6 to I6);
- Astwith cutting, 748m in length, up to 12m in depth, and 71m in width with adjacent landscape mitigation planting to both sides of the Proposed Scheme to provide visual screening to Hardwick Hall and to help integrate the Proposed Scheme into the surrounding landscape. A drain for surface water drainage would be provided along the western boundary of the cutting (see Volume 2: Map CT-06-454, B5 to F6);
- modifications to the existing alignment of Astwith Lane to join the realigned Hawking Lane (see Volume 2: Map CT-06-454, B4 to B5);
- an ecological mitigation pond to the west of the route of the Proposed Scheme, west of the Hawking Lane realignment, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-454, D4);
- a balancing pond for railway drainage, 110m west of the route of the Proposed Scheme, with access from the realigned Hawking Lane to the east of the pond (see Volume 2: Map CT-06-454, E4 to F5);
- Stainsby South embankment, 237m in length and up to 9m in height There would be areas of landscape mitigation planting to both sides of the Proposed Scheme to provide visual screening to Hardwick Hall and residents in Stainsby

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and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-454, F5 to G6);

- diversion of Ault Hucknall Footpath 16 150m to the west of its current alignment for 720m (see Volume 2: Map CT-06-454, D4 to G5);
- a balancing pond for highway drainage, 30m west of the Proposed Scheme with access from the realigned Hawking Lane (see Volume 2: Map CT-06-454, F5);
- a replacement floodplain storage area on the west side of the route of the Proposed Scheme, adjacent to Stainsby viaduct. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-454, F4 to G5);
- Stainsby viaduct, 195m in length and up to 9m in height (see Volume 2: Map CT-06-454, G5 to H6). A noise fence barrier would be provided, west of the route of the Proposed Scheme, up to 2m in height, to provide acoustic screening for properties in Stainsby (see Volume 2: Map CT-06-454, G5 to H5);
- diversion of Ault Hucknall Footpath 37, 50m to the west of its current alignment for 100m (see Volume 2: Map CT-06-454, G5 to H5);
- Stainsby North embankment, 511m in length and up to 13m in height. There would be areas of landscape mitigation planting to the east of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-454, H5 to J6 and Map CT-06-455, A5 to C6). A noise fence barrier would be provided, west of the route of the Proposed Scheme, up to 2m in height, to provide acoustic screening for properties in Stainsby (see Volume 2: Map CT-06-454, G5 to J5);
- a balancing pond for highway drainage, 360m east of the route of the Proposed Scheme with access from the proposed Mill Lane diversion (see Volume 2: Map CT-06-454, H8);
- an ecological mitigation pond to the east of the route of the Proposed Scheme to provide replacement habitat for great crested newt (see Volume 2: Map CT-06-454, H8);
- Gildageforge culvert, 350m north of Stainsby viaduct, for diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-454, J5 to J6);
- closure of Mill Lane west of the route of the Proposed Scheme, at its junction with the A6175 Heath Road, and provision of a turning head to facilitate vehicular access. Most of the existing route of Mill Lane, west of the route of the Proposed Scheme would be retained as a gated private access road for agricultural purposes (see Volume 2: Map CT-06-455, D5-F2);
- realignment of an existing section of Mill Lane crossing the route of the Proposed Scheme under Stainsby viaduct (see Volume 2: Map CT-06-454, G5 to H6);

- diversion of Mill Lane onto a new route 1.2km long, to the east of the M1, on an embankment (see Volume 2: Map Ct-06-454, H8 to I7 and Map CT-06-455, A8 to F8);
- a balancing pond for railway drainage of the Proposed Scheme, 110m west of the Proposed Scheme with access from Mill Lane (see Volume 2: Map CT-06-455, C3 to C5);
- Heath South cutting, 975m in length, up to 19m in depth, and 112m in width with adjacent landscape planting on the east side of the cutting to provide visual screening and to help integrate the Proposed Scheme into the landscape (see Volume 2: Map CT-06-455, C5 to H6);
- an ecological mitigation pond and associated landscape mitigation planting to the west of the route of the Proposed Scheme, north-west of Stainsby North embankment, to provide replacement habitat for great crested newts and habitat connectivity (see Volume 2: Map CT-06-455, C5);
- two ecological mitigation ponds and associated woodland habitat creation to the east of the route of the Proposed Scheme, west of the Mill Lane diversion, to provide replacement habitat for woodlands and great crested newts, and provide connectivity to surrounding linear woodland belts (see Volume 2: Map CT-06-455, D7 to F7); and
- a balancing pond for highway drainage, 270m east of the route of the Proposed Scheme with access from the Mill Lane diversion (see Volume 2: Map CT-06-455, H8).

2.2.18 This section of the route would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.19 Construction of this section would be managed from the Hardstoft North cutting satellite compound, Heath South cutting main compound, Stainsby viaduct satellite compound and Mill Lane diversion satellite compound which are described in Section 2.3, and shown on maps CT-05-453, CT-05-454 and CT-05-455 in Volume 2: LA10 Map Book.

Junction 29 M1 Interchange South overbridge to M1 South viaduct

2.2.20 The route of the Proposed Scheme would continue on to Heath Central cutting, passing to the west of the M1 in Heath North cutting and on Heath embankment, before passing over the M1 via the M1 Motorway South viaduct.

2.2.21 This section of route is illustrated on maps CT-06-455 to CT-06-456 in the Volume 2: LA10 Map Book.

2.2.22 Key features of this approximately 1.8km section would include:

- Junction 29 M1 Interchange South overbridge, 22m in length, and up to 2m in height above ground level and 10m above track level. An area of landscape mitigation planting would be provided in the western quadrant of the junction to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-455, H5 to H6);
- Heath Central cutting, 138m in length, up to 11m in depth and 95m in width (see Volume 2: Map CT-06-455, H5 to H6);
- modifications to the existing Junction 29 M1 Interchange, including an extension of the existing circulatory carriageway to the west and a realignment of the adjoining roads (the A6175 and the A617) to meet the extended circulatory carriageway. Footways and pedestrian underpasses within the junction linking public footpaths to the east and west of the M1 would also require modification (see Volume 2: Map CT-06-455, G4 to J3);
- Heath and Holmewood Footpath 25 underbridge (see Volume 2: Map CT-06-455, H5);
- Junction 29 M1 Interchange North overbridge, 23m in length, crossing at existing ground level and 11m above track level (see Volume 2: Map CT-06-455, H5 to I6);
- Heath North cutting, 344m in length, up to 22m in depth, and 153m in width with adjacent landscape mitigation planting to both sides of the route of the Proposed Scheme to provide visual screening to residents in Heath and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-455, I5 to J6 and Map CT-06-456, A5 to C6);
- Heath embankment, 945m in length and up to 27m in height. There would be areas of landscape mitigation planting to both east and west of the embankment to provide visual screening and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-456, C5 to H6);
- three ecological mitigation ponds to the east of the route of the Proposed Scheme, east of Heath embankment, within an area of landscape mitigation planting, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-456, D6, E6 and E7);
- realignment of Heath and Holmewood Footpath 1, 160m to the west of the existing alignment for 650m to cross the route of the Proposed Scheme via Heath and Holmewood Footpath 1 underbridge (see Volume 2: Map CT-06-456, D5 to F6);
- Owlcotes Wood culvert, 100m south of Heath and Holmewood Footpath 1 accommodation underbridge, for diversion of an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-456, F5 to F6);
- Heath and Holmewood Footpath 1 accommodation underbridge, 14m in length (see Volume 2: Map CT-06-456, F5 to F6);

- a balancing pond for railway drainage from the Proposed Scheme, 25m west of the route of the Proposed Scheme with access from Palterton Lane (see Volume 2: Map CT-06-456, G4 to G5);
- M1 South retaining wall, 138m in length and up to 14m in height, located to the east of the route of the Proposed Scheme to the west of the M1, to provide structural support to the Heath embankment (see Volume 2: Map CT-06-456, G6 to H6);
- an ecological mitigation pond to the west of the M1 Motorway South viaduct, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-456, G4 to H5);
- two ecological mitigation ponds to the west of the M1 Motorway South viaduct, one of which would be within an area of landscape mitigation planting, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-456, G5 to H4);
- M1 Motorway South viaduct, 357m in length and up to 14m in height (see Volume 2: Map CT-06-456, H6 to I6); and
- M1 Sutton Scarsdale northbound carriageway realignment 10m north-east of its current alignment for a length of 500m (see Volume 2: Map CT-06-456, G6 to I5).

2.2.23 This section of the route of the Proposed Scheme would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.24 Construction of this section would be managed from the Heath South cutting main compound, M1 Motorway South viaduct satellite compound and Bolsover South Embankment which are described in Section 2.3, and shown on maps CT-05-455, CT-05-456 and CT-05-457 in Volume 2: LA10 Map Book.

Bolsover South embankment to Shuttlewood embankment

2.2.25 The route of the Proposed Scheme would continue to the east of the M1 on Bolsover South embankment, and then on Bolsover South viaduct. The route would continue west of Bolsover on the Carr Vale embankment, passing onto Bolsover North viaduct and onto Bolsover North embankment. The route would enter the Bolsover cutting before continuing on the Shuttlewood embankment.

2.2.26 This section of route is illustrated on maps CT-06-456 to CT-06-459 in the Volume 2: LA10 Map Book.

2.2.27 Key features of this approximately 3.3km section would include:

- Bolsover South embankment, 1.5km in length and up to 15m in height. There would be areas of landscape mitigation planting to both sides of the embankment to would help integrate the Proposed Scheme into the

surrounding landscape. An area of woodland habitat creation would be provided where Palterton Lane crosses the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-456, I6 to J6 and Map CT-06-457, A6 to I6);

- Sutton Scarsdale auto-transformer station, 49m by 24m, on the western side of the route of the Proposed Scheme, east of the M1, within an area of landscape planting, 200m south of Palterton Lane. Access would be provided from Palterton Lane (see Volume 2: Map CT-06-457, B5);
- thirteen areas of landscape mitigation planting, to the west of the Proposed Scheme to provide off-site visual screening to Sutton Scarsdale (see Volume 2: Map CT-06-457-L1, A7 to G6);
- Palterton Lane underbridge, 22m in length, and up to 12m below track level (see Volume 2: Map CT-06-457, C5 to C6);
- Palterton culvert, 150m north of Palterton Lane, for diversion of an unnamed watercourse crossing under the route of the Proposed Scheme (see Volume 2: Map CT-06-457, D5 to D6);
- realignment of Sutton cum Duckmanton Footpath 19 to cross the Proposed Scheme via Sutton cum Duckmanton Footpath 19 underbridge (see Volume 2: Map CT-06-457, E5 to F6);
- Sutton cum Duckmanton Footpath 19 underbridge, 10m in length (see Volume 2: Map CT-06-457, E5 to E6);
- an ecological mitigation pond and associated woodland habitat creation, west of Bolsover South embankment, to provide replacement habitat for great crested newts and replacement woodland (see Volume 2: Map CT-06-457, F5 to G5);
- Carr Vale culvert, 350m north of Sutton cum Duckmanton Footpath 19 accommodation underbridge, for diversion of an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-457, G5 to G6);
- two ecological mitigation ponds to the west of the route of the Proposed Scheme, west of Bolsover South embankment, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-457, H5 to I5);
- a balancing pond for railway drainage, 25m west of the route of the Proposed Scheme with access from Palterton Lane (see Volume 2: Map CT-06-457, I4 to I5);
- an area of wetland habitat creation would be provided to the east of the route of the Proposed Scheme at The Goit, to provide replacement habitat (see Volume 2: Map CT-06-457, H6);
- an area of replacement floodplain storage to the east of the route of the Proposed Scheme, south-east of the Bolsover South viaduct. Following excavation, the area would be re-graded back to tie into the existing ground

level (see Volume 2: Map CT-06-457, H7 to I6);

- Bolsover South viaduct, 600m in length and up to 13m in height over the floodplain of The Goit (see Volume 2: Map CT-06-457, I6 to J6 and Map CT-06-458, B5 to E5);
- two ecological mitigation ponds to the west of Bolsover South viaduct to provide replacement habitat for great crested newt (see Volume 2: Map CT-06-458, C4 and C5);
- two ecological mitigation ponds to the west of Bolsover South viaduct, within an area of landscape mitigation planting, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-458, C5 to D5);
- realignment of The Goit in a south to north direction around the piers of the Bolsover South viaduct (see Volume 2: Map CT-06-458, C5 to D5);
- diversion of Sutton cum Duckmanton Footpath 18, approximately 330m west of its current alignment for 480m, crossing the Proposed Scheme in the A632 Chesterfield Road underbridge (see Volume 2: Map CT-06-458, D5 to F4);
- a balancing pond for railway drainage, 25m west of the route of the Proposed Scheme with access from A632 Chesterfield Road (see Volume 2: Map CT-06-458, E5);
- Carr Vale embankment, 281m in length and up to 17m in height. There would be areas of landscape mitigation planting on both sides of the embankment to provide visual screening to properties along Chesterfield Road and to help integrate the Proposed Scheme into the surrounding landscape. A noise fence barrier would be provided, east of the route of the Proposed Scheme, 100m in length 2m in height, extending from the northern extent of Carr Vale embankment to provide acoustic screening to properties in Bolsover (see Volume 2: Map CT-06-458, E5 to F6);
- realignment of the A632 Chesterfield Road, 40m northwest of its current alignment for 550m, crossing the route of the Proposed Scheme via the A632 Chesterfield Road underbridge. The A632 Chesterfield Road would be closed where it would cross the route of the Proposed Scheme at the Carr Vale embankment (see Volume 2: Map CT-06-458, F2 to F7). A turning head would be provided to facilitate vehicle access on the retained section of the A632 Chesterfield Road to the east and west of the route of the Proposed Scheme (see Volume 2: Map CT-06-458, F5 and F6);
- A632 Chesterfield Road underbridge, 22m in length and 12m below track level (see Volume 2: Map CT-06-458, F5 to F6);
- two balancing ponds for highway drainage 240m and 460m east and west of the Proposed Scheme respectively with access from the realigned Chesterfield Road. There would be areas of landscape planting surrounding the eastern balancing pond to provide visual screening and to help integrate the Proposed Scheme into the landscape (see Volume 2: Map CT-06-458, F2 and F6 to F7);

- an ecological mitigation pond to the east of the route of the Proposed Scheme, east of Carr Vale embankment, within an area of landscape mitigation planting, to provide replacement habitat for great crested newts (see Volume 2: Map CT-06-458, F6);
- a replacement floodplain storage area on the east side of the route of the Proposed Scheme, south-east of the Bolsover North viaduct. Following excavation, the area would be re-graded back to tie into the existing ground level (see Volume 2: Map CT-06-458, F6 to F7);
- Bolsover North viaduct 213m in length and up to 19m in height. A noise fence barrier would be provided, east of the route of the Proposed Scheme, 2m in height, to provide acoustic screening to properties in Bolsover (see Volume 2: Map CT-06-458, F6 to I6);
- Bolsover North embankment, 341m in length and up to 16m in height. There would be areas of landscape mitigation planting on both sides of the embankment to provide visual screening and to help integrate the Proposed Scheme into the surrounding landscape. A noise fence barrier would be provided, east of the route of the Proposed Scheme 2m in height, to provide acoustic screening to properties in Bolsover (see Volume 2: Map CT-06-458, G5 to I6);
- an area of woodland habitat creation to the east of the route of the Proposed Scheme to help integrate the Proposed Scheme into the surrounding landscape and provide replacement woodland habitat (see Volume 2: Map CT-06-458, H6 to H7);
- Snipe Bog culvert, 140m north Bolsover North viaduct, for diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-458, H5 to H6);
- a balancing pond for railway drainage, 65m west of the route of the Proposed Scheme with access from the B6418 Buttermilk Lane to the west (see Volume 2: Map CT-06-458, H4 to H5 and Map CT-06-459-L1 A10 to B9);
- Bolsover cutting, 333m in length, up to 19m in depth, and 139m in width with adjacent landscape mitigation planting on both sides of the cutting, to provide visual screening to properties on Merlin Avenue and Buttermilk Lane, and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-458, I5 to J6 and Map CT-06-459, A5 to C6);
- alteration of the vertical alignment of Woodhouse Lane for a distance of 1.1km to allow it to pass under the Shuttlewood viaduct on its existing alignment (see Volume 2: Map CT-06-459, B8 to D5);
- a balancing pond for highway drainage, 400m east of the route of the Proposed Scheme with access from Woodhouse Lane (see Volume 2: Map CT-06-459, B8 to B9);

- a balancing pond for highway drainage, 200m west of the route of the Proposed Scheme, with access provided from the realigned B6418 Chesterfield Road/Buttermilk Lane (see Volume 2: Map CT-06-459, C4);
- Nether Woodhouse South drop inlet culvert, 50m south of Woodhouse Lane, for diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-459, C5 to C6); and
- Shuttlewood embankment, 41m in length and up to 8m in height. There would be areas of landscape mitigation planting on both sides of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-459, C5 to C6).

2.2.28 This section of the route would include four maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.29 Construction of this section would be managed from the M1 Motorway South viaduct satellite compound, Bolsover South embankment satellite compound, Carr Vale embankment satellite compound and Shuttlewood viaduct satellite compound, which are described in Section 2.3, and shown on maps CT-05-456, CT-05-457, CT-05-458 and CT-05-459 in Volume 2: LA10 Map Book.

Shuttlewood viaduct to Stanfree embankment

2.2.30 The route of the Proposed Scheme would continue on the Shuttlewood viaduct to the west of Shuttlewood, over Woodhouse Lane and Chesterfield Road, before continuing in the Shuttlewood cutting. The route would continue to the end of the Tibshelf to Shuttlewood area on the Stanfree embankment.

2.2.31 This section of route is illustrated on maps CT-06-459 to CT-06-460 in the Volume 2: LA10 Map Book.

2.2.32 Key features of this approximately 2.1km section would include:

- Shuttlewood viaduct 293m in length and up to 13m in height. A noise fence barrier would be provided, east of the route of the Proposed Scheme, 330m in length and 3m in height, extending from the midpoint of Shuttlewood viaduct to Shuttlewood cutting to provide acoustic screening for properties in Bolsover Woodhouse (see Volume 2: Map CT-06-459, C5 to F6);
- realignment of the B6418 Chesterfield Road/Buttermilk Lane 40m to the north of the existing alignment for 630m to cross the route of the Proposed Scheme under Shuttlewood viaduct (see Volume 2: Map CT-06-459, C3 to F7);
- a balancing pond for highway drainage, 250m east of the route of the Proposed Scheme with access from the realigned B6418 Chesterfield Road/Buttermilk Lane (see Volume 2: Map CT-06-454, F7 and F8);

- a balancing pond for railway drainage, 80m west of the route of the Proposed Scheme with access from the B6418 Chesterfield Road/Buttermilk Lane (see Volume 2: Map CT-06-459, E4 to F5);
- diversion of Bolsover Footpath 34 approximately 150m west of its current alignment for 600m, crossing the route of the Proposed Scheme under the Shuttlewood viaduct (see Volume 2: Map CT-06-459, E5 to G5);
- Shuttlewood cutting, 1.4km in length, up to 24m in depth, and 148m in width with adjacent landscape mitigation planting to both sides of the cutting to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-459, E5 to Map CT-06-460, E6). A noise fence barrier would be provided, east of the route of the Proposed Scheme, 210m in length and 2m in height, extending from 120m south of Shuttlewood culvert to 90m north of Shuttlewood culvert, to provide acoustic screening to properties in Shuttlewood (see Volume 2: Map CT-06-459, D6 to F6 and CT-06-459, H5 to I5);
- an area of woodland habitat creation to the west of the route of the Proposed Scheme to provide replacement woodland habitat (see Volume 2: Map CT-06-459, F5);
- two ecological mitigation ponds to the west of Shuttlewood cutting, within an area of landscape mitigation planting, to provide replacement habitat for great crested newt (see Volume 2: Map CT-06-459, I5);
- Shuttlewood culvert for diversion of an unnamed watercourse crossing under the Proposed Scheme (see Volume 2: Map CT-06-459, I5 to I6);
- three ecological mitigation ponds, within an area of landscape mitigation planting to the east of Shuttlewood cutting, to provide replacement habitat for great crested newt (see Volume 2: Map CT-06-459, I6, I7 and J6 and Map CT-06-460-R1 A1 to B2);
- Bolsover Footpath 35 accommodation underbridge, 63m in length, to provide access accommodation for Woodside Farm (see Volume 2: Map CT-06-460, C5 to C6);
- Stanfree embankment, 424m in length and up to 24m in height. There would be areas of landscape mitigation planting on both sides of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-460, E6 to G6); and
- Shuttlewood auto-transformer station, 49m by 24m, on the western side of the route of the Proposed Scheme, within an area of landscape earthworks with landscape plating, west of Stanfree embankment. Access would be provided from Woodthorpe Road (see Volume 2: Map CT-06-460, F5).

2.2.33

This section of the route would include two maintenance access points allowing vehicle access to the route of the Proposed Scheme. There would also be maintenance access routes, hedgerow planting and utilities works within this section,

which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

- 2.2.34 Construction of this section would be managed from the Shuttlewood viaduct satellite compound which is described in Section 2.3, and shown on maps CT-05-459 in Volume 2: LA10 Map Book; and from the M1 Motorway North viaduct satellite compound, in the Staveley to Aston area (see Volume 2: Community Area report LA11, Staveley to Aston).

Demolitions

- 2.2.35 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.
- 2.2.36 At this stage of the design development, it is anticipated that demolition of 11 existing residential properties, 18 commercial/ business properties (including farm outbuildings) and 24 other structures would be required to construct the permanent features in the Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area. The construction arrangements described in this section provide the basis for the assessment presented in this 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 as far 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 Framework²³ 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 offering opportunities to influence them, where appropriate.
- 2.3.9 A draft CoCP has been prepared and is published alongside this document, in Supporting document: Draft Code of Construction Practice. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

- 2.3.10 Building and preparing the Proposed Scheme for operation will comprise the following general stages:
- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;

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

- civil engineering works including: establishment of construction compounds; haul roads, site preparation and enabling works; main earthworks and structure works; 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:

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

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

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

General overview of construction compounds

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

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

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

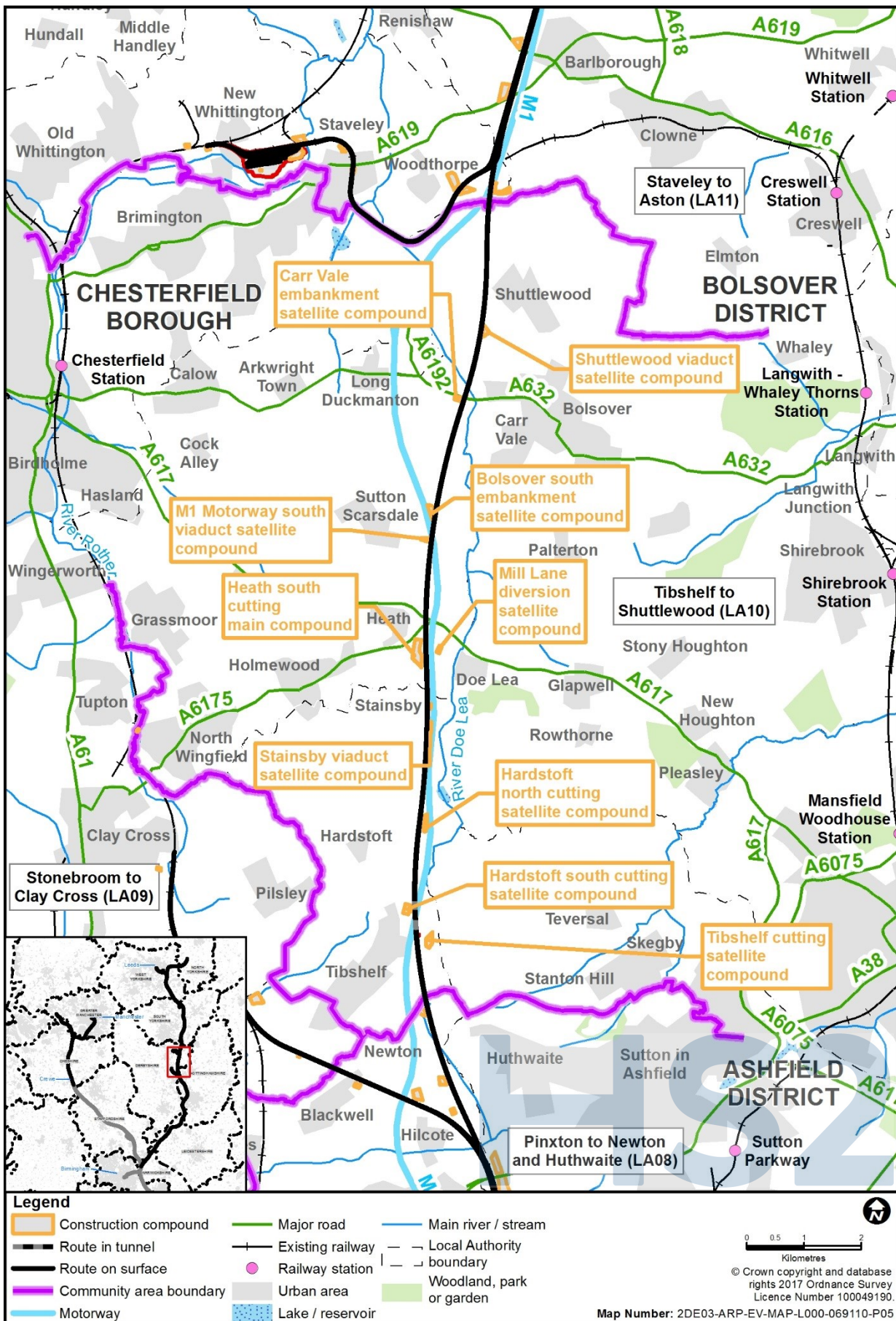
2.3.18 One main civil engineering compound, the Heath South cutting main compound, would be located in the Tibshelf to Shuttlewood area. This would manage nine civil engineering satellite compounds in the Tibshelf to Shuttlewood area and one civil engineering satellite compound (M1 Motorway North viaduct satellite compound) in the Staveley to Aston area (see Volume 2: Community Area report LA11, Staveley to Aston).

- 2.3.19 Following completion of the civil engineering works, five of these compounds would continue to be used as railway installation satellite compounds. Staveley railhead main compound, located in the Staveley to Aston area (see Volume 2: Community Area report LA11, Staveley to Aston) would be used to manage the railways installation satellite compounds in the Tibshelf to Shuttlewood area as well as the movement of imported track ballast and railway installation materials, by rail, throughout the eastern leg of the Proposed Scheme.
- 2.3.20 The location of construction compounds in the Tibshelf to Shuttlewood area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA10 Map Book) show in detail the locations of the construction compounds described below.

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Figure 4: Location of construction compounds in the Tibshelf to Shuttlewood area



- 2.3.21 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.
- 2.3.22 In the Tibshelf to Shuttlewood area, there would be no worker accommodation required.
- 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 topsoil and subsoil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-451 to CT-05-460, in the Volume 2: LA10 Map Book.
- 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 Tibshelf to Shuttlewood 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 and are shown on Map CT-05-451 and Map CT-05-460 in the Volume 2: LA10 Map Book.

Construction compounds

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

Figure 5: Construction compounds for civil engineering works

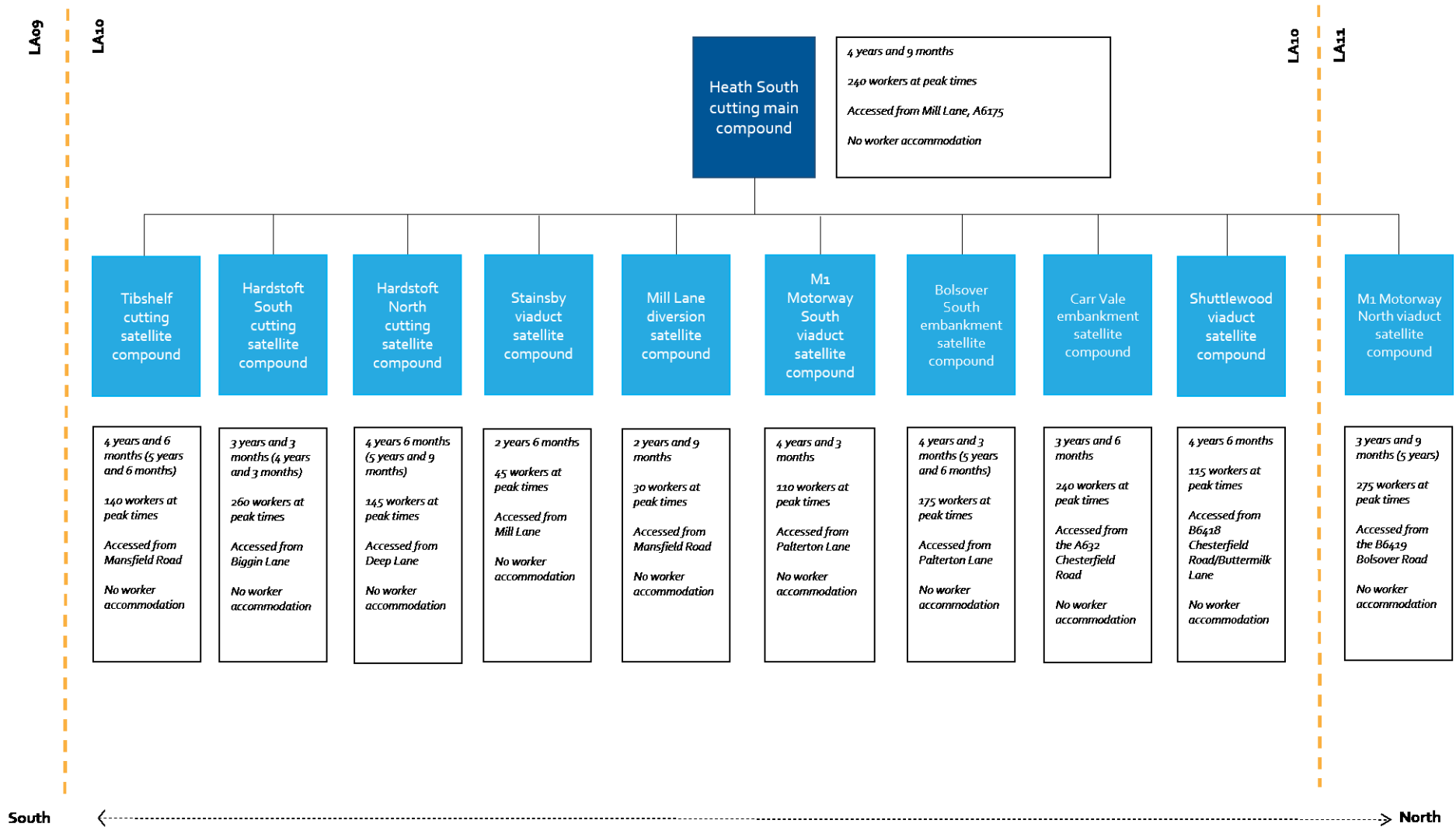
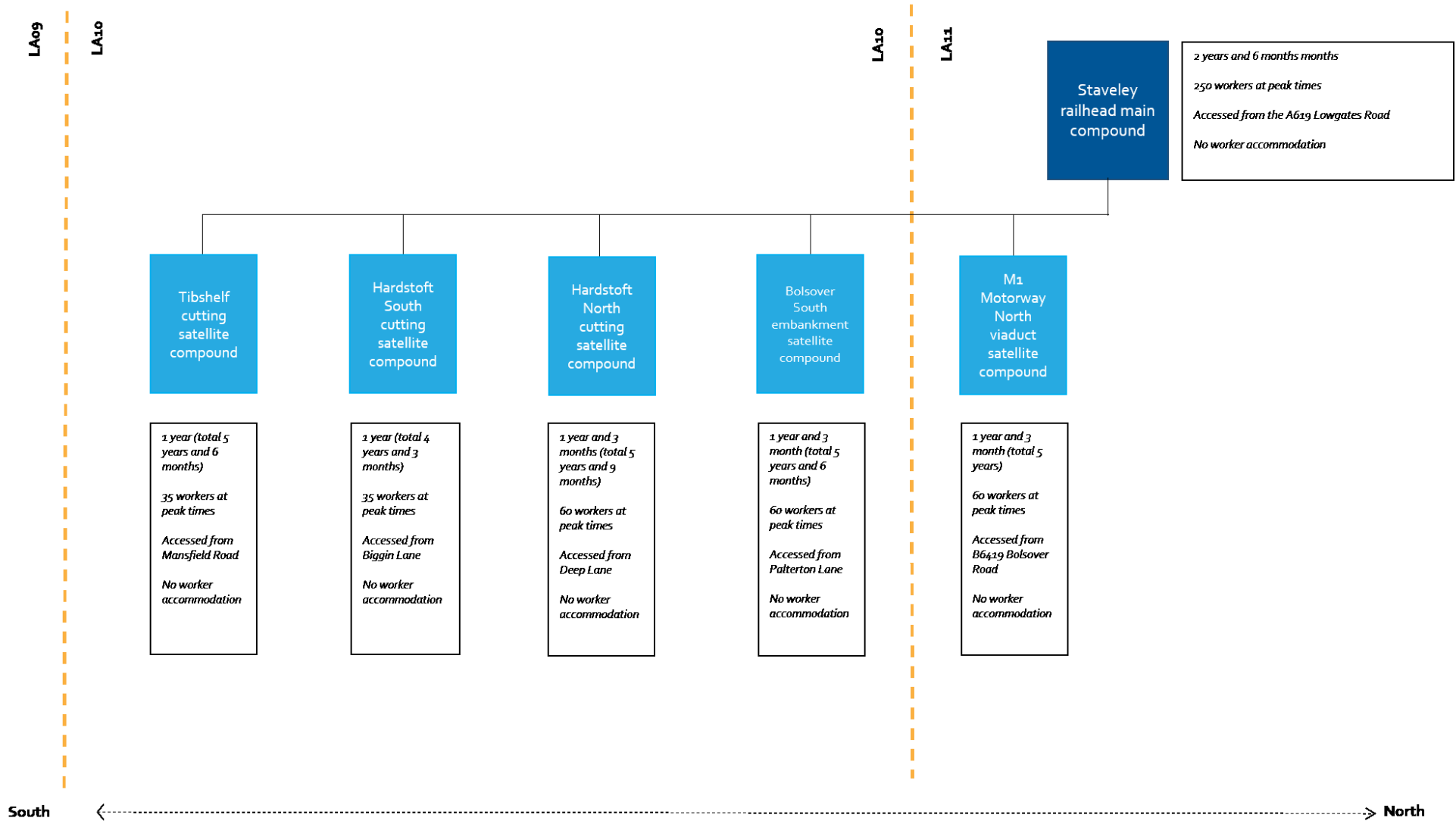


Figure 6: Construction compounds for railway systems installation works



Heath South cutting main compound

- 2.3.30 This compound would be used to manage civil engineering works and provide main compound support to nine satellite compounds in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 for the civil engineering works (see Volume 2: Map CT-05-455, D5 to G4).
- 2.3.31 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the Heath South cutting main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Church Lane, Heath	Heath North cutting
Commercial		
Motorway maintenance depot and associated infrastructure	Heath Road, Heath	Heath South cutting
Other		
Ambulance station and associated infrastructure	Heath Road, Heath	Heath South cutting
Heath Old Church	Old Graveyard, Church Lane, Heath	Heath North cutting
Motorway police depot	Heath intersection, Heath Road, Heath	Stainsby North embankment

- 2.3.32 The compound would be used to manage the construction of the Stainsby viaduct, which would take one year and nine months to complete.
- 2.3.33 The compound would be used to manage the construction of the following embankments and cuttings:
- Stainsby North embankment, which would take one year to complete;
 - Heath South cutting, which would take one year and six months to complete;
 - Heath Central cutting, which would take six months to complete; and
 - Heath North cutting, which would take one year and six months to complete.
- 2.3.34 The compound would be used to manage a concrete batching plant to provide concrete supply for construction works across the Proposed Scheme and would be accessed from Mill Lane and the A6175. The concrete batching plant would be located at this compound for a period of 4 years and 6 months.
- 2.3.35 This compound would manage the Heath South cutting transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the A6175 and via site haul routes (Volume 2: Map CT-05-455, E3 to G4).
- 2.3.36 The works to be managed from this compound would require the following works to public roads:

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- temporary diversions of the A6175 and A617 for a period of two years, with users diverted to the west of the existing alignment; and
- permanent modifications of the M1 junction 29 including the construction of Junction 29 M1 Interchange South overbridge, Heath and Holmewood Footpath 25 underbridge and Junction 29 M1 Interchange North overbridge for a period of one year.

2.3.37 The works to be managed from this compound would require the construction of the Gildageforge culvert which would take six months to complete for the diversion of an unnamed watercourse.

2.3.38 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

Tibshelf cutting satellite compound

2.3.39 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-452, B8 to C7) for a period of four years and six months. On completion of civil engineering works, this compound would remain as a satellite compound for railway systems installation works for a period of one year.

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

Table 2: Demolitions required as a result of the works to be managed from the Tibshelf cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Saw Pit Lane, Tibshelf	Tibshelf cutting
Two residential properties on Mansfield Road	Mansfield Road, Tibshelf	Tibshelf cutting
Residential property	Hurst Farm, Mansfield Road, Tibshelf	Tibshelf cut and cover tunnel
Commercial		
Ten commercial units at Saw Pit Lane Industrial Estate	Saw Pit Lane Industrial Estate, Tibshelf	Tibshelf cutting
Outbuildings at Hurst Farm	Hurst Farm, Mansfield Road, Tibshelf	Tibshelf cut and cover tunnel
Other		
Three outbuilding	Saw Pit Lane, Tibshelf	Tibshelf cutting
Three outbuildings	Mansfield Road, Tibshelf	Tibshelf cutting
Gantry	M1, Tibshelf	Tibshelf cut and cover tunnel

2.3.41 The compound would be used to manage the construction of the Tibshelf cutting, which would take three years and three months to complete.

- 2.3.42 The compound would be used to manage the construction works associated with the Tibshelf cut and cover tunnel as follows:
- the porous portal at the southern end of Tibshelf cut and cover tunnel, which would take three months to complete;
 - tunnel portal building and rescue area at the southern end of Tibshelf cut and cover tunnel, which would take six months to complete; and
 - the southern section of Tibshelf cut and cover tunnel, which would take two years and three months to complete.
- 2.3.43 The works to be managed from this compound would require the following works to public roads:
- construction of an overbridge to carry the B6014 Mansfield Road, which would take one year and three months to complete;
 - the temporary diversion of the B6014 Mansfield Road, with users diverted to the north of its existing alignment. On completion of construction of the B6014 Mansfield Road overbridge, the B6014 Mansfield Road would be reinstated to its existing alignment; and
 - the temporary diversion of the M1, with users diverted to the west of its existing alignment. On completion of construction of the Tibshelf cut and cover tunnel, the M1 would be reinstated to its existing alignment, which would take three months to complete.
- 2.3.44 The works to be managed from this compound would require the following works to PRoW:
- permanent realignment of Tibshelf Bridleway 21 to the north-west of its current alignment;
 - temporary diversion of Tibshelf Footpath 46, for a period of two years, with users diverted to the west, around the perimeter of the Tibshelf cutting. On completion of construction, Tibshelf Footpath 46 would be permanently diverted for 230m to the west of its existing alignment to connect with Newtonwood Lane; and
 - temporary diversion of Tibshelf Footpath 35, for a period of four years, with users diverted to the east of Tibshelf cutting. On completion of construction, Tibshelf Footpath 35 would be permanently diverted for 210m onto the B6014 Mansfield Road.
- 2.3.45 The works to be managed from this compound would require the permanent diversion of an unnamed watercourse around the north-east edge of the Tibshelf cutting, which would take three months to complete.
- 2.3.46 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.47 Key railway systems installation works to be managed from this compound would include construction and fit out of the portal building, which would take one year to complete.

Hardstoft South cutting satellite compound

2.3.48 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-452, E5 to F4) for a period of three years and three months. On completion of civil engineering works, this compound would remain as a satellite compound for railway systems installation works for a period of one year.

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

Table 3: Demolitions required as a result of the works to be managed from the Hardstoft South cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Garage	Hawking Lane, Stainsby	Stainsby South embankment
Utilities infrastructure	Mill Lane, Stainsby	Stainsby viaduct

2.3.50 The compound would be used to manage the construction of the following embankments and cuttings:

- Hardstoft south cutting, which would take one year and six months; and
- Hardstoft south embankment, which would take six months to complete.

2.3.51 The compound would be used to manage the construction works associated with the Tibshelf cut and cover tunnel as follows:

- the northern section of Tibshelf cut and cover tunnel, which would take two years and three months to complete;
- the porous portal at the northern end of Tibshelf cut and cover tunnel, which would take three months to complete; and
- tunnel portal building and rescue area at the northern end of Tibshelf cut and cover tunnel, which would take six months to complete.

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

- construction of an overbridge to carry Tibshelf Footpath 33, which would take six months to complete;
- temporary diversion of Tibshelf Footpath 33 for a period of four years, with users diverted to the west, around the Hardstoft South cutting. On completion of construction, Tibshelf Footpath 33 would be permanently diverted for 850m over Tibshelf cut and cover tunnel onto Tibshelf Footpath 33 overbridge; and

- temporary diversion Tibshelf Footpath 32 for a period of three years, with users diverted to the west. On completion of construction, Tibshelf Footpath 32 would be permanently diverted for 1km and would cross over Tibshelf cut and cover tunnel on the Tibshelf Footpath 33 overbridge.

2.3.53 The works to be managed from this compound would require the following works to watercourses:

- Lane End drop inlet culvert which would take six months to complete for the diversion of an unnamed watercourse; and
- Ridlocks Wood culvert which would take six months to complete for the diversion of an unnamed watercourse.

2.3.54 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.55 Key railway systems installation works to be managed from this compound would include construction and fit out of the portal building, which would take one year to complete.

Hardstoft North cutting satellite compound

2.3.56 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-453, E6 to F6) for a period of four years and six months. On completion of civil engineering works, this compound would remain as a satellite compound for railway systems installation works for a period of one year and three months.

2.3.57 No demolitions 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 the construction of the following embankments and cuttings:

- Hardstoft North cutting, which would take two years and six months to complete;
- Hardstoft North embankment, which would take nine months to complete;
- Astwith cutting, which would take two years to complete; and
- Stainsby South embankment, which would take nine months to complete.

2.3.59 The works to be managed from this compound would require the following works to public roads:

- construction of an overbridge to carry Deep Lane over the route of the Proposed Scheme, which would take one year to complete. During construction, there would be a temporary diversion of Deep Lane to the south of the current alignment, for a duration of one year;

- permanent diversion of Hawking Lane to the west of the current alignment, which would take one year and nine months to complete;
- permanent closure of Hawking Lane, east of the route of the Proposed Scheme; and
- permanent modifications to Astwith Lane, which would take six months to complete.

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

- temporary diversion of the Ault Hucknall Footpath 18 for a period of one year, with users diverted to the west, around the Hawking Lane diversion cutting. On completion of construction, Ault Hucknall Footpath 18 would be permanently diverted 650m to the south of its existing alignment onto the Deep Lane overbridge to cross the route of the Proposed Scheme;
- temporary diversion of the Ault Hucknall Footpath 17 for a period of two years, with users diverted to the west of the Proposed Scheme. On completion of construction, Ault Hucknall Footpath 17 would be permanently diverted 650m to the south of its current alignment onto Deep Lane overbridge to cross the route of the Proposed Scheme;
- permanent diversion of Ault Hucknall Footpath 37, 50m to the west of its current alignment to join Mill Lane; and
- permanent diversion of Ault Hucknall Footpath 16 for 720m west of its current alignment to join Mill Lane.

2.3.61 The works to be managed from this compound would require the construction of the Cockshutt Woods drop inlet culvert, which would take six months to complete, for the diversion of an unnamed watercourse.

2.3.62 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.63 Key railway systems installation works to be managed from this compound would include construction of the Great Pond auto-transformer station, which would take one year and three months to complete.

Stainsby viaduct satellite compound

2.3.64 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-454, F6 to G6 and H6) for a period of two years and six months.

2.3.65 There would be no worker accommodation associated with this compound.

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

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Table 4: Demolitions required as a result of the works to be managed from the Stainsby viaduct satellite compound

Description	Location	Feature resulting in the demolition
Other		
Pylon	Land north of Mill Lane	Heath South cutting

2.3.67 The compound would be used to manage the construction of the Stainsby viaduct, which would take one year and nine months to complete.

2.3.68 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

Mill Lane diversion satellite compound

2.3.69 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-455, E7, F7 and F8) for a period of two years and nine months.

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

2.3.71 The compound would be used to manage the construction of the Heath South cutting, which would take one year and six months to complete.

2.3.72 The works to be managed from this compound would require the following works to public roads:

- construction of the permanent diversion of Mill Lane to the east of the Proposed Scheme, which would take one year and three months to complete; and
- permanent closure of Mill Lane, in two locations, to the north and east of Stainsby.

2.3.73 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

M1 Motorway South viaduct satellite compound

2.3.74 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-456, H4 and H5).

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

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Table 5: Demolitions required as a result of the works to be managed from the M1 Motorway South viaduct satellite compound

Description	Location	Feature resulting in the demolition
Other		
Pylon	Land west of M1	Heath embankment

2.3.76 The compound would be used to manage the construction of the M1 Motorway South viaduct, which would take one year and six months to complete.

2.3.77 The compound would be used to manage the construction of the Heath embankment, which would take two years and six months to complete.

2.3.78 This compound would manage the Heath Embankment transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the A617 and via site haul routes (Volume 2: Map CT-05-456, C5 to D5).

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

- construction of an accommodation underbridge to carry Heath and Holmewood Footpath 1 under the route of the Proposed Scheme, which would take six months to complete. On completion of construction, Heath and Holmewood Footpath 1 would be permanently realigned onto to Heath and Holmewood Footpath 1 accommodation underbridge;
- temporary diversion of the Heath and Holmewood Footpath 14 for a period of two years, with users diverted to the north of its current alignment linking with Heath and Holmewood Footpath 2; and
- permanent M1 Sutton Scarsdale Northbound Carriageway realignment which would take nine months to complete.

2.3.80 The works to be managed from this compound would require the construction of Owlcotes Wood culvert which would take six months to complete for the diversion of an unnamed watercourse.

2.3.81 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

Bolsover South embankment satellite compound

2.3.82 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-457, B5, C5 and C4) for a period of four years and three months. On completion of civil engineering works this compound would remain as a satellite compound for railway systems installation works for a period of one year and three months.

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

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

Description	Location	Feature resulting in the demolition
Other		
Gantry	M1, Bolsover	M1 Motorway South viaduct

2.3.84 The compound would be used to manage the construction of the M1 Motorway South viaduct, which would take one year and six months to complete.

2.3.85 The compound would be used to manage the construction of the Bolsover South embankment, which would take two years and six months to complete.

2.3.86 The works to be managed from this compound would require the construction of an underbridge to carry Palterton Lane under the route of the Proposed Scheme, which would take one year to complete.

2.3.87 The works to be managed from this compound would require the construction of an underbridge to carry the Sutton cum Duckmanton Footpath 19, which would take six months to complete. During construction, there would be a temporary diversion of Sutton cum Duckmanton Footpath 19 for a period of one year, with users diverted to the east of its current alignment using Palterton Lane to cross the route of the Proposed Scheme. On completion of construction, Sutton cum Duckmanton Footpath 19 would be permanently realigned onto the Sutton cum Duckmanton Footpath 19 accommodation underbridge.

2.3.88 The works to be managed from this compound would require the following works to watercourses:

- Palterton culvert, which would take six months to complete for the diversion of an unnamed watercourse; and
- Carr Vale culvert, which would take six months to complete for the diversion of an unnamed watercourse.

2.3.89 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.90 Key railway systems installation works to be managed from this compound would include construction of the Sutton Scarsdale auto-transformer station, which would take one year and three months to complete.

Carr Vale embankment satellite compound

2.3.91 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-458, E4, E5 and F5).

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

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

Description	Location	Feature resulting in the demolition
Commercial		
Farm outbuildings	A632 Chesterfield Road, Bolsover	Carr Vale embankment
Other		
Solar panels	A632 Chesterfield Road, Bolsover	Carr Vale embankment

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

- Bolsover South viaduct, which would take two years and six months to complete; and
- Bolsover North viaduct, which would take two years to complete.

2.3.94 The compound would be used to manage the construction of the Carr Vale embankment, which would take one year to complete.

2.3.95 The works to be managed from this compound would require the construction of an underbridge to carry the A632 Chesterfield Road, which would take one year to complete. The works to be managed from this compound would require the temporary diversion of Sutton cum Duckmanton Footpath 18 for a period of three years, with users diverted to the west of its current alignment. On completion of construction, Sutton cum Duckmanton Footpath 18 would be permanently diverted 480m to the west of its existing alignment to connect with the A632 Chesterfield Road.

2.3.96 The works to be managed from this compound would require the permanent diversion of The Goit in a south to north direction around the piers of the Bolsover South viaduct, which would take three months to complete.

2.3.97 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

Shuttlewood viaduct satellite compound

2.3.98 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood area, as illustrated in Figure 5 (see Volume 2: Map CT-05-459, D7, D6 and E6).

2.3.99 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 8.

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Table 8: Demolitions required as a result of the works to be managed from the Shuttlewood viaduct satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Two business units at Bolsover Business Park	Bolsover Business Park, Bolsover	Bolsover North embankment
Other		
Outbuilding	Land north of Bolsover Business Park	Bolsover North embankment
Two outbuildings	B6418 Buttermilk Lane, Bolsover	Access track for railway balancing pond
Outbuilding	Woodhouse Lane, Bolsover, close to junction with Chesterfield Road	Shuttlewood embankment

- 2.3.100 The compound would be used to manage the construction of the Shuttlewood viaduct, which would take two years to complete.
- 2.3.101 The compound would be used to manage the construction of the following embankments and cuttings:
- Bolsover North embankment, which would take two years and six months to complete;
 - Bolsover cutting, which would take one year to complete; and
 - Shuttlewood embankment, which would take six months to complete.
- 2.3.102 The works to be managed from this compound would require the following works to public roads:
- temporary diversion of Woodhouse Lane for a period of one year, with users diverted to the east of its existing alignment to join onto the A632 Chesterfield Road to cross the route of the Proposed Scheme. On completion of construction, Woodhouse Lane would be permanently realigned to the west of its existing alignment; and
 - permanent realignment of the B418 Chesterfield Road/Buttermilk Lane to the north of its existing alignment.
- 2.3.103 The works to be managed from this compound would require the following works to watercourses:
- Snipe Bog culvert which would take six months to complete for the diversion of an unnamed watercourse; and
 - Nether Woodhouse drop inlet culvert which would take six months to complete for the diversion of an unnamed watercourse.
- 2.3.104 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

M1 Motorway North viaduct satellite compound

- 2.3.105 This compound would be used to manage civil engineering works in the Tibshelf to Shuttlewood (LA10), and in the Staveley to Aston area (LA11) as illustrated in Figure 5 (see Volume 2: Map CT-05-460, I8 to I7 and I6 to J6) for a period of three years and nine months. On completion of civil engineering works, this compound would remain as a satellite compound for railway systems installation works for a period of one year and three months. The works detailed below are those that would be undertaken within the Tibshelf to Shuttlewood area.
- 2.3.106 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 9.

Table 9: Demolitions required as a result of the works to be managed from the M1 Motorway North satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Three residential properties and outbuildings on Chesterfield Road	Chesterfield Road, Shuttlewood	Shuttlewood cutting
Residential property	Woodhouse Farm, Chesterfield Road, Shuttlewood	Shuttlewood cutting
Two residential properties and outbuildings on Woodthorpe Road	Woodthorpe Road, Shuttlewood	Shuttlewood cutting
Commercial		
Outbuildings at Woodhouse Farm	Woodhouse Farm, Chesterfield Road, Shuttlewood	Shuttlewood cutting
Farm outbuildings	Land off Chesterfield Road, Shuttlewood	Shuttlewood cutting
Farm outbuildings	Woodthorpe Road, Shuttlewood	Shuttlewood cutting
Other		
Outbuilding	Chesterfield Road, south-west of Shuttlewood	Shuttlewood cutting
Two gantries	M1	Stanfree embankment
Outbuilding	Seymour Link Road, Markham Vale, North Development, south of Woodthorpe	Staveley East embankment

- 2.3.107 The compound would be used to manage the construction of the following embankments and cuttings:
- Shuttlewood cutting, which would take two years and three months to complete; and
 - Stanfree embankment, which would take one year to complete.
- 2.3.108 The works to be managed from this compound would require the temporary diversion of the B6419 Woodthorpe Road for a period of two years, with users diverted to the east of its existing alignment.

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

- temporary diversion of the Bolsover Footpath 34 for a period of three years, with users diverted to the west of its existing alignment. On completion of construction, the Bolsover Footpath 34 would be permanently realigned around a pier of the Shuttlewood viaduct and to the west of the route of the Proposed Scheme;
- temporary diversion of the Bolsover Footpath 27 for a period of three years, with users diverted to the east of its existing alignment; and
- construction of an overbridge to carry the Bolsover Footpath 35, which would take six months to complete. During construction, there would be temporary diversion of the Bolsover Footpath 35 to the east of its existing alignment, for a period of three years. On completion of construction, the Bolsover Footpath 35 would be permanently realigned onto the Bolsover Footpath 35 accommodation overbridge to cross the route of the Proposed Scheme.

2.3.110 The works to be managed from this compound would require the construction of Shuttlewood culvert which would take six months to complete for the diversion of an unnamed watercourse.

2.3.111 It is currently anticipated that temporary or permanent diversions of utilities may be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.112 Key railway systems installation works to be managed from this compound would include construction of the Shuttlewood auto-transformer station, which would take one year and three months to complete.

Transfer nodes

2.3.113 Transfer nodes are areas for the storage and loading and unloading of bulk earthworks material, which is moved to and from the site on public highways.

2.3.114 Within the Tibshelf to Shuttlewood area, two transfer nodes would be established at the following locations:

- Heath South cutting transfer node, adjacent to A6175 and Heath South cutting main compound (Volume 2: LA10 Map Book, Map CT-05-455, E3 to G4); and
- Heath embankment transfer node, adjacent to Heath embankment (Volume 2: LA10 Map Book, Map CT-05-456, C4 to D5).

Motorway crossing works

2.3.115 The M1 crossing at Tibshelf cut and cover tunnel would be constructed using standard construction techniques. To maintain safe operation of the M1 it would be necessary to construct a temporary realignment. The M1 realignment works would be conducted under traffic management. The construction of the M1 crossings in this area would be coordinated to reduce the overall duration of disruption.

Construction waste and material resources

- 2.3.116 Excavated material (defined as excluding topsoil and subsoil) 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.
- 2.3.117 Forecasts of the amount of construction, demolition and excavation waste that would be produced during construction of the Proposed Scheme are reported in Volume 3: Route-wide effects.
- 2.3.118 Local excess or shortfall of excavated material within the Tibshelf to Shuttlewood area would be managed through the integrated 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

- 2.3.119 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

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

Monitoring during construction

- 2.3.121 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.
- 2.3.122 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.

2.4 Operation of the Proposed Scheme

Introduction

- 2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Tibshelf to Shuttlewood 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 seven trains per hour each way passing through the Tibshelf to Shuttlewood 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 zoom trains or two zoom 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 infrastructure maintenance depot (IMD) in the Staveley to Aston area (LA11). Further information on the Staveley IMD can be found in Volume 2: Community Area Report LA11: Staveley to Aston.

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

Sheffield spur alignment

- 2.5.1 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the route of the Sheffield spur (which falls within the Pinxton to Newton and Huthwaite area (LA08) and the the Stonebroom to Clay Cross area (LA09), as well as the Tibshelf to Shuttlewood area). The route of the Sheffield spur would provide a link from the HS2 main line to the existing conventional rail network, connecting to either the Erewash Valley Line or MML, providing for services to Sheffield and Chesterfield. Four options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered. A summary of the outcomes of the preliminary appraisal of the alternative options is described in Volume 2, Community area report LA08, Pinxton to Newton and Huthwaite.

Heath cut and cover tunnel

- 2.5.2 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the route where it would pass Heath. The route of the Proposed Scheme would pass to the east of Heath in cutting, before passing under the M1 junction 29. Design options were available for the Heath cut and cover tunnel. These options presented opportunities to simplify the construction methods, create smaller structures, and reduce the disruption to the exiting road network. The length of the tunnel would be 170m.
- 2.5.3 The following five options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:
- Option O (the route announced in July 2017): a cut and cover tunnel with piled concrete walls (the baseline option). Option O would consist of a reinforced concrete box structure with piled walls. The total length of the tunnel would be 170m, and the width of the tunnel would be 17m with a central wall between the rail tracks. The maximum height of the cutting required would be 16m. The roof of the tunnel could be a cast in-situ slab or use precast beams;
 - Option A: a cut and cover tunnel in the form of a concrete box formed in-situ with a central wall. Option A would comprise the use of temporary methods of soil support and bottom up construction of a reinforced concrete box structure. The geometry of the tunnel would be as described for the baseline option, Option O;
 - Option B: a cut and cover tunnel in the form of a prefabricated concrete box jacked into place. Option B would comprise a combination of jacked box and cut and cover tunnel. The total length of the jacked box is assumed to be 50m and the cut and cover tunnel 120m. The jacked box section could be installed as either one box, 17m wide, or two boxes side by side, each 8.5m wide;
 - Option C: a cut and cover tunnel in the form of a concrete box formed in-situ without a central wall. Option C would be similar to both Options O and A.

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However, no central wall would be constructed between the tracks. The concrete box would be 170m in length, 22m wide and 16m in height; and

- Option D: a retained cut with piled concrete walls, crossed by two single span overbridges, requiring elongation of the existing motorway junction. The proposed spans over the HS2 main line would be 23m in length, and a bridge deck 1.4m in depth made from either concrete or steel beams.

2.5.4 Table 10 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 10: Consideration of local alternatives for the route of the Proposed Scheme through Heath

Option	Outcome of analysis	Further action/considerations
Option O	<ul style="list-style-type: none"> • Less land required compared to the Proposed Scheme. • Similar air quality, water resources and flood risk, landscape and visual, and ecology impacts compared to the Proposed Scheme. • Marginally fewer historic environment impacts compared to the Proposed Scheme. • Greater disruption to vehicles using M1 junction 29 during construction compared to the Proposed Scheme. • Less opportunity to improve permanent traffic flows from the junction reconfiguration compared to the Proposed Scheme. • Longer construction programme compared to the Proposed Scheme. • Higher costs compared to the Proposed Scheme. 	This option will not be subject to further consideration
Option A	<ul style="list-style-type: none"> • Less land required compared to the Proposed Scheme. • Similar air quality, water resources and flood risk, and landscape and visual impacts compared to the Proposed Scheme, but overall marginally greater ecology impacts than the Proposed Scheme due to increased hedgerow removal. • Marginally fewer historic environment impacts compared to the Proposed Scheme. • Similar disruption to vehicles using M1 junction 29 during construction as the Proposed Scheme. • Less opportunity to improve permanent traffic flows from the junction reconfiguration compared to the Proposed Scheme. • Longer construction programme compared to the Proposed Scheme. • Higher costs compared to the Proposed Scheme. 	This option will not be subject to further consideration
Option B	<ul style="list-style-type: none"> • Less land required compared to the Proposed Scheme. • Similar air quality, water resources and flood risk, landscape and visual impacts compared to the Proposed Scheme, but overall marginally fewer ecology impacts than the Proposed Scheme due to less hedgerow removal. 	This option will not be subject to further consideration

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Option	Outcome of analysis	Further action/considerations
	<ul style="list-style-type: none"> • Marginally fewer historic environment impacts compared to the Proposed Scheme. • Less disruption to vehicles using M1 junction 29 during construction compared to the Proposed Scheme. • Less opportunity to improve permanent traffic flows from the junction reconfiguration compared to the Proposed Scheme. • Longer construction programme compared to the Proposed Scheme. • Higher costs compared to the Proposed Scheme. 	
Option C	<ul style="list-style-type: none"> • Less land required compared to the Proposed Scheme. • Similar air quality, water resources and flood risk, landscape and visual impacts compared to the Proposed Scheme, but overall marginally fewer ecology impacts than the Proposed Scheme due to less hedgerow removal. • Marginally fewer historic environment impacts compared to the Proposed Scheme. • Greater disruption to vehicles using M1 junction 29 during construction compared to the Proposed Scheme. • Less opportunity to improve permanent traffic flows from the junction reconfiguration compared to the Proposed Scheme. • Longer construction programme compared to the Proposed Scheme. • Higher costs compared to the Proposed Scheme. 	This option will not be subject to further consideration
Option D (the Proposed Scheme)	<ul style="list-style-type: none"> • Greater land required compared to the alternative options. • Similar air quality, water resources and flood risk, landscape and visual, ecology and biodiversity impacts compared to alternative options, although marginally greater impacts on ecology when compared to Option B and Option C. • Increased potential for impacts on historic environment through disturbance of unrecorded archaeological remains associated with the village of Heath. • Less disruption to vehicles using the M1 junction 29 during construction compared to alternative options (apart from Option O and Option B), as the permanent extended junction would be constructed as part of the temporary works. • Greater opportunity to improve permanent traffic flows from the junction reconfiguration compared to alternative options. • Shorter construction programme (as two structures can be constructed in parallel) compared to the alternative options. • Overall a simplified construction method and reduced temporary works, compared to alternative options, with lowest costs and lowest programme risk. 	This is the selected option carried into the Proposed Scheme

- 2.5.5 Option D was taken forward into the Proposed Scheme. Option O would have similar environmental impacts, while Option A would result in more hedgerow removal and as a result, greater ecology and biodiversity impacts, compared to the Proposed Scheme. Both Options O and A would cost more to construct than the Proposed Scheme. Options B and C would have fewer environmental impacts overall, but this was not considered sufficient to justify the disproportionately higher cost, particularly when the community connectivity benefits of Option D in relation to the footpaths through the junction are taken into account.
- 2.5.6 All options would require temporary realignment of junction 29 of the M1 to allow its continued use by traffic, and this would be likely to result in the loss of trees to the west that screen the junction from the area around Heath. In all cases, replacement planting would be considered.
- 2.5.7 Options O, A, B and C would sever an underpass on the west side of the existing motorway roundabout that links footpaths west of the M1 with footpaths east of the M1, both north and south of the A617, forming an important community link. These options would require replacement of the underpass with at-grade crossings or a raised footbridge, resulting in visual impacts, whereas the permanent realignment of the highway for Option D means that it would enable the replacement of the underpass similar to the existing underpass.
- 2.5.8 Option D would be open cut, whereas the other options would be covered over to form a cut and cover type tunnel. However, as trains would be in a vertical-sided cut between 12m and 15m deep, it is unlikely that any difference in noise or visual impact would be significant. Option D would also require the permanent highway infrastructure to be 60m closer to properties in Heath, as result of the junction extension. Option D would provide a greater opportunity to improve the permanent traffic flows from the junction reconfiguration.

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 11.

Table 11: 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

Engagement and consultation activity and mechanisms	Date
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 Summary 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 Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area since the 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 including at Stainsby and Bolsover;
 - provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
 - retention or realignment of PRoW including at Carr Vale Nature Reserve and the Stockley trail to TransPennine trail;
 - temporary or permanent changes to road access, including Mill Lane near Stainsby and the M1 junction 29 and re-alignment of Buttermilk Lane;

- the potential noise impact which would occur, both during construction and operation, to those communities closest to the route including Tibshelf, Stainsby, Heath and Bolsover;
- issues around traffic on the A632 during construction;
- impacts on access to local community, educational, care, sporting, leisure and/or cultural facilities including at Heath Old Church, Hardwick Hall, Stainsby Mill, Sutton Scarsdale, Carr Vale nature reserve, Peter Fidler nature reserve, Snipe Bog and Poolsbrook Country Park;
- temporary and permanent impacts to Heath Old Church;
- the potential severance of communities during construction and operation, including all satellite hamlets of Ault Hucknall Parish Council;
- impacts to local businesses including at Saw Pit Lane industrial estate and the former Coalite site at Bolsover; and
- visual impact on the landscape including at Hardwick Hall, Sutton Scarsdale and Bolsover Castle.

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 Tibshelf to Shuttlewood 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

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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 12 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 12: Engagement to date with community stakeholders

Stakeholder	Area of focus
Lee Rowley MP for North East Derbyshire	Discussion with MP for North East Derbyshire around general issues concerning the Proposed Scheme within the Tibshelf to Shuttlewood area, mainly focusing on local residents and businesses.
Derbyshire Local Access Forum	Initial meetings have taken place with LAF to discuss potential impacts of the Proposed Scheme on outdoor recreation, PROWs, and access to the countryside.
Diocese of Derby and Minister for Old Heath Church	Meeting with the Diocese of Derby and Minister to discuss the Proposed Scheme design and its potential impact on the ruins of Old Heath Church.
Bolsover School	Engagement with Year 10 pupils regarding career opportunities.
Residents of Heath	To discuss potential disruption during construction of the Proposed Scheme, including noise impacts, increase in traffic congestion and property blight.

Local authorities and parish councils

- 3.4.6 Direct engagement has been undertaken with county, borough, district and parish councils within the Tibshelf to Shuttlewood 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 of the Proposed Scheme.
- 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 13.

Table 13: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Sheffield 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.
Derbyshire County Council	General introductory and project update meetings, including briefings to the Council leaders. Discussion on needs of LA, including approach to engagement with stakeholders.
	Meeting to discuss way a forward with organising technical meetings and what potential future meetings are likely to involve.

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Stakeholder	Area of focus
	Meetings with technical leads to collate data and discuss key assessment topics including; community and equality issues; ecology; flood risk, drainage and water; historic environment; landscape and visual issues; land quality; geotechnics; road diversions, realignments and structures; traffic and transport; utilities; and waste and material resources.
	Meeting to discuss Transport Assessment Scoping Report and Modelling.
	Meeting to discuss access to land owned by Derbyshire County Council.
	Meeting to discuss definitive, non-definitive and planned future trails and PRoW alignments crossed by the route, and mitigation options.
	HS2 Ltd also attended a Department for Transport workshop with Derbyshire County Council and other local authorities in the East Midlands responsible for the East Midlands HS2 Growth Strategy. Derbyshire County Council shared their aspirations for a main construction compound at Staveley and for an extra train to stop at Chesterfield.
North East Derbyshire District Council	General introductory and project update meetings, including briefings to Council leaders and elected members. Discussion on needs of LA, including approach to engagement with stakeholders.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; community and equality issues; ecology; historic environment; landscape and visual issues; land quality; geotechnics; socio-economics; sound, noise and vibration; utilities; and waste and material resources.
	Meeting to discuss Transport Assessment Scoping Report and Modelling.
	Meeting to discuss access to land owned by North East Derbyshire District Council.
Bolsover District Council	General introductory and project update meetings, including briefings to Council leaders and elected members. Discussion on needs of LA, including approach to engagement with stakeholders.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; community and equality issues; ecology; historic environment; landscape and visual issues; land quality; geotechnics; socio-economics; sound, noise and vibration; utilities; and waste and material resources.
	Meeting to discuss Transport Assessment Scoping Report and Modelling.
	Meeting to discuss access to land owned by Bolsover District Council.

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

²⁴ Supporting document: Draft Code of Construction Practice

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;
- the Archbishop's Council;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Clinical Commissioning Groups and local health authorities - Hardwick CCG, Chesterfield District Council, Bolsover District Council (BDC), Chesterfield Royal Hospital NHS Foundation Trust;
- Coal Authority;
- Department for Environment, Food & Rural Affairs;
- Diocese of Derby;
- D2N2 Local Enterprise Partnership;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- The Ramblers;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts, Derbyshire Wildlife Trust, Derbyshire Bat Conservation Group; and
- Sheffield City Region Local Enterprise Partnership 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 National Grid Transmission (electric); Yorkshire Water; Cadent Gas; Severn Trent Water; Western Power Distribution; BT Openreach; Virgin Media; GeneSys; CityFibre; and Colt to establish what infrastructure exists in the Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood 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 11 farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.
- 3.4.17 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 Tibshelf to Shuttlewood area, an information event was held at Bainbridge Hall on 23 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 Wanzl, Hydro, Subframes UK, Bolsover Land/St Francis Group, National Trust/Hardwick Hall, and Derbyshire Wildlife Trust.
- 3.4.20 HS2 Ltd is continuing to engage with directly affected individuals and major asset owners 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 Tibshelf to Shuttlewood 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 Guide²⁵.
- 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: LA10 Map Book.

4.2 Scope, assumptions and limitations

- 4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)²⁶.
- 4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.
- 4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)²⁷ system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

²⁵ To be prepared for Phase 2b in due course, as per previous Phases found here: <https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers>

²⁶ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

²⁷ Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

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

- 4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts on this feature have been calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.
- 4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation, carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.
- 4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction and operation of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.
- 4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1, Section 8. These assumptions include the restoration of agricultural land that is required temporarily for construction 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 Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area is provided in Section 10, Land quality and Section 15, Water resources and flood risk. The underlying geology of the study area is mapped by the British Geological Survey

(BGS)²⁸. Superficial deposits of alluvium are mapped to the east of the M1, in association with the main channel and tributaries of the River Doe Lea. There are no other superficial deposits mapped in the study area.

- 4.3.3 The bedrock geology is of Carboniferous age, of the Pennine Coal Measures Group. This group (of which the Middle and Lower Coal Measures Formations are components) includes interbedded grey mudstones, siltstones and pale grey sandstones developed in fluvial, marshland or shallow-marine environments. Coal seams are common.
- 4.3.4 The Pennine Middle Coal Measures Formation is mapped throughout the area. To the north-east of Tibshelf is an outcrop of the Pennine Lower Coal Measures Formation, which occupies some of the highest altitudes and steeper slopes in the area.
- 4.3.5 Intersecting the Pennine Middle Coal Measures Formation are elongated deposits of a variant within the formation, which is dominated by sandstone. A variant of the Pennine Lower Coal Measures dominated by sandstone is also present within the outcrop to the north and south-east of Hardstoft.

Topography and drainage

- 4.3.6 The main topographical and drainage feature of the study area is the series of valleys containing tributaries and smaller unnamed watercourses, which drain the land toward the River Doe Lea.
- 4.3.7 The highest altitudes and steepest slopes are in the south of the Tibshelf to Shuttlewood study area, with landform generally becoming more moderately sloping and falling in altitude to the north.
- 4.3.8 The highest altitude is around 185m above Ordnance Datum (AOD) to the east of Tibshelf from where shallow slopes fall northward to around 180m AOD. Between Tibshelf and Hardstoft, a small watercourse has cut into the outcrop forming valley sides, which are largely convex and are moderately steep sloping falling eastwards from an altitude of around 160m AOD to 125m AOD. A narrow valley is aligned roughly east to west to the east of Hardstoft and is associated with more irregular slopes, which are likely to exceed seven degrees in localised areas (which would preclude this land from being BMV land²⁷).
- 4.3.9 An elongated ridge extends northward from the east of Astwith. The highest ground of the ridge is at approximately 125m AOD with shallow slopes, likely to be below 7 degrees, to the east and moderate slopes to the west.
- 4.3.10 Shallow foot-slopes from Stainsby, and continuing northward to Heath, are between 125m and 120m AOD. A second narrow valley north of Heath has moderate, irregular slopes, which may also exceed 7 degrees, and drains the land eastward to the River Doe Lea beyond the M1.
- 4.3.11 West of Bolsover the topography becomes characterised by level to very gently sloping land comprising the valley of the River Doe Lea.

²⁸ British Geological Survey (2018). Geology of Britain viewer. Available online at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

- 4.3.12 The restored Markham Vale Colliery site lies to the west of Shuttlewood and is now identifiable by a rounded summit with irregularly and moderately sloping sides in all directions. At the northern end of the Markham Vale Colliery site, the topography is very gently sloping to the lowest altitude of around 85m AOD.
- 4.3.13 The Environment Agency's Flood Map for Planning (rivers and sea)²⁹ has been used to identify the baseline flood risk for flooding from main rivers and ordinary watercourses. Land at risk of flooding is confined to the channel and tributaries of the River Doe Lea, in which the land is predominantly classed as Flood Zone 3³⁰.

Description and distribution of soil types

- 4.3.14 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales³¹ and their general distribution is shown on the National Soil Map³². Soils possessing similar characteristics are amalgamated into associations.
- 4.3.15 There are four known soil associations in this study area. The most prevalent soil types, found throughout the area, comprise fine-textured soils derived from Carboniferous mudstone and include the Bardsey and Dale associations. The topsoils comprise stoneless clay loam, sandy clay loam or clay and overlie subsoil horizons of clay or silty clay. Bardsey association soils are of Wetness Class³³ (WC) III or IV, whilst Dale association soils are poorly drained, of WC IV or V.
- 4.3.16 The second most prevalent soils, are of the Rivington 1 association, found east of Tibshelf and east of Heath and developed in outcrops of coal measures. The Rivington 1 association includes sandy loam or sandy silt loam topsoils over sandstone or extremely stony sandy loam. Profiles are well drained (WC I) and may be slightly droughty for common agricultural crops.
- 4.3.17 The least prevalent soil is of the Conway association and is mapped in conjunction with the River Doe Lea. Developed in alluvium, the Conway association comprises stoneless silty clay loam. The soils have restricted permeability and are affected by flood risk and groundwater which reduces them to WC IV or V.
- 4.3.18 Throughout the area, significant areas of land are mapped as having disturbed soils. The soil profile characteristics in these areas are likely to be very variable.

Soil and land use interactions

Agricultural land quality

- 4.3.19 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

²⁹ Environment Agency (2018). Flood Map for Planning. Available online at: <https://flood-map-for-planning.service.gov.uk/>

³⁰ The Environment Agency defines Flood Zone 3 as land having a 1 in 100 or greater annual probability of river flooding, or where water has to flow or be stored in times of flood. Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.

³¹ Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.

³² Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*. Cranfield University: National Soil Resources Institute.

³³ 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.

capability of land resulting from the interactions of soil, climate, topography and drainage.

- 4.3.20 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.
- 4.3.21 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 droughtiness³⁴ limitations of the land.
- 4.3.22 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset³⁵ for four points within the study area. The data show the area to be moderately moist. Altitude influences the temperatures which vary from cold at around 165m AOD to moderately cool at lower altitudes of around 70m AOD. The number of field capacity days (FCDs)³⁶, when the moisture deficit³⁷ is zero, ranges from 163 to 172 days per annum. This is higher than average for lowland England (150 days) and generally slightly unfavourable 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 small.
- 4.3.23 Site factors include gradient and microrelief³⁸, which are likely to be limiting to agricultural land quality especially in the south of the area, for example east of Hardstoft, where slopes are likely to exceed seven degrees and limit land to Subgrade 3b. Flooding of low lying land is a potential limitation in the valley of the River Doe Lea and also likely to be limiting to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk.
- 4.3.24 The main physical limitations which result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and susceptibility to erosion. Each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs; and 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.
- 4.3.25 The most prevalent soil types of the study area, comprising fine loamy and clayey textures of the Bardsey and Dale associations, are affected by soil wetness and workability. Poorly drained Bardsey association soils of WC IV with clay loam or sandy clay loam topsoils are limited to Subgrade 3b, as are better drained (WC III) profiles with heavy clay loam topsoils. Bardsey profiles of WC III with medium loamy topsoils are less severely limited, to Subgrade 3a. Poorly drained Dale association soils of WC

³⁴ 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

³⁵ Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

³⁶ Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.

³⁷ 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.

³⁸ 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.

IV with clay loam or clay topsoil are similarly limited to Subgrade 3b, and those of WC V are limited to ALC Grade 4.

- 4.3.26 The second most prevalent soils comprising well drained, sandy soils of the Rivington 1 association are most likely to be affected by soil droughtiness, the severity of which is determined by the factors described above. As moisture deficits are moderate to moderately small, droughtiness limitations are likely to be slight to Grade 2 or Subgrade 3a.
- 4.3.27 The least prevalent soils, comprising poorly drained alluvial soils of the Conway association, developed in the valley bottom, are subject to multiple limitations including wetness, workability, groundwater and flood risk. These soils are likely to be of Subgrade 3b or Grade 4.
- 4.3.28 As set out in the SMR³⁹, 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 mapping⁴⁰ shows that there is a low likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of high sensitivity in this study area.
- 4.3.29 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

- 4.3.30 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 England⁴¹ and the Government's White Paper, *The Natural Choice: securing the value of nature*⁴², and include:
- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
 - the support of ecological habitats, biodiversity and gene pools;
 - support for the landscape;
 - the protection of cultural heritage;
 - the provision of raw materials; and
 - the provision of a platform for human activities, such as construction and recreation.

³⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

⁴⁰ Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

⁴¹ Defra (2009), *Soil Strategy for England*.

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

- 4.3.31 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.
- 4.3.32 The valley and floodplains of the River Doe Lea, and the ponds within the Carr Vale Flash, occupy land where water must 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 locally important ecological habitat.

Land use

Land use description

- 4.3.33 Land in this area is primarily in arable cultivation, with the majority of the fields being medium to large in scale. There are pockets of land in pasture around Tibshelf, Stainsby, Heath and west of Shuttlewood. These pockets of pasture have a more intimate field pattern, with the smaller fields reflecting the livestock and equestrian use of the land.
- 4.3.34 Woodland is found throughout the study area, generally comprising small blocks of broadleaved woods including those at Cockshutt Woods, Owlcotes Wood ancient woodland, Carr Vale Flash, and the mixed broadleaved and coniferous woodland planted at the restored Markham Vale Colliery site. Larger woodlands such as Stainsby Plantation and Astwith Dumbles ancient woodland are found south of Stainsby, with the woodlands associated with the Hardwick Hall Estate nearby. It is not yet known whether any of the woodlands affected by the Proposed Scheme are managed commercially.
- 4.3.35 A number of environmental designations influence land use within the study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply, limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.
- 4.3.36 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.
- 4.3.37 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 14.

Number, type and size of holdings

4.3.38 Table 14 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.

4.3.39 Table 14 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 14: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land west of Saw Pit Lane*	Rough grassland	3	Not known	None	Low
Overmore Farm	Beef store cattle	1	None	None	Low
Hurst Farm	Arable, beef cattle and sheep	48	Abattoir, butchers (wholesale and retail)	None	Medium
High House Farm*	Arable	95	Not known	None	Medium
Yew Tree Farm	Dairy, beef cattle, arable	133	None	CSS (mid-tier)	Medium (affected land not part of grazing block)
Stainsby Farm	Arable, beef cattle and sheep	150	None	None	Medium
Land at Cockshutt Woods*	Arable	7	Not known	None	Medium
Mill Farm (Stainsby)/ Bank's Farm	Dairy, beef cattle and arable	144	B&B	CSS (mid-tier)	High
Gildage Farm*	Arable, beef cattle and sheep	84	Not known	None	Medium

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Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Callow Green Farm*	Arable	222	Not known	ELS	Medium
Land east of Heath*	Grassland	12	Not known	None	Medium
Owlcotes Farm/Deepdale Farm	Arable and beef cattle	245	None	None	Medium
Park Farm/Mill Farm (Bolsover)	Pig, beef cattle and arable	460	Solar panels	ELS and HLS	High
Land north of Sutton Scarsdale*	Arable	94	Not known	None	Medium
Longcourse Farm	Dairy, beef cattle and arable	457	Shoot	HLS (unaffected)	High
Hilltop Farm	Arable and beef cattle	189	Phone masts	None	Medium
Nether Woodhouse Farm	Equestrian (commercial)	3	Haulage company	None	Medium
Land off Woodhouse Lane*	Grassland	22	Not known	None	Medium
Land at Bolsover Woodhouse*	Equestrian (non-commercial)	1	Not known	None	Low
Woodhouse Farm*	Equestrian (commercial)	17	Not known	None	Medium
Robinsons Close Farm*	Arable	20	Not known	None	Medium
Woodside Farm	Arable and beef cattle	485	Phone masts, equestrian let and cottage let	None	Medium

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

4.4 Effects arising during construction

Avoidance and mitigation measures

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

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

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- 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. Where they occur, there will be special provisions for handling peat and peaty soils (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

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

- Heath and Holmewood Footpath 1 accommodation underbridge to mitigate severance of Owlcotes Farm and Deepdale Farm (CT-06-456); and

⁴³ Supporting document: Draft Code of Construction Practice

- Bolsover Footpath 35 accommodation overbridge to mitigate severance of Woodside Farm (CT-06-460).

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 the Bardsey, Dale and Conway 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 390ha of agricultural land within the Tibshelf to Shuttlewood

area during the construction phase, of which approximately 14ha (4%) are likely to be classified as BMV land (Grade 3a). This is a low magnitude of impact on BMV land.

- 4.4.10 As BMV land in this area is a receptor of high sensitivity, and it is currently anticipated that the likely effect of the Proposed Scheme on BMV land during the construction phase would be moderate adverse, which would be significant.
- 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 Soils⁴⁴. These principles would be followed throughout the construction period.
- 4.4.14 Clayey and seasonally waterlogged soils (including the Dale, Bardsey and Conway associations) are least able to remain structurally stable if moved in wet conditions or by 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

⁴⁴ Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*.

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

4.4.19 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 15: Summary of temporary effects

Holding name/Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Land west of Saw Pit Lane Low sensitivity	High	Negligible	Moderate adverse
Overmore Farm Low sensitivity	High	Negligible	Moderate adverse
Hurst Farm Medium sensitivity	High	High	Major/moderate adverse
High House Farm Medium sensitivity	Negligible	Negligible	Negligible
Yew Tree Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Stainsby Farm Medium sensitivity	High	Medium	Major/moderate adverse
Land at Cockshutt Woods Medium sensitivity	High	Negligible	Major/moderate adverse
Mill Farm (Stainsby)/Bank's Farm High sensitivity	High	High	Major adverse
Gildage Farm Medium sensitivity	High	Low	Major/moderate adverse

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Holding name/Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Callow Green Farm Medium sensitivity	Negligible	High	Major/moderate adverse
Land east of Heath Medium sensitivity	Medium	Negligible	Moderate adverse
Owlcotes Farm/Deepdale Farm Medium sensitivity	High	High	Major/moderate adverse
Park Farm/Mill Farm (Bolsover) High sensitivity	Negligible	Medium	Major/moderate adverse
Land north of Sutton Scarsdale Medium sensitivity	High	Low	Major/moderate adverse
Longcourse Farm High sensitivity	Negligible	Negligible	Minor adverse
Hilltop Farm Medium sensitivity	Negligible	Negligible	Negligible
Nether Woodhouse Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Land off Woodhouse Lane Medium sensitivity	Low	High	Major/moderate adverse
Land at Bolsover Woodhouse Low sensitivity	High	Negligible	Moderate adverse
Woodhouse Farm Medium sensitivity	High	High	Major/moderate adverse
Robinsons Close Farm Medium sensitivity	Medium	High	Major/moderate adverse
Woodside Farm Medium sensitivity	Medium	High	Major/moderate adverse

4.4.20 Overall, the construction of the Proposed Scheme would potentially affect 22 agricultural holdings in the Tibshelf to Shuttlewood area temporarily. On the basis of information currently available, 19 would experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.

- 4.4.21 One agricultural holding at Mill Farm (Stainsby)/Bank's Farm is currently anticipated to experience a major adverse permanent effect from construction. It is a high sensitivity dairy and beef unit, which would experience a high impact in terms of the proportion of the holding required and the severance of Bank's Farm.
- 4.4.22 Thirteen farms are anticipated to experience major/moderate adverse temporary effects, which is principally due to the high proportion of land required or severance impacts on medium sensitivity holdings. Five holdings are anticipated to experience moderate adverse effects, the majority of which are due to a large proportion of land required from small holdings.
- 4.4.23 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

- 4.4.24 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 220ha of agricultural land permanently within the Tibshelf to Shuttlewood area, of which approximately 14ha (7%) are likely to be classified as BMV land (Subgrade 3a). This is a low magnitude of impact on BMV land.
- 4.4.25 As BMV land in this local area is a receptor of high sensitivity, it is currently anticipated that the likely effect of the Proposed Scheme on BMV land following construction would be moderate adverse, which would be significant.

Impacts on forestry land

- 4.4.26 It is currently anticipated that an area of approximately 5ha of woodland would be required at Owlcotes Wood, Carr Vale Flash, and the restored Markham Vale Colliery site. None of these woodlands are known to be managed commercially, although the impacts 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

- 4.4.27 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 16 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.
- 4.4.28 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.

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Table 16: 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
Land west of Saw Pit Lane Low sensitivity	High	Negligible	Negligible	Moderate adverse
Overmore Farm Low sensitivity	High	Negligible	High	Moderate adverse
Hurst Farm Medium sensitivity	High	Low	High	Major/moderate adverse
High House Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Yew Tree Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse
Stainsby Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land at Cockshutt Woods Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Mill Farm (Stainsby)/Bank's Farm High sensitivity	Medium	Low	Negligible	Major/moderate adverse
Gildage Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse
Callow Green Farm Medium sensitivity	Negligible	Low	Negligible	Minor adverse
Land east of Heath Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Owlcotes Farm/Deepdale Farm Medium sensitivity	Medium	Negligible	Negligible	Moderate adverse
Park Farm/Mill Farm (Bolsover) High sensitivity	Negligible	Medium	High	Major adverse
Land north of Sutton Scarsdale Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse

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Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Longcourse Farm High sensitivity	Negligible	Negligible	Negligible	Minor adverse
Hilltop Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Nether Woodhouse Farm Medium sensitivity	High	Negligible	High	Major/moderate adverse
Land off Woodhouse Lane Medium sensitivity	Negligible	Low	Negligible	Minor adverse
Land at Bolsover Woodhouse Low sensitivity	High	Negligible	High	Moderate adverse
Woodhouse Farm Medium sensitivity	High	Low	High	Major/moderate adverse
Robinsons Close Farm Medium sensitivity	Low	Low	Negligible	Minor adverse
Woodside Farm Medium sensitivity	Low	High	High	Major/moderate adverse

- 4.4.29 Overall, the construction of the Proposed Scheme would potentially affect 21 holdings in the Tibshelf to Shuttlewood area permanently. On the basis of information currently available, 15 could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding. One holding at High House Farm would not experience any permanent effects.
- 4.4.30 One agricultural holding at Park Farm/Mill Farm (Bolsover) is currently anticipated to experience a major adverse permanent effect from construction. It is a high sensitivity intensive pig unit, which would experience a high impact on farm infrastructure associated with the demolition of the dry sow house.
- 4.4.31 Eight farm holdings are anticipated to experience major/moderate adverse permanent effects from construction, due to the proportion of land required for the Proposed Scheme, and/or the demolition of farm infrastructure, with a permanent severance impact at Woodside Farm.
- 4.4.32 Six holdings are anticipated to incur moderate permanent adverse effects from construction, which would be due to medium land requirements from medium sensitivity holdings, or a high proportion of land required from low sensitivity holdings. The low sensitivity holdings at Overmore Farm and Land at Bolsover

Woodhouse would also experience high impacts due to the demolition of the residential properties and buildings.

Other mitigation measures

- 4.4.33 Soils and their associated seed banks from the ancient woodlands would be stored separately and utilised in species translocation.
- 4.4.34 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.
- 4.4.35 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all affected 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

- 4.4.36 Although the extent of land required permanently by ALC grade is not yet known in the Tibshelf to Shuttlewood area, current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and moderate adverse permanently from construction, which would also be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.
- 4.4.37 Nineteen of the 22 farm holdings identified are anticipated to experience moderate or major/moderate adverse temporary effects during construction; with 15 anticipated to experience moderate, major/moderate or major adverse permanent effects, which would be significant for each holding.
- 4.4.38 Effects on forestry land and soils to be disturbed will reported in the formal ES.

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

- 4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:
- noise emanating from moving trains; and
 - the propensity of operational land to harbour noxious weeds.
- 4.5.3 Five sets of farm buildings at Hurst Farm, Stainsby Farm, Park Farm/Mill Farm, Nether Woodhouse Farm and Woodside Farm lie 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 Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area. Oxides of nitrogen (NO_x) including nitrogen dioxide (NO₂), fine particulate matter⁴⁵ (PM₁₀, PM_{2.5}) 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 Bolsover District Council (BDC) and North East Derbyshire District Council (NEDDC) has been undertaken. 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 are provided in the Volume 2: LA10 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 Scoping and Methodology Report (SMR)⁴⁶.
- 5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur⁴⁷:
- from construction activities;
 - 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 (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.
- 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

⁴⁵ PM_{2.5} and PM₁₀ describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.

⁴⁶ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

⁴⁷ The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

(2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from the 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 Tibshelf to Shuttlewood area are emissions from road vehicles and agricultural activities. The main roads within the area are: the M1, the A6175 Heath Road/Williamthorpe Road/St Lawrence Road, the A617 Mansfield Road, the A632 Chesterfield Road/Station Road, the A6192 Markham Lane/Erin Road, the B6014 Mansfield Road/High Street, the B6039 Chesterfield Road/Tibshelf Road, the B6418 Chesterfield Road/Buttermilk Lane and the B6419 Bolsover Road.
- 5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Erin Landfill Site, Hydro Extrusion aluminium works and Storetec Limited zinc plating works. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.
- 5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)⁴⁸, for the baseline year of 2017. The data are estimated for 1km grid squares for NO_x, NO₂, PM₁₀ and PM_{2.5}. Background concentrations are within the air quality standards for all pollutants within the Tibshelf to Shuttlewood area.

Local monitoring data

- 5.3.4 There are currently 12 local authority diffusion tube sites located within the Tibshelf to Shuttlewood area for monitoring NO₂ concentrations. Measured concentrations in 2016 were within the air quality standard⁴⁹.

Air quality management areas

- 5.3.5 No air quality management areas (AQMAs) have been declared within the Tibshelf to Shuttlewood area.

Receptors

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

⁴⁸ Department for Environment, Food and Rural Affairs (Defra) Defra Background Pollutant Concentration Maps; <http://ukair.defra.gov.uk/data/laqm-background-maps?year=2015>

⁴⁹ At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

- 5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential, located within Tibshelf, Doe Lea, Heath, Bolsover, Duckmanton and Shuttlewood. Other receptors include schools and care facilities.
- 5.3.8 There are no statutory designated ecological sites within the Tibshelf to Shuttlewood area. Non-statutory sensitive ecological sites identified close to the Proposed Scheme include the Owlcotes Wood ancient woodland and local wildlife site (LWS), Astwith Dumbles ancient woodland and LWS and a further 15 LWS. Two Sites of Biological Importance (SBI) are also identified close to the Proposed Scheme namely, Stanley Grasslands SBI and Stablet Grange Grasslands SBI. 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)⁵⁹. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.
- 5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:
- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
 - inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
 - cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
 - the use of water spray systems on demolition sites to dampen down fugitive dust;
 - keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
 - the use of enclosures to contain dust emitted from construction activities; and
 - soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion.

⁵⁹ Supporting documents: 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 PM_{2.5} concentrations.

Construction dust effects

- 5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout⁵¹, have been assessed for their effect on dust soiling, human health⁵² and ecological sites. There are residential and ecological receptors located within the Tibshelf to Shuttlewood area.
- 5.4.6 It has been identified that there would be a low to medium risk of dust effects and low risk of human health effects from demolition activities. For earthworks and construction activities, 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 activities. There would also be a low risk of human health effects from both earthworks and construction. For trackout, there would be a 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 currently anticipated from 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 A6175 Heath Road/Williamthorpe Road/St Lawrence Road, the A617 Chesterfield Road, the A632 Chesterfield Road/Station Road, the A6192 Markham Lane/Erin Road, the B6014 Mansfield Road/High Street, the B6039 Chesterfield Road/Tibshelf Road, the B6418 Chesterfield Road/Buttermilk Lane, the B6419 Bolsover Road, Deep Lane, Hardstoft Road, Hawking Lane, Mill Lane (near Stainsby), Church Lane, Mansfield Road, Palterton Lane, Sutton Lane, Woodhouse Lane and Mill Lane (near Shuttlewood) would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic is anticipated on these roads. Temporary closures and diversions or realignments are anticipated on the M₁, the A6175 Heath Road, the A617 Chesterfield Road, the B6014

⁵¹ Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

⁵² Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM₁₀.

Mansfield Road, the B6014 Bolsover Road, Deep Lane, Astwith Lane and Woodhouse Lane. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

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

Permanent effects

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

Other mitigation measures

- 5.4.12 No other mitigation measures are proposed at this stage 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 would be proposed during operation of the Proposed Scheme.

Assessment of impacts and effects

- 5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic and changes in road alignment.
- 5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect emissions from sources such as rail and brake wear have been assumed to be negligible.

Operational traffic effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

- 5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 5.5.8 Any area specific requirements for monitoring air quality effects during operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

- 6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Tibshelf to Shuttlewood area.
- 6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Bolsover School, Derbyshire Local Access Forum, Bolsover Land/St Francis Group, Diocese of Derby and Minister for Old Heath Church, National Trust and Hardwick Hall, Heath and Holmewood Parish Council, and Ault Hucknall Parish Council. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information and inform the design development 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: LA10 Map Book.

6.2 Scope, assumptions and limitations

- 6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁵³.
- 6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on community facilities and resources will be reported in the formal ES.
- 6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreational 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 the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

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

- 6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure, then this will be discussed with the relevant local authority and local groups and reported in the formal ES.
- 6.2.6 The assessment in the working draft ES is based on the design information, including demolitions as set out in Section 2 available at the time of the assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.
- 6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.
- 6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, HGV traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.
- 6.2.9 For the working draft ES, the full details of the construction traffic routes and geographical scope of likely in-combination (amenity) effects are yet to be determined. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.
- 6.2.10 At this stage it has not been possible to complete surveys of public open spaces in this area; therefore, for the working draft ES, an assumption has been made about the level of sensitivity on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

6.3 Environmental baseline

- 6.3.1 The Proposed Scheme through the Tibshelf to Shuttlewood area would be approximately 14km in length and lie within the Bolsover District Council (BDC) and North East Derbyshire District Council (NEDDC) areas. It would extend from Tibshelf in the south, passing close to the settlements of Stanley, Hardstoft, Astwith, Stainsby, Heath, Doe Lea, Sutton Scarsdale, Bolsover and Shuttlewood in the north.
- 6.3.2 The Tibshelf to Shuttlewood area is predominantly semi-rural in nature with a mix of settlements. In general, the majority of community facilities are located in the larger settlements of North Wingfield and Holmewood which are outside the study area, and also in Bolsover and Tibshelf.
- 6.3.3 Hardstoft, Stanley, Astwith, Stainsby, Heath, Doe Lea, Sutton Scarsdale, and Shuttlewood are villages and hamlets that are located within the study area close to the route of the Proposed Scheme. These settlements are predominantly residential in nature, although some provide a small number of local services. Outside of the

main settlements the area is characterised by small clusters of dwellings and individual dwellings within rural areas.

Tibshelf

- 6.3.4 Tibshelf is a village located approximately 550m north of Newton, and west of the M1. The village comprises approximately 1,600 residential properties. The nearest residential properties would be approximately 20m west of the route of the Proposed Scheme. Notable community facilities in the village within the study area include Tibshelf Town End Junior School, Tibshelf Community School, and Tibshelf Infant and Nursery School, St John the Baptist Parish Church, High Street Methodist Church, Tibshelf ponds, Shetland Road recreation ground, Tibshelf village hall, Heathfield Gardens care facility, a post office, an allotment garden, two cemeteries, and three shops on the High Street.

Hardstoft and Astwith

- 6.3.5 Hardstoft and Astwith are rural villages located approximately 800m north of Tibshelf. Hardstoft contains approximately 65 residential properties. The nearest residences in the village would be located approximately 625m west of the route of the Proposed Scheme. The village of Astwith contains approximately 25 residential properties and the nearest residential properties in the village would be located approximately 855m west of the route of the Proposed Scheme. The settlements are predominantly residential in nature. The community facilities in Hardstoft comprise of two restaurants.

Stainsby

- 6.3.6 Stainsby is a village located on either side of the M1 motorway, approximately 850m south of Heath. The village is predominantly residential in nature and contains approximately 20 residential properties. The nearest residential properties would be adjacent to the route of the Proposed Scheme. Notable community facilities in Stainsby include the National Trust Stainsby Mill, Stainsby Plantation woodland, and the grounds of the annual Stainsby Festival.
- 6.3.7 Stainsby Mill, located to the east of Stainsby, is a fully operational restored historic flour mill managed by the National Trust. It is a heritage attraction linked to the nearby Hardwick Estate. The mill is open to the public and used for school visits.
- 6.3.8 Stainsby plantation is a woodland area and pond located south of Stainsby and north of Astwith. The plantation is accessed from Astwith Road. There are two PRoW on part of the eastern and southern boundaries that also provide access to the woodland area.

Heath, Doe Lea, Sutton Scarsdale and surrounds

- 6.3.9 Heath is a village located south-west of Bolsover and east of Holmewood. The village would be located immediately west of the route of Proposed Scheme. The nearest residential property in Heath would be on the route of the Proposed Scheme. Heath contains approximately 400 residential properties and a number of local services and community facilities including ruins of Heath Old Church and burial ground, All Saints

Church and churchyard, Heath Village Hall, Hazlewood House care facility and Heath Primary School.

- 6.3.10 Heath Old Church was founded in the 12th century and was closed in 1853, when it was replaced by All Saints Church. During the summer period, services are held in the historic ruins of part of the church and its attendant burial ground. The Old Church burial ground remained in occasional use until 1934 and cremations interred in the 1990s. Heath Old Church is located north-east of Heath and north of the M1 junction 29.
- 6.3.11 All Saints Church is an Anglican Church that is located in the northern part of Heath and accessed from Church Lane. The church includes a churchyard which superseded Heath Old Church as the main place of burial for the parish from 1853 onwards, serving both Heath and Holmewood. Services in All Saints Church are held every Sunday.
- 6.3.12 The East Midlands NHS Trust ambulance station is an emergency dispatch centre that is located east of the A6175, to the east of Heath and west of the M1. It is located within a depot site, which also includes police and motorway maintenance depots. Doe Lea is a village located east of Heath where the nearest residential properties would be located approximately 350m east of the route of the Proposed Scheme. The village is predominantly residential in nature and contains approximately 300 residential properties. Notable community amenities within the study area in Doe Lea include Hardwick Hall, Doe Lea Resource Centre, Doe Lea Football Ground and Bramley Vale Primary School.
- 6.3.13 Sutton Scarsdale is a village located north of Heath and south-west of Bolsover. The nearest residential properties would be located approximately 200m from the route of the Proposed Scheme. The village contains approximately 90 residential properties. Its community amenities comprise St Mary's Church and Sutton Scarsdale Hall.

Bolsover, Shuttlewood and surrounds

- 6.3.14 Bolsover is a town located east of Chesterfield and Shuttlewood is a village located north of Bolsover. The two settlements are closely linked and would be located east of the Proposed Scheme. Bolsover and Shuttlewood together contain approximately 5500 residential properties of which some residential properties would be on the route of the Proposed Scheme.
- 6.3.15 Bolsover includes a number of local services and community facilities including Snipe Bog, Carr Vale Flash and Peter Fidler nature reserves, Castle Leisure Park, Bolsover Castle, shops, restaurants, schools (New Bolsover Primary School, Bolsover Church of England Junior School, Bolsover Infant and Nursery School, and Bolsover Secondary School), community centres, play areas, healthcare centres, churches, allotments and sport centres. Shuttlewood is predominantly residential in nature with a small number of community facilities including two allotment gardens, Banister Memorial Chapel church, Brockley Primary and Nursery School, Shuttlewood recreation ground and a public house.
- 6.3.16 Carr Vale Flash is a wetland nature reserve owned and managed by the Derbyshire Wildlife Trust and located east of Bolsover and south of the A632 Chesterfield Road. It

is popular for bird watching and includes a footpath. The nature reserve can be accessed from the Stockley Trail which is a multi-user recreational trail with links to Peter Fidler nature reserve.

- 6.3.17 The Peter Fidler nature reserve is located north of Carr Vale Flash nature reserve and on the northern end of the Stockley Trail. The nature reserve includes a network of footpaths that are used for walking, cycling and horse-riding. One of the footpaths connects the nature reserve to Carr Vale Flash nature reserve.
- 6.3.18 Snipe Bog nature reserve is located north of the A632 Chesterfield road and west of Bolsover business park. The nature reserve is bordered by River Doe Lea along its western boundary and contains two ponds.

6.4 Effects arising during construction

Avoidance and mitigation measures

- 6.4.1 The draft Code of Construction Practice (CoCP)⁵⁴ includes a range of provisions that will help mitigate community effects associated with construction within this area, including:
- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
 - sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
 - maintenance of public rights of way (PRoW) during construction where reasonably practicable (Section 14);
 - monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16);
 - specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
 - where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

Assessment of impacts and effects

Temporary effects

Residential properties

- 6.4.2 Construction of the Stainsby South embankment would temporarily require part of the driveway of a residential property on Hawking Lane for a duration of nine months. The loss of this area of outside space would not impact on the ability of the residents

⁵⁴ Supporting document: Draft Code of Construction Practice

to use their dwelling and access would be modified. This is not considered to have a significant community effect.

- 6.4.3 Construction of the Mill Lane diversion and pond would temporarily require part of the garden of a residential property on Mill Lane. The temporary loss of this small area of outside space for a duration of approximately one year and three months would not impact on the ability of the residents to use their dwelling. This is not considered to have a significant community effect.
- 6.4.4 The planting of landscape mitigation in Sutton Scarsdale would require construction access from land within the gardens and access drives of two residential properties on Palterton Lane. The temporary loss of this area of land for a short duration (approximately two weeks) would not impact on the ability for residents to use their dwelling and access would be maintained throughout construction. This is not considered to have a significant community effect.
- 6.4.5 Works associated with the construction of the Shuttlewood embankment and Shuttlewood viaduct would temporarily require part of the garden and access drive of a residential property on the B6014 Buttermilk Lane for a duration of approximately two years. The temporary loss of this area of land would not impact on the ability of residents to use their dwelling and access would be modified. This is not considered to have a significant community effect.
- 6.4.6 Works associated with the construction of the Shuttlewood viaduct and the realignment of the B6418 Chesterfield Road / Buttermilk Lane would temporarily require part of the gardens of three residential properties on Chesterfield Road for a duration of approximately two years. The loss of these areas of outside space would not impact on the ability of the residents to use their dwellings and access would be maintained throughout construction. This is not considered to have a significant community effect.

Community facilities

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

Recreational facilities

- 6.4.8 Construction of the Mill Lane diversion and pond would temporarily require a small area (approximately 1.5%) of landscaping within the boundaries of the National Trust Stainsby Mill. The temporary loss of this small area of land for a duration of approximately one year and three months, would not impact on the use of the recreational facility. This would result in a minor adverse effect, which would not be significant.

Open space and recreational PRow

- 6.4.9 The construction of the Hawking Lane diversion and pond including a permanent access track/turning head to facilitate vehicle access on the retained section of Hawking Lane would temporarily require a small area of land within Stainsby Plantation (less than 1% of the open space which is approximately 21 hectares in size) for a duration of approximately one year and nine months. The temporary loss of this

small area of land would not impact on the use and function of the open space. This would result in a minor adverse effect, which would not be significant.

- 6.4.10 The realignment of the A617 road associated with the construction of the junction 29 M1 Interchange modifications would require a small area of land (less than 1%) within the boundary of the All Saints church churchyard. This small area of land is required for surface works and would be restored following construction. The temporary loss of this small area of land for a duration of approximately two years would not impact on the use. This would result in a minor adverse effect which would not be significant.
- 6.4.11 Works associated with the construction of Bolsover South embankment would temporarily require land that falls within the boundaries of Carr Vale Flash nature reserve for a duration of two years and six months. The temporary loss of this small area of land (less than 2% of the existing open space) would not impact on the use of the open space. This would result in a negligible adverse effect which would not be significant.

Permanent effects

Residential properties

- 6.4.12 The construction of the Tibshelf cutting and the Tibshelf cut and cover tunnel would require the demolition of three residential properties on Mansfield Road. These residential properties would be permanently lost.
- 6.4.13 The construction of the Tibshelf cutting would require the demolition of one residential property on Saw Pit Lane. This residential property would be permanently lost.
- 6.4.14 The construction of the Heath North cutting would require the demolition of a residential property on Church Lane. This residential property would be permanently lost.
- 6.4.15 The construction of the Shuttlewood cutting would require part of the access drive serving four residential properties on the B6419 Woodthorpe Road. The loss of this area of land would not impact on the ability for residents to use their homes and access would be maintained. This is not considered to have a significant community effect.
- 6.4.16 The construction of the Shuttlewood cutting would require the demolition of six residential properties on Chesterfield Road and Woodthorpe Road. These residential properties would be permanently lost. This would result in a moderate adverse effect, which would be significant.

Community facilities

- 6.4.17 Construction of the Heath South cutting and the associated works would require the demolition of the East Midlands NHS Trust ambulance station adjacent to the M1 junction 29, which also includes a police depot. Proposed mitigation and an assessment of effects will be reported in the formal ES.

Recreational facilities

- 6.4.18 No permanent effects on recreational facilities have been identified as a result of the land required for construction of the Proposed Scheme.

Open space and recreational PRow

- 6.4.19 The construction of a permanent access track/turning head to facilitate vehicle access on the retained section of Hawking Lane would permanently require a small area of land within Stainsby Plantation (less than 0.5% of the existing open space). The permanent loss of this small area of land would not impact on the use and function of the open space. This would result in a minor adverse effect which would not be significant.
- 6.4.20 The construction of the Heath North cutting and the associated works, would require all of the land occupied by the ruins of the Heath Old Church and burial ground. This would be permanently lost. This would result in a major adverse effect, which would be significant.
- 6.4.21 The construction of the Bolsover South viaduct would require land within Carr Vale Flash nature reserve. The permanent loss of this small area of land (approximately less than 1% of the existing reserve) would not impact on the use of the open space and it would remain open and accessible throughout construction. This would result in a negligible adverse effect, which would not be significant.
- 6.4.22 The construction of the Bolsover South viaduct would require land within the Peter Fidler nature reserve. The permanent loss of this small area of land (approximately 0.5% of the existing reserve) would not impact on the use of the open space. This would result in a negligible adverse effect, which would not be significant.
- 6.4.23 Land required for the construction of the Bolsover North viaduct and Bolsover North embankment would require the total loss of the Snipe Bog nature reserve. This open space would be permanently lost. This would result in a major adverse effect, which would be significant.

Other mitigation measures

- 6.4.24 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in this assessment.
- 6.4.25 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

- 6.4.26 Land required for the construction of the Proposed Scheme is likely to result in permanent residual significant effects on the following community resources:
- Heath Old Church and burial ground on Church End Lane;
 - Loss of residential properties on Chesterfield Road and Woodthorpe Road in Shuttlewood; and
 - Snipe Bog Nature Reserve on the A632 Chesterfield road.

Cumulative effects

- 6.4.27 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.
- 6.4.28 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 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 combination effects on a community during operation of the Proposed Scheme, which would result in cumulative community 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 Tibshelf to Shuttlewood 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, the Forestry Commission, Derbyshire County Council and Derbyshire Wildlife Trust (who also provide advice to the local planning authorities: North East Derbyshire District Council (NEDDC), Bolsover District Council (BDC) and Chesterfield District Council (CDC)) 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: LA10 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)⁵⁵.
- 7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.
- 7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. The surveys include (but are not limited to) broad habitat and detailed plant surveys, great crested newt surveys, wintering and breeding bird surveys, bat surveys, otter and water vole surveys. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

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

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

7.3.2 The land required for the construction of and adjacent to the Proposed Scheme in the Tibshelf to Shuttlewood area consists mainly of agricultural land, with small areas of woodland, residential and commercial properties and isolated farmsteads. The land required for the Proposed Scheme would include wetland areas close to Carr Vale and Snipe Bog; in addition, the route of the Proposed Scheme would cross the River Doe Lea, The Goit and several smaller unnamed watercourses within the Tibshelf to Shuttlewood area.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA10 Map Book.

Designated sites

7.3.4 There are no statutory designated sites of international importance that are relevant to the assessment in the Tibshelf to Shuttlewood area.

7.3.5 There are three nationally important Sites of Special Scientific Interest (SSSI) that are relevant to the assessment in the Tibshelf to Shuttlewood area. The Proposed Scheme in this area is within the Impact Risk Zone relevant to railway infrastructure for these SSSIs as identified by Natural England⁵⁶. They are:

- Dovedale Wood SSSI, covering an area of 13.4ha, is designated as it comprises one of the best remaining ancient ash-wych elm woods in Nottinghamshire. This SSSI is located north-east of Stanley, 800m east of the land required for the Proposed Scheme;
- Terversal Pastures SSSI, covering an area of 17.9ha, is designated for its species-rich neutral grasslands characteristic of clay and alluvial loam soils, grassland with flushed soils and neutral marsh. This SSSI is located east of Terversal, 3.1km east of the land required for the Proposed Scheme; and
- Terversal & Pleasley Railway SSSI, covering an area of 3.1ha, is comprised of a cutting and embankments associated with an active railway. It is designated for a range of habitats including limestone crag, scree, short-sward and tall-herb vegetation through to scrub and woodland. The SSSI is located 3km east of the land required for the Proposed Scheme.

7.3.6 There is one Local Nature Reserve (LNR) of potential relevance to the assessment in the Tibshelf to Shuttlewood area. Doe Lea, which covers an area of 3.1ha. It is designated for its reedbed, wet woodland and grassland habitats. This is considered to be of county/metropolitan value. The LNR is 240m north-east of the land required for the Proposed Scheme.

7.3.7 There are 19 Local Wildlife Sites (LWSs) of potential relevance to the assessment in the Tibshelf to Shuttlewood area, each of which is of county/metropolitan value. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information

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

have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Hardwick Hall Park LWS, covering an area of 129.4ha, is designated for its wood pasture and park habitat which supports a diverse invertebrate assemblage. The LWS is immediately adjacent to the land required for the Proposed Scheme;
- Great Pond LWS, covering an area of 4.7ha, is designated for its standing water, broad-leaved wet woodland, rare and scarce and a nationally scarce click beetle species. The LWS is 37m north-east of land required for the Proposed Scheme;
- Astwith Dumbles LWS, covering an area of 17.8ha, is designated for its broad-leaved woodland and wet woodland habitats. The LWS lies partly within the land required for the Proposed Scheme;
- St. Lawrence's Churchyard LWS, covering an area of 1.7ha, is designated for its lowland hay meadow and reptile/amphibian assemblage. The LWS is 22m north-east of land required for the Proposed Scheme;
- Stainsby Pond LWS, covering an area of 1.1ha, is designated for its standing open water and lowland swamp habitat. The LWS is immediately adjacent to the land required for the Proposed Scheme;
- Heath Hedges LWS, covering an area of 0.8ha, is designated for its hedgerow habitat. The LWS lies partly within the land required for the Proposed Scheme;
- Junction 29 meadow LWS, covering an area of 0.6ha, is designated for its unimproved neutral grassland habitat. The LWS lies wholly within the land required for the Proposed Scheme;
- Owlcotes Wood LWS, covering an area of 9.2ha, is designated for its broad-leaved woodland habitat. The LWS lies partly within the land required for the Proposed Scheme;
- Wrang Plantation LWS, covering an area of 6.1ha, is designated for its broad-leaved woodland habitat. The LWS lies partly within the land required for the Proposed Scheme;
- Pond Plantation LWS, covering an area of 4ha, is designated for its standing open water habitat. The LWS is immediately adjacent to the land required for the Proposed Scheme;
- Carr Vale Flash LWS, covering an area of 12.5ha, is designated for its reedbed and lowland swamp habitats which support a diverse bird assemblage and a water vole population. The LWS lies partly within the land required for the Proposed Scheme;
- Peter Fidler Reserve and The Goit Railway (west) LWS, covering an area of 10.6ha, has been subject to reclamation works which have created habitats including willow carr, reedbed and grassland. The LWS lies partly within the

land required for the Proposed Scheme;

- Peter Fidler Reserve and The Goit Railway (east) LWS, covering an area of 10.4ha, has been subject to reclamation works which have created habitats including willow carr, reedbed and grassland. The LWS is immediately adjacent to the land required for the Proposed Scheme;
- Bolsover Colliery Marsh LWS, covering an area of 1ha, is designated for its reedbed and wet woodland habitats. The LWS lies wholly within the land required for the Proposed Scheme;
- Markham Colliery Reedbed LWS, covering an area of 6ha, is designated for its reedbed habitat. The LWS lies wholly within the land required for the Proposed Scheme;
- Woodside Field Slope and Stream LWS, covering an area of 0.6ha, is designated for its unimproved neutral grassland habitat and its flowing stream. The LWS lies wholly within the land required for the Proposed Scheme;
- Oxcroft Colliery North LWS, covering an area of 3.2ha, is designated for its grassland and wet woodland habitats. The LWS is immediately adjacent to the land required for the Proposed Scheme;
- Poolsbrook Flash LWS, covering an area of 1.5ha, is designated for its lowland swamp habitat and bird assemblage. The LWS lies partly within the land required for the Proposed Scheme; and
- Chesterfield Canal LWS, covering an area of 622ha and meandering between the Tibshelf to Shuttlewood area and the Staveley to Aston area (LA11). This site is designated for its water vole population and lies immediately adjacent the land required for the Proposed Scheme.

7.3.8 There are 3 Sites of Biological Importance (SBI) of potential relevance to the assessment. Both are considered to be of county/metropolitan value. They are:

- Stanley Grasslands SBI, covering an area of 4.3ha, is designated for unimproved grassland on coal measures. The SBI is located immediately adjacent to the land required for the Proposed Scheme;
- Stanley Grange Grassland SBI, covering an area of 7.53ha is designated for species rich grassland on coal measures. The SBI is located immediately adjacent to the land required for the Proposed Scheme; and
- County Dumble SBI, covering an area of 2.6ha, is designated for its wooded stream supporting a noteworthy flora. The SBI is located immediately adjacent to the land required for the Proposed Scheme next to Stanley Grange Grassland SBI and the M1.

7.3.9 There are two Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment in the Tibshelf to Shuttlewood area, each of which is of county/metropolitan value. They are:

- Astwith Dumbles AWIS is a Plantation on an Ancient Woodland Site (PAWS) covering an area of 5.8ha, within the extent of Astwith Dumbles LWS. It is located 40m south-west of the land required for the Proposed Scheme; and
- Owlcotes Wood AWIS covering an area of 5.6ha, within the extent of Owlcotes Wood LWS. It is located within the land required for the Proposed Scheme.

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

Habitats

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

Woodland

7.3.12 In addition to the aforementioned woodlands, there are a further eight areas comprising 97 discrete lowland deciduous woodlands (likely to qualify as habitats of principal importance⁵⁷ and either a Derbyshire or Rotherham local Biodiversity Action Plan (BAP)^{58,59} habitat) within the land required for the Proposed Scheme. These woodland areas are located as follows:

- along the M1 corridor;
- adjacent to Saw Pit Lane Industrial Estate;
- around the M1 junction 29;
- on land south east of Palterton Lane, Sutton Scarfield;
- either side of The Goit watercourse;
- Bolsover Business Park;
- on land west of Shuttlewood; and
- on land east of Poolsbrook.

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

Grassland

7.3.14 Grasslands outside of designated sites occur within the land required for the Proposed Scheme. One area of floodplain grazing marsh has an area of 8.3ha and is located west of Staveley. This grassland may qualify as a habitat of principal importance and Derbyshire or Rotherham local BAP habitat. On a precautionary basis, pending the

⁵⁷ Section 41 of the Natural Environment and Rural Communities Act 2006

⁵⁸ Lowland Derbyshire Biodiversity Partnership (2011) Lowland Derbyshire Biodiversity Action Plan 2011-2020.

⁵⁹ Rotherham's Biodiversity Forum (2012) Rotherham Biodiversity Action Plan 2012

findings of field surveys (which may identify this as unimproved grassland) this grassland is considered to be of up to district/borough value.

Hedgerows

- 7.3.15 Many of the hedgerows in the land required for the Proposed Scheme are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997⁶⁰. In addition, they could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

- 7.3.16 Sections of the River Doe Lea, its unnamed tributaries, and The Goit, lie within the land required for the Proposed Scheme. The River Doe Lea and The Goit may qualify as habitats of principal importance and Derbyshire or Rotherham local BAP habitats. On a precautionary basis, pending the findings of field surveys, the River Doe Lea and The Goit are considered to be of up to county/metropolitan value. The smaller tributaries are considered to be of up to district/borough value.

Water bodies

- 7.3.17 There are nine ponds located within, or partly within, the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area. Some may qualify as habitats of principal importance or Derbyshire or Rotherham local BAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newts). On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

- 7.3.18 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area. On a precautionary basis, any such ancient and veteran trees are considered to be of up to county/metropolitan value.

Reedbed

- 7.3.19 Outside of designated sites there are three areas of reedbed within or immediately adjacent to the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area. These may qualify as habitats of principal importance or Derbyshire or Rotherham local BAP habitats. The reedbeds are located west of Gateway Business Park, Bolsover and north-west of Bolsover Business Park (an area known as Snipe bog). On a precautionary basis, pending the findings of field surveys, it is considered that these areas of reedbed are of district/borough value.

⁶⁰ "Statutory Instrument 1997 No. 1160" Hedgerows Regulations 1997

Protected and notable species

7.3.20 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 17.

Table 17: Species potentially relevant to the assessment within the Tibshelf to Shuttlewood area

Resource/feature	Value	Rationale
Bats	Up to regional	<p>There is suitable habitat for roosting and foraging bats within the land required for the Proposed Scheme. The woodland, hedgerows and arable fields are likely to be used by a range of bat species for foraging and commuting. Trees, buildings and structures have been identified with potential to support roosting at numerous locations within 100m of the land required for the Proposed Scheme.</p> <p>Desk study records confirm the presence of eleven species of bat: noctule, Natterer's bat, Leisler's bat, common and soprano pipistrelle, Daubenton's, brown long-eared bat, Whiskered bat, Brandt's bat, Serotine, and Nathusius' pipistrelle within the county of Derbyshire⁶¹.</p>
Otter	Up to county/metropolitan	<p>Desk study records exist 500m from the land required for the Proposed Scheme on an unnamed tributary of the Rive Doe Lea, near Duckmanton.</p> <p>Habitat potentially suitable for otter is present along stretches of the River Doe Lea and its tributaries, particularly north of Hardwick Hall, and Pools Brook. These watercourses are both adjacent and within the land required for the Proposed Scheme.</p>
Water vole	Up to county/metropolitan	<p>Desk study records for water vole exist at Peter Fidler Reserve LWS, Carr Vale Flash LWS, Chesterfield Canal LWS and Poolsbrook Country Park⁶², which is partially within land required for the Proposed Scheme along the Staveley spur, and which includes Pools Brook.</p> <p>Suitable habitat for water vole is present along Pools Brook, River Doe Lea, and several smaller watercourses such as that west of Nether Woodhouse.</p>
Great crested newt	Up to county/metropolitan	<p>Desk study data references a great crested newt European Protected Species licence at the commercial park off Markham Lane, 350m east of the M1 and outside the land required for the Proposed Scheme. There are ponds within 500m of this site which are located adjacent to the land required for the Proposed Scheme. In addition, desk study data indicates the historical presence of great crested newt in Carr Vale and Poolsbrook Country Park.</p> <p>There are nine ponds within the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area.</p>

⁶¹ Derbyshire Bat Conservation Group, *Gallery*. Available online at: <http://www.derbyshirebats.org.uk/gallery.php>

⁶² Chesterfield Borough Council, *Poolsbrook Country Park*. Available online at: <https://www.chesterfield.gov.uk/explore-chesterfield/parks-and-green-spaces/parks/a-z-of-parks/poolsbrook-country-park.aspx>

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		In the absence of further survey information and on a precautionary basis, these ponds are assumed to provide habitat for great crested newt.
Birds	Up to county/metropolitan	<p>Potentially suitable roosting and breeding habitat was recorded in the vicinity of Gateway Business Park and in buildings south of Shuttlewood. Desk study data references the sighting of barn owl within Carr Vale Flash LWS⁶³.</p> <p>Surveys have identified a kingfisher nesting site, a Schedule 1 species, along the River Doe Lea north-east of Duckmanton, within the land required for the Proposed Scheme. Desk study data also references nesting kingfisher at Hardwick Park, within 500m of the land required for the Proposed Scheme.</p> <p>The farmland and woodland throughout the Tibshelf to Shuttlewood area is suitable for breeding and wintering birds. Species associated with these habitats include lapwing, skylark, tree sparrow, yellow wagtail, linnet, and yellowhammer, which breed in low numbers in farmland habitats. In addition, desk study data references the importance of Carr Vale Flash LWS for wintering, breeding and migratory birds⁶⁴.</p>
White-clawed crayfish	Up to county/metropolitan	Suitable habitat for white-clawed crayfish is likely to be present in watercourses within land required for the Proposed Scheme.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates is likely to be present in watercourses within the land required for the Proposed Scheme, including smaller watercourses, drainage ditches, and water bodies (ponds).
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates exists within the land required for the Proposed Scheme. Such areas include the AWIS, poor-semi improved grassland, ruderal communities, and where undisturbed grassland is present on the M1 corridor.
Fish	Up to district/borough	<p>There are records of fish in the River Doe Lea, including bullhead and brown/sea trout (data from Environment Agency National Fish Populations Database (NFPD)⁶⁵).</p> <p>Suitable habitat for protected and notable fish species is likely to be present in watercourses within the land required for the Proposed Scheme.</p>
Reptiles	Up to district/borough	<p>There are desk study records of grass snakes around St. Lawrence's churchyard LWS, Tibshelf business park, Carr Vale Flash LWS, Peter Fidler Reserve and The Goit Railway (east) LWS, and Peter Fidler Reserve and The Goit Railway (west) LWS.</p> <p>There are suitable habitats for common species of reptiles within the land required for the Proposed Scheme, notably to the north-west of the B6418 Buttermilk Lane, to the north side of A632 Chesterfield Road and to the west of Carr Vale Flash LWS. In addition, the land around Hardwick Park and Stainsby provides</p>

⁶³ Derbyshire Wildlife Trust, *Carr Vale sighting by Mark Beevers*. Available online at:

<http://www.derbyshirewildlifetrust.org.uk/blog/carrvale/2018/01/02/carr-vale-sighting-mark-beevers>

⁶⁴ Derbyshire Wildlife Trust, *Carr Vale*. Available online at: <http://www.derbyshirewildlifetrust.org.uk/reserves/carr-vale-flash>

⁶⁵ Environment Agency, (2016), *Freshwater Fish Counts for all Species, all Areas and all Years*. Available online at:

<https://data.gov.uk/dataset/freshwater-fish-counts-for-all-species-all-areas-and-all-years>

		optimal habitats conditions for reptiles and is connected through a green network of ditches and streams ⁶⁶ .
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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-o6 in the Volume 2: LA10 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigating the losses of habitat and effects on species:

- construction of the Bolsover North viaduct and the Stainsby viaduct would avoid direct effects to the watercourses beneath and allow free passage for wildlife beneath this structure by maintaining the existing ecological connectivity to adjacent habitats;
- construction of the Bolsover South viaduct would maintain the existing ecological connectivity under the route of the Proposed Scheme to adjacent habitats and reduce habitat loss and fragmentation;
- new woodland planting would contribute towards replacing the losses of woodland (e.g. east of the M1 between Hardstoft and Hardwick Park, north-east of the M1 junction 29 with the A617, and west of Shuttlewood), and to enhance connectivity between remaining woodlands;
- new wetland habitat creation to enhance existing reedbed and fen habitats east of the proposed Bolsover South embankment;
- provision of new ecological ponds (ponds lost that do not support great crested newt would be replaced on a 1:1 basis); and
- provision of new species-rich hedgerows, using appropriate native species, to contribute towards compensation for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the Proposed Scheme.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)⁶⁷, 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

⁶⁶ Derbyshire Wildlife Trust, Living Landscapes. Available online at: <http://www.derbyshirewildlifetrust.org.uk/living-landscapes>

⁶⁷ Supporting document: Draft Code of Construction Practice

ecological importance such as ancient woodlands and watercourses;

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

Assessment of impacts and effects

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

Designated sites

- 7.4.5 Due to their distance from the land required for the Proposed Scheme, there would be no significant effects on Dovedale Wood SSSI (800m), Teversal Pastures SSSI (3.1km) and Teversal & Pleasley Railway SSSI (3km).
- 7.4.6 Astwith Dumbles LWS is partially within the land required for the Proposed Scheme. The construction of an access track and turning head for a balancing pond would result in the loss of 0.1ha (0.5%) of this LWS. Given the limited amount of habitat loss this would be a permanent adverse effect, which would be significant at the district/borough level.
- 7.4.7 Heath Hedges LWS is partially within the land required for the Proposed Scheme. The construction of Junction 29 M1 Interchange modifications would result in a permanent loss of 400m²(4.4%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.8 Junction 29 meadow LWS is within the land required for the Proposed Scheme. The construction of the Heath Central Cutting would result in a permanent loss of 0.6ha (100%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.9 Owlcotes Wood LWS is partially within the land required for the Proposed Scheme. Realignment of the Heath and Holmewood Footpath 1 would result in a permanent

loss of 0.1ha (1.3%) of this LWS. Given the limited extent of habitat loss within this LWS this would be a permanent adverse effect at the district/borough level.

- 7.4.10 Wrang Plantation LWS is partially within the land required for the Proposed Scheme. The construction of an access road leading to a balancing pond would result in a permanent loss of 0.3 ha (4.7%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.11 Carr Vale Flash LWS is partially within the land required for the Proposed Scheme. The construction of the Bolsover South Embankment and Bolsover South viaduct would result in a permanent loss of 1ha (7.9%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.12 Peter Fidler Reserve & the Goit Railway (west) LWS is partially within the land required for the Proposed Scheme. The construction of the Bolsover North Viaduct would result in a permanent loss of 1.9ha (17.7%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.13 Bolsover Colliery Marsh LWS is within the land required for the Proposed Scheme. The construction of the Bolsover North Viaduct would result in a permanent loss of this LWS (1 ha) which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.14 Markham Colliery Reedbed LWS is within the land required for the Proposed Scheme. Construction would result in a permanent loss of this LWS (6 ha) which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.15 Woodside Field Slope and Stream LWS is within the land required for the Proposed Scheme. The construction of Shuttlewood Cutting would result in permanent loss of this LWS (0.6 ha) which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.16 Poolsbrook Flash LWS is partially within the land required for the Proposed Scheme. Construction of the Staveley East Embankment would result in a permanent loss of 0.8 ha (61.8%) of this LWS which would be a permanent adverse effect at the county/metropolitan level.
- 7.4.17 Realignment of Heath and Holmewood Footpath 1 would result in the permanent loss of 0.1ha (2%) of Owlcotes Wood AWIS. This will have a permanent adverse effect on the site's integrity that would be significant at the county/metropolitan level.

Habitats

- 7.4.18 The following habitat types which occur in this area are relevant to this assessment of effects and impacts within the Tibshelf to Shuttlewood area.

Woodland

- 7.4.19 The Proposed Scheme would result in the loss of 25.3ha of lowland mixed deciduous woodland from the Tibshelf to Shuttlewood area, outside of the designated sites. The incorporated habitat creation is not expected to compensate for woodland loss and, given the extent of this loss and the potential for the ongoing review to identify

additional ancient woodlands, the permanent loss of these woodlands would result in an effect that would be significant at up to the county/metropolitan level

Grassland

- 7.4.20 The Proposed Scheme south of the Staveley IMD would result in the loss of 0.3ha floodplain grazing marsh in the Tibshelf to Shuttlewood area. The loss of this area would result in an effect that would be significant at up to the district/borough level.

Hedgerows

- 7.4.21 The Proposed Scheme would result in the permanent loss of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The effects of these losses will be fully assessed in the formal ES. The Proposed Scheme includes new hedgerow planting, which would help replace losses. Further hedgerow planting would be proposed as part of the design development. In the absence of this additional mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

- 7.4.22 The route of the Proposed Scheme would cross an unnamed tributary of the River Doe Lea south of Mill Lane on the Stainsby viaduct and the River Doe Lea itself on the Bolsover North viaduct. These watercourses would not be directly affected and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP.
- 7.4.23 The route of the Proposed Scheme would cross an unnamed watercourse that flows into The Goit, which would be culverted (Carr Vale culvert). This would result in the permanent loss of sections of this watercourse and create severance of this watercourse. This would result in a permanent effect that would be significant at up to the county/metropolitan level.
- 7.4.24 A number of smaller unnamed watercourses and unnamed tributaries of the River Doe Lea would be crossed by the Proposed Scheme. These will be culverted in six locations which would result in the permanent loss of sections of these watercourses and create severance. This would result in a permanent effect that would be significant at up to the district/borough level.

Water bodies

- 7.4.25 Nine ponds would be lost as a result of the Proposed Scheme. The loss of these ponds could result in an impact that would be significant up to the county/metropolitan level however these ponds would be replaced reducing the effect to a level that is not significant.

Ancient and veteran trees

- 7.4.26 Subject to survey, it is assumed that any ancient and veteran trees that may be present within the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area would be permanently lost. Ancient and veteran trees are an

irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at county/metropolitan level in each case.

Reedbed

- 7.4.27 Outside of the designated sites, the Proposed Scheme would result in the loss of reedbed habitat as a consequence of potential hydrological impacts. This would be a permanent adverse effect significant at up to the district/borough level.

Species

Bats

- 7.4.28 The permanent removal of vegetation may have impacts on bats. Habitat loss would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP. On a precautionary basis, in the absence of further survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to the regional level.

Otter

- 7.4.29 Habitat loss and construction effects would affect those watercourses identified as supporting suitable habitat for otter, as well as several smaller unnamed watercourses within the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area. On a precautionary basis, in the absence of further survey information, impacts to otters would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Water vole

- 7.4.30 Habitat loss and construction effects would affect those watercourses identified as supporting suitable habitat for water vole, as well as several smaller unnamed watercourses within the land required for the Proposed Scheme in the Tibshelf to Shuttlewood area. On a precautionary basis, in the absence of further survey information, impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Great crested newt

- 7.4.31 On a precautionary basis, it has been assumed that all nine ponds and surrounding terrestrial habitat within the land required for the Proposed Scheme may support great crested newts and would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newts across this area. Where great crested newt is shown to be present by survey, two new ecological mitigation ponds would be created for every pond lost to the land permanently required for the Proposed Scheme. The implementation of this mitigation would reduce the effect of loss of breeding habitat to not significant. Suitable terrestrial habitat would be required around new ponds with links to encourage dispersal (e.g. by

incorporating existing habitat or creating new habitat). In the absence of full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

Birds

- 7.4.32 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly woodland and wetland species. These are likely to include the Schedule 1 species barn owl, close to Carr Vale Flash LWS, south of Shuttlewood and the Gateway Business Park, and kingfisher, which has been recorded nesting at Hardwick Park within 500m of the land required for the Proposed Scheme and along the River Doe Lea north-east of Duckmanton within the land required for the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it has been assumed 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

- 7.4.33 The route of the Proposed Scheme would pass over the River Doe Lea and a smaller unnamed watercourse by viaduct, avoiding the loss of potentially suitable white-clawed crayfish habitat. Indirect impacts to white-clawed crayfish, if present, would be controlled through measures in the draft CoCP. White-clawed crayfish within the unmade watercourse that flows into The Goit and other, smaller watercourses, could still be affected by proposed realignments of those watercourses and culverts. On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme, would result in permanent adverse effect that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

- 7.4.34 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates (including species of principal importance⁶⁸). On a precautionary basis, in the absence of further survey information, it has been assumed that construction of Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Terrestrial invertebrates

- 7.4.35 The land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates (including Section 41 species⁵⁷). On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Fish

- 7.4.36 There are historic records of fish in the River Doe Lea, including species such as European bullhead (listed on Annex II of the EC Habitats Directive), brown/sea trout.

The route of the Proposed Scheme would pass over this watercourse on viaducts, and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)⁶⁹. On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Reptiles

- 7.4.37 There is suitable habitat for common species of reptiles within the land required for the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it has been assumed that the land required for the Proposed Scheme, would result in permanent adverse effect that would be significant at up to the district/borough level.
- 7.4.38 Effects on other habitats and species that would be significant at the local/parish level during construction will be reported in the formal ES.
- 7.4.39 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

- 7.4.40 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:
- options to respond to the permanent loss of Markham Colliery Reedbed LWS, Bolsover Colliery Marsh LWS, Woodside Field Slope and Stream LWS and Junction 29 meadow LWS;
 - options to respond to the permanent loss of part of Astwith Dumbles LWS, Heath Hedges LWS, Owlcotes Wood LWS, Wrang Plantation LWS, Carr Vale Flash LWS, Peter Fidler Reserve & the Goit Railway (west), and Poolsbrook Flash LWS;
 - additional measures in response to the permanent loss of a small area of Owlcotes Wood AWIS;
 - ancient woodland is an irreplaceable resource and this loss is considered to be a permanent adverse residual effect. The loss of ancient woodland would be partly compensated through a package of measures bespoke to the woodland affected. Ancient woodland soil with its associated seed bank would be salvaged and translocated to receptor sites that have, wherever possible, been chosen because they link to and/or are adjacent to ancient woodland fragments. This would seek to increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and

⁶⁹ EU Water Framework Directive. Available online at: http://ec.europa.eu/environment/water/water-framework/index_en.html

shrub species of local provenance, enhancement of retained woodland, and translocation of coppice stools and dead wood, would be undertaken as appropriate;

- provision of additional broadleaved woodland (non-ancient) to replace those lost, and/or enhancement of remaining woodlands;
- provision of additional hedgerows, which would replace the losses and maintain the connectivity of the network;
- options to create new species rich grasslands (including translocation where appropriate) in response to grassland losses;
- options to undertake wetland planting and habitat creation to respond to impacts on smaller watercourses subject to realignment and/or diversion;
- options to relocate the spring east of Snipe Bog and maintain downstream water supply to the reedbed habitat to mitigate any adverse impacts;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- considering the need for inclusion of structures to reduce severance effects on bats;
- options for responding to the loss of kingfisher nesting sites;
- 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; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great crested newts are lost), outside the area required for the permanent works but within the land required for the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal. Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders.

Summary of likely residual significant effects

7.4.41

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 18.

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Table 18: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Astwith Dumbles LWS	Loss of 0.09ha (0.5%) habitat	Up to district/borough
Heath Hedges LWS	Loss of 0.04ha (4.4%) habitat	Up to county/metropolitan
Owlcotes Wood LWS	Loss of 0.12ha (1.3%) habitat	Up to district/borough
Wrang Plantation LWS	Loss of 0.28ha (4.7%) habitat	Up to county/metropolitan
Carr Vale Flash LWS	Loss of 1ha (7.9%) habitat	Up to county/metropolitan
Peter Fidler Reserve & The Goit Railway (west) LWS	Loss of 1.9ha (17.7%) habitat	Up to county/metropolitan
Bolsover Colliery Marsh LWS	Loss of 1ha (100%) habitat	Up to county/metropolitan
Markham Colliery Reedbed LWS	Loss of 6.1ha (100%) habitat	Up to county/metropolitan
Woodside Field Slope and Stream LWS	Loss of 0.6ha (100%) habitat	Up to county/metropolitan
Poolsbrook Flash LWS	Loss of 0.8ha (61.8%) habitat	Up to county/metropolitan
Owlcotes Wood AWIS	Loss of 0.1ha (2.1%) habitat	Up to county/metropolitan
Woodlands	Loss of 25.3ha of lowland deciduous woodland, potentially including additional ancient woodlands	Up to county/metropolitan
Grasslands	Loss of an area of 0.3ha of floodplain grazing marsh.	Up to district/borough
Hedgerows	Loss of hedgerow habitat	Up to district/borough
Watercourses	Severance by culverting of unnamed watercourse flowing into The Goit. Severance of smaller unnamed watercourses and dewatering effects on two springs	Up to county/metropolitan
Ancient and veteran trees	Permanent loss of individual trees	Up to county/metropolitan
Reedbed	Potential permanent loss of reedbed due to hydrological changes	Up to district/borough
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the Proposed Scheme	Up to county/metropolitan

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Water vole	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the Proposed Scheme	Up to county/metropolitan
Great crested newts	Loss of nine ponds and surrounding terrestrial habitat which may support great crested newts.	Up to county/metropolitan.
Birds	Loss of nesting and foraging habitat for a range of breeding and wintering birds, including Schedule 1 species barn owl and kingfisher.	Up to county/metropolitan.
White-clawed crayfish	Loss of habitat in unnamed watercourse flowing into The Goit and smaller watercourses, which may support white clawed crayfish.	Up to county/metropolitan.
Aquatic invertebrates	Loss of habitat suitable for aquatic invertebrates including species of principal importance).	Up to district/borough
Terrestrial invertebrates	Loss of habitat suitable for terrestrial invertebrates (including species of principal importance)	Up to district/borough
Fish	Loss of habitat in smaller watercourses, which may include European bullhead (listed on Annex II of the EC Habitats Directive) and brown/sea trout.	Up to district/borough
Reptiles	Loss of habitat for common species of reptiles	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 county/metropolitan level.

7.5.4 Barn owls are at risk of colliding with trains, particularly near Carr Vale Flash LWS where there have been desk study records of barn owl, and south of Shuttlewood, where there is suitable foraging and roosting 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. Effects on all other habitats and species would likely be significant at the local/parish level during operation. These effects will be assessed and reported in the formal ES.

Other mitigation measures

7.5.5 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan⁷⁰ which has been developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with local landowners; and
- structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.6 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 19.

Table 19: 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 county/metropolitan
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

Monitoring

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

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

⁷⁰ Currently in development for Phase One of HS2.

8 Health

8.1 Introduction

- 8.1.1 This section identifies the communities within the Tibshelf to Shuttlewood area (LA10) 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 Public Health England, relevant directors of Public Health and Health and Wellbeing Boards, and relevant Clinical Commissioning Groups. The purpose of the engagement has been to understand health issues in the Tibshelf to Shuttlewood area 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 Tibshelf to Shuttlewood 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: LA10 Map Book.

8.2 Scope, assumptions and limitations

- 8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)⁷¹.
- 8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being 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.

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

- 8.2.4 The health determinants of relevance within the Tibshelf to Shuttlewood area are:
- for impacts during construction (temporary and permanent):
 - neighbourhood quality;
 - access to services, health and social care;
 - access to green space, and space for recreation and physical activity; and
 - social capital.
 - for impacts during operation (permanent):
 - neighbourhood quality;
 - access to green space, and space for recreation and physical activity; and
 - education.
- 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 Tibshelf to Shuttlewood area

- 8.3.1 The Tibshelf to Shuttlewood area is predominantly semi-rural; characterised by a mix of towns and villages with scattered individual properties dispersed amongst farmland and former industrial or reclaimed mining land. As reported in Section 14, Traffic and transport, there are a number of public rights of way (PRoW) within the vicinity of the Proposed Scheme, which provide access to the countryside and are considered important to health and wellbeing.
- 8.3.2 For the purposes of the health assessment, the study area is divided into the communities described below. A description of community facilities is provided in Section 6, Community.

Tibshelf, Hardstoft, Astwith and surrounds

- 8.3.3 Tibshelf is a village to the west of the route of the Proposed Scheme, comprising approximately 1,600 residential properties. The nearest residential properties would be located approximately 20m west of the route. Community facilities include allotments, a post office, a nursery, a primary school, a secondary school, a village hall, a care home and churches. Tibshelf Ponds and Shetland Road recreation ground provide recreational opportunities for the general public.
- 8.3.4 Hardstoft and Astwith are villages located approximately 800m north of Tibshelf, connected by the B6039 Chesterfield Road. Hardstoft contains approximately 65 residential properties, the nearest of which would be located approximately 625m west of the route of the Proposed Scheme. Astwith contains approximately 25 residential properties, the nearest of which would be located approximately 855m west of the route. The villages are predominantly residential in nature and contain limited community facilities.

Stainsby, Doe Lea, Heath, Sutton Scarsdale and surrounds

- 8.3.5 Stainsby is a village which is predominantly residential in nature, comprising approximately 20 residential properties. The village straddles both the M1 and the route of the Proposed Scheme. As a result, the nearest residential properties would be adjacent to the route. Stainsby Mill (a historic flour mill managed by the National Trust) and Stainsby Plantation (a woodland area and pond) provide recreational opportunities for the general public.
- 8.3.6 Heath is a village located predominantly west of the route of the Proposed Scheme with some parts of the village extending to the east. Heath comprises approximately 400 residential properties. The nearest residential property in Heath would be on the route. Community facilities include churches, a village hall, a care home and a primary school.
- 8.3.7 Doe Lea is a village, predominantly residential in nature, comprising approximately 300 residential properties. The nearest residential properties would be approximately 350m east of the route of the Proposed Scheme. Community facilities within Doe Lea

include a primary school. In addition, Hardwick Hall, Doe Lea Football Ground and Doe Lea Resource Centre provide recreational opportunities for the general public.

- 8.3.8 Sutton Scarsdale is a village which comprises approximately 90 residential properties. The nearest residential properties would be approximately 200m from the route of the Proposed Scheme. Community facilities include a church. Sutton Scarsdale Hall provides recreational opportunities for the general public.

Bolsover, Shuttlewood and surrounds

- 8.3.9 Bolsover and Shuttlewood are a town and village respectively, both located to the east of the route of the Proposed Scheme, and connected by the B6419 Shuttlewood Road. The two settlements are closely linked and together contain approximately 5,500 residential properties. The nearest residential properties would be on the route of the Proposed Scheme. Community facilities are primarily located in Bolsover as Shuttlewood is predominantly residential. Such community facilities include allotments, a public house, community centres, healthcare centres, churches, and schools.
- 8.3.10 Play areas, sport centres, Snipe Bog, Carr Vale Flash (a wetland nature reserve), Peter Fidler nature reserve, Castle Leisure Park, Bolsover Castle and Shuttlewood recreation ground provide recreational opportunities for the general public.

Demographic and health profile of the Tibshelf to Shuttlewood area

- 8.3.11 The local communities in the Tibshelf to Shuttlewood area have a relatively low population density, commensurate with the semi-rural nature of the area.
- 8.3.12 Data provided by the Office for National Statistics⁷² for the local authority areas of Bolsover District Council (BDC) and North East Derbyshire District Council (NEDDC), shows that this population has a broadly similar health status compared with the national (England) averages.
- 8.3.13 The population has similar levels of deprivation compared to the national average, with regard to the combined indices of multiple deprivation⁷³, and the health domain (a sub-set of the indices of multiple deprivation).
- 8.3.14 The available data provides detail down to local authority level and enables a demographic and health profile to be made of the population within the Tibshelf to Shuttlewood area. The description of the whole population, and the populations within local authority, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

⁷² 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.

⁷³ 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>

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, as far as reasonably practicable;
 - reducing visual intrusion and noise, as far 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 In addition, the locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts as far 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)⁷⁴, which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.
- 8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.
- 8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

⁷⁴ Supporting document: Draft Code of Construction Practice

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 would affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGV). These will be assessed in the relevant sections of the formal 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 Tibshelf to Shuttlewood 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 permanent⁷⁵ impacts on neighbourhood quality in areas close to construction sites. 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 activities 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 reported in Section 13, Sound, noise and vibration. It is currently expected that the construction of the Proposed Scheme may be visible from nearby neighbourhoods, as reported in Section 11, Landscape and visual. This has the potential to contribute to impacts on neighbourhood quality and will be assessed in the formal ES.
- 8.4.14 Traffic and transport impacts in the Tibshelf to Shuttlewood area would include:
- construction vehicle movements to and from the various construction compounds and sites;
 - temporary and permanent road closures and associated diversions; and
 - temporary and permanent alternative routes for PRoW.
- 8.4.15 Construction traffic, including HGV, would be present on a number of roads in this area, as reported in Section 14, Traffic and Transport.
- 8.4.16 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.
- 8.4.17 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*
- 8.4.18 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

⁷⁵ 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.

feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

- 8.4.19 The Tibshelf to Shuttlewood area is predominantly semi-rural in character. To some extent, there is a reliance on a limited range of shops and services in nearby settlements within the area. To access alternative services it is necessary to travel longer distances. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be assessed and reported in the formal ES.

Access to green space, recreation and physical activity

- 8.4.20 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 amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.
- 8.4.21 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:
- impacts on PRow, including temporary closures, diversions and loss of amenity, which may deter the use of these routes by walkers, cyclists and equestrians;
 - any loss of green space or facility used for physical activity; and
 - the presence of construction traffic, including HGV, on the local road network, which may deter their use by walkers, cyclists and equestrians.
- 8.4.22 There would be direct impacts on access to green space, recreation and physical activity in the Tibshelf to Shuttlewood area, where land required for the construction of the Bolsover North viaduct and Bolsover North embankment would cause the permanent loss of the Snipe Bog nature reserve.
- 8.4.23 As reported in Section 14, Traffic and transport, the route of the Proposed Scheme would intersect a number of PRow in the Tibshelf to Shuttlewood area. The impacts on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be assessed in the formal ES.
- 8.4.24 Construction traffic would mainly use the site haul routes along the route of the Proposed Scheme. Some construction traffic, however, including HGV, would be present on local roads. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. Health effects associated with these impacts, including consideration of levels of use and available alternative routes for active travel and recreation, will be assessed in the formal ES.

Social capital

- 8.4.25 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'⁷⁶.

- 8.4.26 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A decrease in social capital has the potential to reduce the beneficial health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.
- 8.4.27 The settlements along the route support well-established communities. The size of the temporary construction workforce may 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 main compounds and satellite compounds in the vicinity of the settlements of Tibshelf, Stainsby, Heath, Doe Lea, Sutton Scarsdale, Bolsover and Shuttlewood. The duration of the works at each site ranges from approximately two years and six months to three years and six months. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds, and workers using facilities such as shops, restaurants and public houses within settlements.
- 8.4.28 The introduction of a temporary construction workforce into communities could have 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.
- 8.4.29 The draft CoCP 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.
- 8.4.30 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

⁷⁶ Office for National Statistics- Measuring Social Capital. Available online at:
http://webarchive.nationalarchives.gov.uk/20160107115718/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

- 8.4.31 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.
- 8.4.32 In the Tibshelf to Shuttlewood area, there is a potential for such impacts to occur, where it is currently anticipated that 11 residential properties would be demolished as a result of the Proposed Scheme. 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.
- 8.4.33 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 communities.

Other mitigation measures

- 8.4.34 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.
- 8.4.35 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.
- 8.4.36 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 Tibshelf to Shuttlewood 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 reported in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme may be visible from nearby neighbourhoods as reported in Section 11, Landscape and visual. This has the potential to contribute to impacts on neighbourhood quality and will be assessed in the formal ES.

Access to green space, recreation and physical activity

- 8.5.3 The potential impact on neighbourhood quality during operation, described above, could have the potential to change behaviours, such as reducing the use of outdoor spaces. The effects arising from the operation of the Proposed Scheme will be assessed in the formal ES.

Other mitigation measures

- 8.5.4 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 measures will be described in the formal ES.

Monitoring

- 8.5.5 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 8.5.6 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 Tibshelf to Shuttlewood 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 (HE), the National Trust, North East Derbyshire District Council (NEDDC), Bolsover District Council (BDC), the Archbishops' Council and Heath Parish Council. 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: LA10 Map Book. Only designated heritage assets within the Tibshelf to Shuttlewood area are shown on maps CT-10-376b to CT-10-380a. 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 with the HER prefix MDR). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

- 9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁷⁷, 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

⁷⁷ 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.
- 9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.
- 9.2.5 The historic environment methodology includes the consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.
- 9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage value of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.
- 9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.
- 9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has, in the main, been undertaken on that basis. However, an exception to this is Ault Hucknall War Memorial, a Grade II listed building which although situated within the land required for the construction of the Proposed Scheme would not be physically impacted. Other exceptions are the conservation areas of Hardwick and Rowthorne, Stainsby, Sutton Scarsdale, and Heath Village, which although they are within the land required for the Proposed Scheme and would be physically affected, would not be completely removed. Also, in relation to the following assets, although the asset is within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant:
- Deer Park and gardens (site of), Sutton Scarsdale Hall, Sutton Cum Duckmanton (MDR 5931) (within Sutton Scarsdale Conservation Area);
 - Midland Railway, Doe Lea Branch (route of) (MDR 11016);
 - Lancashire, Derbyshire & East Coast Railway (route of) (MDR 8651);
 - GCR Markham Colliery Branch Railway (route of) (MDR 11588);
 - GCR Bolsover Colliery Branch Railway (route of) (MDR 11590);
 - Coal wharf (site of) and railway (route of), Saw Pit Lane to Mansfield Road, Tibshelf (MDR 6064);

- Cropmarks, east of Heath (MDR 5979);
- Chesterfield to Mansfield (via Hasland) turnpike road (MDR 11649);
- Bolsover Colliery, Colliery Co. HQ and Brickworks (site of), Chesterfield Road, Bolsover (MDR 11015);
- Former Coalite Works (site of), Buttermilk Lane, Bolsover (MDR 11589); and
- Earthworks, possibly medieval, in the orchard of Woodhouse Farm, Bolsover (MDR 6278).

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 results of field surveys will be reported within 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 within 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);
- Derbyshire 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:

- Ault Hucknall War Memorial (NHLE 1429138), a Grade II listed building of moderate value;
- Ruins of Heath Old Church (NHLE 1108901), a Grade II listed building standing within a graveyard, which is an asset of high value;
- Woodhouse Farmhouse (NHLE 1108977), a Grade II listed building of moderate value;
- Hardwick and Rowthorne Conservation Area, a conservation area of high value;
- Stainsby Conservation Area, a conservation area of high value;
- Heath Village Conservation Area, a conservation area of moderate value; and
- Sutton Scarsdale Conservation Area, a conservation area of high value.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within 2km of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- six scheduled monuments of high value: Hardwick Old Hall, an Elizabethan great house (NHLE 1015889, also a Grade 1 listed building NHLE 1052337); Stainsby defended manorial complex including site of chapel (NHLE 1015890); Sutton Scarsdale Hall (NHLE 1007035, also a Grade I listed building NHLE 1108914); four watchtowers south west of town (NHLE 1007045); Bolsover Castle, a 11th century motte and bailey castle, 12th century tower keep castle and 17th century country house (NHLE 1012496); and Medieval town defences, 183m south-east of Church of St Mary and St Lawrence, and 335m north-east of Bolsover Castle (NHLE 1007053, also a Grade I listed Building NHLE 1108976);
- six Grade I listed buildings of high value: Hardwick Old Hall (NHLE 1052337, also a scheduled monument NHLE 1015889); Hardwick Hall (NHLE 1051617); Church of St Lawrence, North Wingfield (NHLE 1335463); Church of St John the Baptist, Tibshelf (NHLE 1108936); Sutton Scarsdale Hall (NHLE 1108914, also a scheduled monument NHLE 1007035); and Bolsover Castle (NHLE 1108976, also a scheduled monument NHLE 1007053);
- eight Grade II* listed buildings of high value: Range of outbuildings and stables, and walls enclosing a courtyard to south of Hardwick Hall (NHLE 1051634); Church of St Mary, Sutton cum Duckmanton (NHLE 1108915); Conduit House (NHLE 1108954); Conduit House to the rear of Number 85 (NHLE 1372046); Conduit House to the south-east of St Bernadette's Church (NHLE 1108981); Church of St Mary and St Lawrence, Old Bolsover (NHLE 1054045); Conduit House (NHLE 1054750); and the Cundy House (NHLE

1367442);

- 111 Grade II listed buildings of moderate value, including three churches, three mills, two inns, ten farmhouses and a variety of other agricultural, industrial, ornamental and domestic buildings;
- one conservation area of high value: Bolsover Conservation Area;
- four conservation areas of moderate value: Tibshelf Conservation Area; Hardstoft Conservation Area; Astwith Conservation Area and Palterton Conservation Area; and
- two Grade I registered parks and gardens (RPG) of high value: Hardwick Hall (NHLE 1000450) and Bolsover Castle (NHLE 1000674).

Non-designated assets

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

- Lowne, Lune or Lund depopulated Medieval village (site of), Heath (MDR 5951);
- Deer Park and gardens (site of), Sutton Scarsdale Hall, Sutton Cum Duckmanton (MDR 5931) (within Sutton Scarsdale Conservation Area);
- Midland Railway, Doe Lea Branch (route of) (MDR 11016);
- Lancashire, Derbyshire & East Coast Railway (route of) (MDR 8651);
- GCR Markham Colliery Branch Railway (route of) (MDR 11588); and
- GCR Bolsover Colliery Branch Railway (route of) (MDR 11590).

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

- Coal wharf (site of) and railway (route of), Saw Pit Lane to Mansfield Road, Tibshelf (MDR 6064);
- Cropmarks, east of Heath (MDR 5979);
- Chesterfield to Mansfield (via Hasland) turnpike road (MDR 11649);
- Bolsover Colliery, Colliery Co. HQ and Brickworks (site of), Chesterfield Road, Bolsover (MDR 11015);
- Former Coalite Works (site of), Buttermilk Lane, Bolsover (MDR 11589); and
- Earthworks, possibly medieval, in the orchard of Woodhouse Farm, Bolsover (MDR 6278).

- 9.3.7 Non-designated heritage assets located partially or wholly within the 500m study area include:
- Bronze Age finds and possible occupation site, Wetton Lane, Tibshelf (MDR 6061) and Cropmark complex, Harehill Wood (MDR6052);
 - World War II camp (site of), Hardwick Park, Ault Hucknell (MDR 13333);
 - Stainsby Park (site of), Ault Hucknell (MDR 5960);
 - 38 historic buildings dating from the 17th to 19th centuries within Heath Village Conservation Area;
 - Sutton Scarsdale Medieval deer park (possible site of), Sutton cum Duckmanton (MDR 12114); and
 - Poolsbrook Model Village, Staveley (MDR 11081).

Historic environment overview

- 9.3.8 Around 9,500BC a period of dramatic environmental change began in Britain. Climatic warming led to a rise in sea levels and a change in vegetation patterns. Open landscapes were replaced by forests of beech and pine, and species such as arctic hare and reindeer gave way to boar and deer. These changes encouraged the development of Mesolithic hunter-gatherer societies, and the subsequent emergence of the early agricultural societies of the Neolithic period.
- 9.3.9 Mesolithic sites in the East Midlands are often found in areas with well-drained soils and are particularly concentrated within the limestone districts of Derbyshire⁷⁸. Scatters of Mesolithic flint have been recovered from the Bolsover area⁷⁹. The Neolithic period saw the beginning of woodland clearance, a process that gathered pace during the Early Bronze Age which followed. Although no Neolithic evidence is known from within the Tibshelf to Shuttlewood area, a potential Bronze Age settlement site at Wetton Lane, Tibshelf suggests other such sites may be present within the study area.
- 9.3.10 There is little archaeological evidence for settlement activity in Derbyshire during the Romano-British period. Where evidence does exist, it is concentrated mainly within the Peak District⁸⁰. However, finds of Romano-British pottery at Long Duckmanton (HER reference 13401) and Bolsover Woodhouse (HER reference 11211) suggest that the Tibshelf to Shuttlewood area contained settlements during this period, and that there is the potential for such remains to be present elsewhere within the study area.
- 9.3.11 A recent review of the period between the 5th and 9th centuries has noted 'There are ... no excavated settlements in huge areas of Derbyshire and Nottinghamshire. Settlement patterns and material culture in these areas are simply unknown⁸¹.' During

⁷⁸ Myres, A, (1998 – 2000a), An Archaeological Resource Assessment of the Mesolithic in Derbyshire. East Midlands Archaeological Research Framework

⁷⁹ Riden, P and Fowkes, D, (2009), Hardwick: A Great House and its Estate, Philimore

⁸⁰ Barrett, D, (1998 – 2000a), An Archaeological Resource Assessment of Anglo-Saxon Derbyshire. East Midlands Archaeological Resource Framework

⁸¹ Vince, A, 'The Anglo-Saxon Period (c.400-850)' in Cooper, N J (ed), (2006), *The Archaeology of the East Midlands: An Archaeological Resource Assessment and Research Agenda*, Leicester Archaeology Monograph No. 13 161

the late 9th and early 10th centuries Scandinavian settlement predominated in the area and is evidenced by surviving place-names containing the Scandinavian words 'tun', 'by' and 'thorpe', Stainsby being an example. These settlements became the framework for land use during the medieval period. An example is Stainsby, a manor recorded in Domesday Book, a comprehensive survey of England issued in 1086. Some medieval settlements gradually fell out of use and are no longer visible within the landscape. An example of this phenomenon is provided by the ruins of Heath Old Church, the only visible remains of the settlement of Lund which lay to the east of present-day Heath. A possible shrunken medieval settlement is also thought to be present within the existing village of Sutton Scarsdale.

- 9.3.12 Settlement at Heath during the medieval period was probably first established next to what is now the ruined church and graveyard of Heath Old Church, a Grade II listed building (NHLE 1108901). This settlement is known to have been called Lune in the 12th century and Lowne in the 16th century⁸², by which time cultivation of the moorland had led to creation of the new village of Heath. Subsequently, the original village was abandoned; much of its site was removed by construction of the A617, and no trace of it is visible in the modern field. The old church survived until 1852, at which point most of it was demolished. The porch was conserved as a picturesque ruin within a walled graveyard containing some 18th and 19th century gravestones. All Saints Church in Heath was built in 1853, partly using stone from the old church, as well as two 11th or 12th century coffin slabs from the same church.
- 9.3.13 A medieval manor house and chapel stood behind a defensive rampart on the hill at what is now the small village of Stainsby. The manor of Stainsby also included a deer park (east of the M1) and the village of Ault Hucknall. The manor was in the possession of the Sauvage family from the 12th century until 1593, when Edward Sauvage sold his land to Bess of Hardwick, further consolidating her family's holdings in the area. By that time, the manor house was no longer in use as the main family seat, and may have become a farmhouse or have been partly demolished. The site is occupied by a Victorian school building (now a Scout centre) which contains two crucks within its fabric and may therefore incorporate part of the medieval manor house. The adjacent school house may have origins as an ancillary agricultural building.
- 9.3.14 Aside from settlement, land was also utilised during the medieval period for game-management and hunting. Parks, which were an essential part of this process, are known to have existed at Stainsby Park, Ault Hucknall, Sutton Scarsdale and Sutton cum Duckmanton.
- 9.3.15 Bolsover was established as a town and castle borough soon after the Norman Conquest of 1066, probably by William Peveril⁸³. The new borough was located to the east of the castle and was the focus of a number of Peveril's manors in the east of

⁸² also called Lowne, Lunt or Lund in other sources

⁸³ Creighton, O, (2002), *Castles and Landscapes: Power, Community and Fortification in Medieval England*

Derbyshire. These complemented his wider landholdings in the Peak District, and around Nottingham⁸⁴.

- 9.3.16 During the 16th and 17th centuries three notable country houses were constructed within the 2km study area. From south to north, these were Hardwick, Sutton Scarsdale and Bolsover Castle. Sutton Scarsdale and Bolsover Castle developed from the medieval sites which preceded them. Hardwick appears to have been a new development; however, it may have been related to the manor of Stainsby. These houses are related to each other in the context of the history of the area, and exerted considerable influence over the development of the landscape around and between them.
- 9.3.17 The Old Hall, Hardwick Hall and parkland at Hardwick were established in the 16th century as a hunting preserve in the medieval style, at the direction of Elizabeth Cavendish, Countess of Shrewsbury and better known as Bess of Hardwick. Hardwick Old Hall was first constructed in the early 16th century but remodelled by Bess of Hardwick between 1587 and 1596. It is sub-rectangular in plan, is aligned east to west, and has a forecourt and two lodges to the north. It survives as a ruin, of which the west wing rises to approximately its original height of five storeys. The adjacent Hardwick Hall was constructed between 1590 and 1597, and was of particular note for its extensive use of glass, a highly valuable material in the 16th century. Its imposing glazed elevations gave rise to the local saying 'Hardwick Hall, more glass than wall'. It has two storeys over a basement storey, with three-storey towers at each end, and is roughly H-shaped in plan. Its roof is hidden behind parapets, and the elevations are covered with an extensive, symmetrical pattern of fenestration. The western elevation has a colonnade and doorway opening into a grassed forecourt with views westward and down across the parkland towards the M1 motorway below. There are formal gardens in four hedge-enclosed quadrangles to the south of the new hall (and east of the old hall). Further south of that is a group of service buildings (which are listed) and a road (Hardwick Drive) that curves south and westwards through the park to exit at Deep Lane.
- 9.3.18 The park and gardens of Hardwick Hall are a designed landscape that extends eastwards from the M1 for approximately 2.4km. The western side of the park drops in height from the halls by approximately 60m to the M1, and contains patches of woodland and a series of ponds at the bottom, to create a semi-natural, rural appearance. The eastern side is flatter, and includes more formal vistas and walks, with avenues of trees leading to the 'new' hall. A second road runs northwards from the halls, forking to head north-east for Rapphorne and north-west to meet Mill Lane on the way to Stainsby. Hardwick remained the principal seat of the Earls of Devonshire until the 1680s.
- 9.3.19 Sutton Scarsdale Hall is probably the site of several houses, with earlier examples which are no longer visible above ground dating from the Anglo-Saxon period onwards. The earliest documented buildings on the site are a manor house and church, which were recorded in 1086. An outbuilding of 17th century date on the

⁸⁴ *ibid*

western side of the site is probably indicative of an earlier hall. The extant hall was built in 1724 as a country house for the Earl of Scarsdale. It is located at the north-west corner of the village, adjacent to the church, looking out over steeply-sloping land to the north and east, including views towards Bolsover. The land north and west of the hall was parkland from the 17th century, 260 acres being enclosed by drystone walls. It appears to have been re-landscaped in the early 18th century, and was described in 1827 as containing fine plantations and spacious fishponds. The hall was a fine Palladian mansion incorporating elements of Baroque style, but is now a ruin, having been stripped of its fixtures and fittings during the early 20th century.

- 9.3.20 In the 17th century Bolsover passed into the hands of the Cavendish family through a process initiated by Bess of Hardwick's fourth marriage, to George Talbot, Earl of Shrewsbury. It was Charles Cavendish, one of Bess's sons from her second marriage (to Sir William Cavendish) who began the rebuilding of Bolsover Castle in the form that it exists today. Together with Hardwick Hall, Bolsover was a clear demonstration of the Cavendish family's influence and control of the area.
- 9.3.21 Bess and her husband, the first Earl of Devonshire, invested heavily in the local coal industry. During the mid-16th century they developed small pits at Heath, Hardstoft and Bolsover. Other industrial ventures included glassworks, which supplied the window glass for Bess of Hardwick's grand halls, and charcoal burning within the bounds of the former park at Stainsby.
- 9.3.22 As the pace of the Industrial Revolution quickened during the course of the 18th century, the demand for coal prompted an increase in the number and size of collieries in the district. The prospect of work at the collieries encouraged people to move into the area. Most were housed in new coal estate villages such as Holmewood, to the west of Heath, Glapwell and Doe Lea between Hardwick and Bolsover, Carr Vale, New Bolsover, and Skegby and Pleaseley. The majority of these new communities comprised rows of terraced houses laid out in a grid pattern, but New Bolsover was atypical, being arranged around a green and offering a range of civic amenities⁸⁵.
- 9.3.23 The scale of the colliery workings, and the mining villages, railway branches and sidings which developed to service them, fundamentally altered large parts of the local landscape. This activity would also have affected the historic environment, with a resultant widespread loss of buried archaeological remains within these parts of the study area. After the collieries began to close towards the end of the 20th century the landscape gradually began to return to agricultural and other industrial uses. Today, little obvious landscape evidence of the area's mining past survives, with the exception of remaining areas of colliery spoil.

⁸⁵ Riden, P and Fowkes, D, (2008), *Bolsover Castle, Town and Colliery*, Philimore

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 as far as reasonably practicable.
- 9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)⁸⁶ 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 Stainsby defended manorial complex including the site of a chapel (NHLE 1015890) is a scheduled monument of high value located less than 100m west of the land required for construction of the Proposed Scheme. It comprises the buried remains of a manor house and chapel, surviving earthworks of a defensive ditch and rampart, an outer circuit bank and a fishpond. The asset is on a low hill and has northward and eastward views across rolling countryside, which includes surviving strip fields⁸⁷ to the west and north that date to the 17th century or earlier. As a manorial site, the asset derives much of its value from its historic interest and research potential. Elements of the asset's setting also contribute to its value, including its prominence within the landscape, its relationship with settlement to the south, and its relationship with surrounding agricultural land-use (despite subsequent changes to the field pattern in the wider area). Other elements of the setting, including the openness and green

⁸⁶ Supporting document: Draft Code of Construction Practice

⁸⁷ A strip field is the result of a method of farming which involves a field being partitioned into long, narrow strips to allow a crop rotation system. They were common in the medieval period.

space of the views, aid appreciation of the asset's value. However, the M1 motorway to the east introduces noise and movement (albeit screened by trees) to the setting, impacts that detract somewhat from an appreciation of the asset's value.

- 9.4.6 The asset would experience temporary changes to its setting as a result of construction activities associated with the Proposed Scheme, which would affect views out of the asset as well as views into it from the west. These changes would relate principally to a materials stockpile area located approximately 280m to the north of the asset, and also the movement of construction traffic on Mill Lane to the north and east of the asset. This would have a low impact on the value of the scheduled monument, due to a reduction in the ability to appreciate its historical context and setting. The low magnitude of impact would result in a moderate adverse effect.

Permanent effects

- 9.4.7 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.
- 9.4.8 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.
- 9.4.9 Hardwick and Rowthorne Conservation Area is a designated heritage asset of high value which lies partly within the land required for the Proposed Scheme. The asset encompasses a large area containing two villages (Ault Hucknall and Rowthorne), farms, a mill, and associated land uses (woodland, agricultural fields and a designed parkland). It has an historic core to the south, focussed around Hardwick Old Hall, a scheduled monument (NHLE 1015889) and Grade I listed building (NHLE 1052337), and Hardwick Hall, a Grade I listed building (NHLE 1051617), and Hardwick Hall's Grade I registered park and garden (NHLE 1000450). Those assets are grouped in this assessment, and are discussed separately below. The northern part of the conservation area is characterised by agricultural fields. These make a beneficial contribution to the value of the conservation area by virtue of creating a broad and clear buffer between the park and the modern character of the surrounding rural landscape setting⁸⁸. To the west, the setting includes the M1 motorway, which slightly reduces the contribution the setting makes to the character and appearance of the conservation area.
- 9.4.10 The north-western part of the asset that would be physically affected by the Proposed Scheme comprises an agricultural field, which makes a small contribution to the conservation area's value in comparison with the southern part that contains the cluster of high-value assets around Hardwick Hall. The Mill Lane diversion would be

⁸⁸ The northern part of the conservation area contains late 18th century Stainsby Mill (NHER 1052316) and Ault Hucknall War Memorial (NHLE 1429138). These are Grade II listed buildings standing approximately 50m apart on the northern road into the conservation area. Stainsby Mill lies immediately outside the land required for the Proposed Scheme, while Ault Hucknall War Memorial lies just inside. Just north of Hardwick Hall Grade I registered park and garden (NHLE 1000450), and lying within the conservation area, stands The Grange (NHER 1052258), an impressive sandstone double-fronted house, built in the 17th century (with later modifications) on a steep slope within a strip of woodland. These assets would not experience significant effects from either physical or setting-related impacts as a result of the Proposed Scheme.

constructed in this area, resulting in a loss of land and field boundaries. There would also be some change to the setting of the conservation area due to the presence of the Proposed Scheme beside the M1. As a result, this asset would experience a low adverse impact and a moderate adverse effect.

- 9.4.11 Ruins of Heath Old Church (NHLE 1108901) is a Grade II listed building of high value. It comprises a ruined church and associated graveyard. This asset derives much of its value from its research potential, but is also of substantial historic interest as well as social and spiritual importance. The ruins are the only visible remainder of the original settlement in this area, which pre-dated and was later contemporary with the current village of Heath and which is now abandoned. The ruins also represent a continuity of worship with the later All Saints Church, Heath, and were recreated as a ruin during the Victorian period. The church and churchyard would be removed by the Proposed Scheme. This would constitute a high magnitude of impact and a major adverse effect.
- 9.4.12 Stainsby Conservation Area is a designated heritage asset of high value. The eastern edge of the conservation area lies within the land required for the Proposed Scheme. The asset derives its value from its aesthetic and historic interest as a medieval fortified settlement on a low hill (Stainsby defended manorial complex, NHLE 1015890). The settlement developed into the surviving small post-medieval settlement and its associated multi-phase field system. Value is also derived from the setting of the asset, which includes the survival of the historic relationship between settlement and fields, the latter of which include strip fields to the west and other fields in the valley to the north which date to the 17th century or earlier. The setting also includes the M1 motorway which, despite being screened from the asset by vegetation, slightly reduces the contribution that setting makes to the value of the conservation area. The eastern edge of the conservation area marks the clearly-perceptible eastern boundary of the settlement of Stainsby, as depicted in a map of 1610⁸⁹, although a large field which was originally contemporary with the strip fields has later been enclosed into three fields which radiate down from the settlement on the hill.
- 9.4.13 Stainsby Conservation Area would be physically impacted by the Proposed Scheme (unlike the scheduled monument at Stainsby, which would be affected by changes to its setting only; see above). The Proposed Scheme would truncate the lower parts of the three fields on its eastern edge, plus sections of their boundaries. In addition, the Proposed Scheme would be constructed on an embankment, adding a new and visually dominant element to the landscape, which would be harmful to the aesthetic interest and appearance of the conservation area. The new boundary, aligned in a straight line from south to north, would replace the historic semi-circular boundary of the conservation area and fields around the manor, obscuring part of the historic interest and character of the asset. A new attenuation pond would also be constructed to the north, in the opposing slope of the river valley. As a result of these changes, the asset would experience a medium adverse impact and a major adverse effect.

⁸⁹ Senior, W; 1610; *The Platt of the Mannor of Stainsbie, belonging to the Right Honourable William L Cavendish*

- 9.4.14 Woodhouse Farmhouse (NHLE 1108977) is a Grade II listed building of moderate value. It was built in the early 19th century of sandstone with a Welsh slate roof. This asset would be removed by the Proposed Scheme, constituting a high magnitude of impact and a major adverse effect.
- 9.4.15 Lowne, Lune or Lund depopulated Medieval village (site of), Heath (MDR 5951), a non-designated asset of moderate value, would be removed by the Proposed Scheme. This asset is of moderate value because of its regional importance as an example of the remnants of a deserted medieval village largely untouched by later development. It may include dwellings, industrial areas and land divisions which could aid an understanding of how the settlement functioned. Removal of the asset would constitute a high magnitude of impact and a major adverse effect.
- 9.4.16 Earthworks in the orchard of Woodhouse Farm (MDR 6278) would be removed by the Proposed Scheme. This non-designated asset is possibly medieval in date and may indicate the remains of an isolated farmstead or industrial site of local interest, and therefore of low value. Removal of the earthworks during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect.
- 9.4.17 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:
- 9.4.18 A group of assets in Hardwick Park (discussed here as the Hardwick Hall group) comprise three designated assets of high value which are associated with a complex, wider set of medium and high value assets⁹⁰. The group comprises two Elizabethan 'great houses', Hardwick Old Hall and Hardwick Hall, within a designed park and garden, alongside a collection of other historic buildings. Hardwick Old Hall is a scheduled monument (NHLE 1015889) and Grade I listed building (NHLE 1052337) of high value. Approximately 200m east of Hardwick Old Hall is Hardwick Hall (NHLE 1051617), another Grade I listed building of high value. The extensive grounds of Hardwick Hall are a Grade I registered park and garden (RPG) of high value (NHLE 1000450).
- 9.4.19 Hardwick Old Hall, Hardwick Hall and the RPG around them are designated at the highest level for their asset types. In their own right, the buildings are of exceptional interest, and as a group with the park and garden they are of international value. This value is derived from many sources, including the architectural innovation and quality of the buildings, their close associations with other buildings (that is, those within the RPG and similar great halls) and their power to illustrate and explain important periods of English history. Their association with notable people and events is also important, as is their potential to aid future research into the development and character of great halls. The asset group's value is increased by the fact that the

⁹⁰ In the vicinity of the two halls are other listed buildings, including the Grade II* listed Range of Outbuildings and Stables, and Walls Enclosing a Courtyard to South of Hardwick Hall (NHER 1051634), and the following Grade II listed buildings: Gazebo and Garden Walls at Hardwick Hall (NHER 1108997), Conduit House South of Hardwick Old Hall (NHER 1108996), Group of Six Statues in the Gardens of Hardwick Hall (NHER 1051625), Range of Cottages to South West of Hardwick Hall (NHER 1108998), Engine House, Saw Mill and Attached Chimney at Hardwick Saw Mill (NHER 1108999), Joiner's Shop to North of Saw Mill (NHER 1335391), and Shed to North of Engine House and Saw Mill (NHER 1372650). These are omitted from the description of the significance of effect on the Hardwick Hall group as they would not experience a significant impact as a result of the Proposed Scheme.

buildings function as focal points within a wider landscape that is itself of great interest for its design, history and the evidence it provides for land-use before the halls' construction and later. The assets that form this group also gain a considerable proportion of their value from their aesthetic 'interest', both in terms of their intentional design and engagement with their natural character and appearance.

- 9.4.20 The Hardwick Hall group also gains some of its value from its setting, the most important elements of which are the relationship between the two halls, the formal gardens, the surrounding designed parkland, and the associated service buildings. The RPG encompasses much of the area within which the halls are set, although the wider setting is also important, in particular to views in and out of the group. This wider setting includes the agricultural fields, woodland and two villages within the northern part of Hardwick and Rowthorne Conservation Area (see above), as well as the modern agricultural landscape beyond, to the south, west and north. The M1 motorway, located immediately west of the RPG, is also an element of the setting, and detracts somewhat from the contribution setting makes to the asset group's value.
- 9.4.21 There are views over the park and surrounding landscape from various viewpoints within the Hardwick Hall group. The two halls share most of the same views (from different viewpoints) across a largely rural landscape to the north-west, west, south-west and south, although Hardwick Hall has a more formal relationship with the designed landscape (plus views to the east, away from the Proposed Scheme). Notable viewpoints include the roof of the 'new' hall, which was designed to be used to appreciate the wider landscape, the west side of the 'new' hall courtyard, the western side of Old Hall, and along the road that runs through the centre of the hall complex, next to the top of the escarpment. Views to the north, west and south include the M1 (which lies approximately 60m below the halls), while views to the north-west extend to Chesterfield and beyond, and also include the large white roofs of an industrial estate. The prominent positions of these viewpoints contribute to the asset group's value by illustrating its high status, and the scale and rural character of the landscape in these views aid appreciation of the group's value. However, the presence of the M1 and other modern intrusions into these views detract slightly from the contribution they make to that value. There are views out of the RPG from many locations, encompassing parts of the same landscape as is visible from the halls. Views across and within the Hardwick Hall group (for example, the view of Hardwick Old Hall on approach through the RPG from the south-east) also contribute to its value, by placing the different components in context and helping visitors to understand and appreciate their character and relationships.
- 9.4.22 Views towards and including the Hardwick Hall group also contribute to its value. The halls are notable landmarks visible from many directions in views where their landscape context is clearly appreciable (for example, the halls may break the skyline, but also be encircled by tree cover that extends down into the wider parkland). The halls are perceptible in some long views, particularly from elevated positions (for example, the southern side of Stainsby village, approximately 2km away). Views toward the halls from lower terrain (for example, to the west) contribute to their value by accentuating their prominent position, which is an intentional indication of their

high status. Many views from the west also incorporate the existing M1; in instances where the motorway is close or prominent, it detracts from the contribution that those views makes to the group's value.

- 9.4.23 Hardwick Hall RPG is, at its closest point, located immediately adjacent to the land required for the Proposed Scheme. Hardwick Old Hall is located 750m to the east of the land required for the Proposed Scheme, and Hardwick Hall is located approximately 950m to the east. The Proposed Scheme would cross the landscape from south to north on the opposite side of the M1, at its closest reaching to within approximately 80m of the RPG. It would involve construction of (from south to north) Hardstoft North cutting, which would be approximately 900m long, Hardstoft North embankment, which would be fairly slight and extend for approximately 260m, and Astwith cutting, which would be fairly shallow and approximately 770m long. To the south, an overbridge would be constructed where Deep Lane crosses the new Hardstoft North cutting, and to the north a new viaduct (Stainsby Viaduct) would be constructed. Hawking Lane would be closed immediately west of the M1 and re-routed to the west of the new railway line between Deep Lane and Stainsby. The new road would mirror the route of the railway across the existing topography by lying in a deep cutting at its southern end, then on a slight embankment, and then in cutting where it would run northwards from Astwith Lane.
- 9.4.24 Unlike Hardwick and Rowthorne Conservation Area, the Hardwick Hall group of assets would not be physically impacted by the Proposed Scheme. However, the construction of the railway, cuttings and embankments, and works to the road network would alter the settings of this group of assets. The Proposed Scheme would introduce a large modern element into the landscape of the Hardwick Hall group, altering the historic rural character of the area by changing field patterns and routes across it, and by adding an additional modern intrusion into views to, from and including the asset group. The railway would cross the landscape at grade, in contrast with the undulating terrain beneath it, although the adverse impact of this variation would be reduced by the fact that it would also provide some screening of views. When experienced from many points within the asset group, the Proposed Scheme would be present in intermittent views, glimpsed through existing vegetation. When experienced from various viewpoints to the north-west, west, south-west and south of the asset group, the presence of the Proposed Scheme would alter views up to it; the degree to which these views change would vary depending on the location of the viewpoint and local conditions such as landform and vegetation. These changes would slightly affect the viewer's ability to understand and appreciate the historical context of the Hardwick Hall group. This would have a low impact on each of these asset's values and on the group as a whole, resulting in a moderate adverse effect on the group.
- 9.4.25 The setting of Stainsby defended manorial complex, including the site of a chapel, a scheduled monument (NHLE 1015890; described above) lying less than 100m from the land required for the Proposed Scheme, would be changed by the presence of the Proposed Scheme. In views from the monument, the western face of Stainsby North embankment would be partially visible, as would the track bed and catenary system of the railway. Because the nearby M1 is present in these same views it is considered that

the change to the monument's setting, and therefore the impact to its value, would be low. This would constitute a moderate adverse effect.

- 9.4.26 Sutton Scarsdale Hall (NHLE 1007035, NHLE 1108914), a scheduled monument and Grade I listed building of high value, is located 750m to the west of the land required for the Proposed Scheme. The hall comprises the shell of a Georgian mansion, the interior of which was dismantled in the early 20th century. The setting of the hall includes intentional views towards Bolsover Castle. Whilst this view remains, it now contains modern intrusions such as the M1 and the modern settlements and commercial buildings surrounding Bolsover.
- 9.4.27 Despite the modern intrusions, the setting of Sutton Scarsdale Hall makes a positive contribution to its value, as the topographical relationship with Bolsover Castle remains. The hall would experience changes to its setting as a result of the presence of the Proposed Scheme. The route would pass to the east of the existing M1 on embankment, at a distance of approximately 1.2km from the building. The Proposed Scheme would be visible within, and would break up the cohesion of this view, and therefore would have an effect on the ability of the viewer to appreciate the hall's historic context and setting. This change would constitute a low impact, resulting in a moderate adverse effect.
- 9.4.28 Bolsover Castle (NHLE 1012496, NHLE 1108976, NHLE 1000674), a scheduled monument, Grade I listed building and Grade I RPG of high value set within a conservation area, is located approximately 1km from the land required for the Proposed Scheme. The choice of site for the original medieval castle was deliberate, the location having extensive views over the valley to the west which provided a clear strategic advantage in terms of monitoring and controlling activity in the area. Later, this same aspect was to offer dramatic effect when the castle was transformed from a defensive structure to a 'great house'. This view is a key element of the setting of the castle and contributes to its value. The landscape between the castle and the Proposed Scheme, which would lie to the west of the monument, contains large areas of modern development in the form of the settlements of Carr Vale and New Bolsover. Traffic moving on the M1 is also visible from the castle. Despite these modern intrusions, the setting of the castle, by virtue of its topography, makes a positive contribution to its value. The change to the castle's setting arising from the presence of the Proposed Scheme would affect the ability of the viewer to appreciate its historic context and setting. This change would constitute a low impact, resulting in a moderate adverse effect⁹¹.

Other mitigation measures

- 9.4.29 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:

⁹¹ There would be not be a significant effect on Bolsover Conservation Area. Although views across the wider landscape make an important contribution to the value of the scheduled monument and listed building they are not so important to the character of the conservation area.

- 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

- 9.4.30 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.
- 9.4.31 As no specific mitigation measures have yet been identified in relation to heritage assets described above, the residual effects are the same as those reported under permanent effects. Over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

- 9.5.1 The following measure has been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-o6 Map Series within the Volume 2: LA10 Map Book:
- noise mitigation measures have been included within the Proposed Scheme that could reduce potential impacts on some heritage assets;
 - landscape planting could increasingly reduce impacts on the settings of the designated heritage asset within the study area as it matures.

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 ground works are anticipated, and as such there would be no further physical impacts 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 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:

- Hardwick and Rowthorne Conservation Area;
- Hardwick Old Hall;
- Hardwick Hall;
- Hardwick Hall RPG;
- Stainsby Defended Manorial Complex;
- Sutton Scarsdale Hall; and
- Bolsover Castle.

9.5.7 In relation to the following asset, the operation of the Proposed Scheme would result in additional affects that are significant and greater than the permanent effects of construction alone.

9.5.8 Stainsby Conservation Area is a designated heritage asset of high value focussed on a scheduled medieval fortified settlement (Stainsby defended manorial complex, NHLE 1015890). During the operational phase of the Proposed Scheme, trains would cross the eastern part of the conservation area on embankment, introducing disturbance through movement of the trains. This would result in an additional low magnitude of impact and a moderate adverse effect.

Other mitigation measures

9.5.9 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

9.5.10 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

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

9.5.12 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 Tibshelf to Shuttlewood 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), areas of historical mineral extraction in the context of land quality and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.
- 10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Derbyshire County Council (DCC), Bolsover District Council (BDC), Local RIGS (Regionally Important Geological Sites) Groups, Mansfield District Council (MDC), North East Derbyshire District Council (NEDDC), the Coal Authority, the Environment Agency, Fera Science Limited (FSL)⁹² and the Animal and Plant Health Agency (APHA). 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: LA10 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)⁹³.
- 10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased up to 1km.

⁹² Formerly known as the Food and Environment Research Agency.

⁹³ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 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 resources⁹⁴ 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 and SSSI data.

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, Coal Authority, Public Health England, the Environment Agency, and Natural England, FSL and APHA records, as well as web sources such as local geological trusts and local authorities.

⁹⁴ 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 Tibshelf to Shuttlewood area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate⁹⁵.
- 10.3.3 Table 20 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme and in the study area.

Table 20: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Historical areas of coal extraction, near seams around Tibshelf, Hardstoft, Stainsby, Doe Lea and Sutton Scarsdale. Deposits between Bolsover and Poolsbrook. Generally resulting from activities such as coal extraction and waste/spoil disposal	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not applicable
Superficial			
Alluvium	Along the River Doe Lea, River Rother and tributaries	Gravel, sand, silt and clay	Secondary A
Head	In the upper reaches of the Doe Lea and tributaries of the River Rother near Hardwick Hall and Poolsbrook	Clay, silt, sand and gravel ⁹⁶	Secondary (undifferentiated)
Bedrock			
Pennine Middle Coal Measures Formation	Outcropping across the majority of the study area	Interbedded mudstone, siltstone and sandstone, with coal seams	Secondary A
Pennine Lower Coal Measures Formation	Small outcrop around the Hardstoft area and at the far west of the Staveley Spur	Interbedded mudstone, siltstone and sandstone, with coal seams	Secondary A

Made ground

- 10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds or pits have been backfilled.

⁹⁵ British Geological Survey, (2012), *Chesterfield Bedrock and Superficial Deposits*. Available online at: <http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1004273>

⁹⁶ The BGS Lexicon describes Head deposits as polymict deposits comprising gravel, sand and clay. Poorly sorted and poorly stratified, comprising sand and gravel, locally with lenses of silt, clay or peat and organic material

- 10.3.5 There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground. Furthermore, colliery spoil heaps are present in a significant proportion of the area. See Table 21 to Table 23 for further details of these features.
- 10.3.6 Made ground is recorded on the BGS geological map of the area. This includes:
- constructional fill, mine and quarry waste at Bolsover;
 - excavations, wholly or partly backfilled associated with opencast mining around the Staveley area;
 - excavations, wholly or partly backfilled associated with opencast mining around junction 29 of the M1 to Hardstoft; and
 - excavations, wholly or partly backfilled associated with opencast mining north of the Tibshelf services.
- 10.3.7 Furthermore, this area has been heavily worked for coal, therefore substantial unrecorded colliery spoil heaps may be present. There is little documented evidence of the location of these spoil heaps, but historical mapping, colliery records, anecdotal evidence and anthropogenic geomorphological evidence have been used to identify spoil heap localities.
- 10.3.8 The Coal Authority has classified the whole of the area as having a potential for underground workings. Known mining areas include elongated zones of ground subject to shallow workings (<30m depth) that are located throughout the study area. These areas may contain voids or broken ground.
- 10.3.9 No known farm burial or pyre sites associated with the 2001 outbreak of foot and mouth disease (FMD) are known to be present within the Tibshelf to Shuttlewood area. 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. In all cases, the records do not provide an exact location for the burial or pyre sites and other, unrecorded sites are likely to be present.
- 10.3.10 The APHA Foot and Mouth Disease (FMD) County Status maps⁹⁷ show high risk, at risk and FMD free counties during the 2001-2002 outbreak. According to the maps the study area falls within FMD free counties.

Superficial geology

- 10.3.11 Alluvial deposits variably comprising gravel, sand, silt and clay, occur along the courses of streams and rivers. Alluvium is present in the study area associated with the River Doe Lea and its tributaries and the River Rother.

⁹⁷ Foot and Mouth Disease 2001 - County Status Map 29.10.2001, APHA available at: <https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001>.

- 10.3.12 Head deposits comprising clay, silt, sand and gravel are present associated with the River Doe Lea upstream of Hardwick Hall Great Pond and at the upper reaches of Pools Brook and Trough Brook.

Bedrock geology

- 10.3.13 The Pennine Middle Coal Measures Formation underlies the majority of the Proposed Scheme in this study area, and comprises cyclical⁹⁸ layers of interbedded mudstone, siltstone and sandstone with coal seams. The Pennine Middle Coal Measures Formation is characterised by well-developed cyclothems⁹⁹, good quality economically important coal seams and thick sandstone beds.
- 10.3.14 Many of the coal seams in the study area outcrop at the surface and have been worked economically in the past. Key seams south of Hardwick Hall include:
- Top Hard;
 - Dunsil;
 - 1st Waterloo;
 - 3rd Waterloo; and
 - 2nd Ell.
- 10.3.15 Between the M1 junction 29 and Sutton Scarsdale, the Pennine Middle Coal Measure outcropping seams include:
- High Hazles;
 - Low Bright (or Abdy);
 - Two Foot; and
 - Clowne.
- 10.3.16 The Williamthorpe Syncline causes the Pennine Middle Coal Measures seams to outcrop again at Shuttlewood, trending approximately north-west/south-east.
- 10.3.17 Occasional minor faults cross the study area, trending approximately north-east to south-west. The Inkersall Fault is a major fault, trending approximately north-west to south-east, crossing the route of the Proposed Scheme near Bolsover.
- 10.3.18 Around Hardstoft the Pennine Lower Coal Measures outcrop at the surface. The Pennine Lower Coal Measures predominantly comprise mudstones, with locally thin sandstone beds. Two coal seams (Clay Cross and Deep Soft Coals) outcrop in this area; both have been mined using shallow mining methods.
- 10.3.19 Coal mining is further discussed in Section 10.3.57.

⁹⁸ Repetitive patterns of different rock layers, caused by repeated changes in the depositional environment

⁹⁹ Coarsening-upward sequences of mudstone, siltstone and sandstone, often topped with seatearths and coal seams

Radon

- 10.3.20 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 Dataset¹⁰⁰. This is expressed as a percentage of homes that are at or above the action level of 200 becquerels per cubic metre of air (Bq/m³) for residential properties.
- 10.3.21 The majority of the study area is within an area where less than 1% of homes are estimated to be at or above the radon action levels. However, there are a number of areas where between 1 and 3% of homes are estimated to have radon levels at or above the action level. These are:
- any part of the route that is indicated to overlie alluvium deposits;
 - an approximately 1km² area around Shuttlewood village;
 - the area south of Hardwick Hall Park to Stanley; and
 - an elongated area extending between Saw Pit Lane industrial estate and Hardstoft village.
- 10.3.22 Approximately 3 to 5% of homes are estimated to have radon levels at or above the action level in an area between Miller's Pond at Hardwick Hall, Doe Lea village and Astwith village.
- 10.3.23 Approximately 5 to 10% of homes are estimated to have radon levels at or above the action level in an elongated area extending approximately south-east from Saw Pit Lane industrial estate.
- 10.3.24 The formal ES will include an assessment of areas where 5% and over of homes are estimated to have radon levels at or above the action level of 200 Bq/m³.

Groundwater

- 10.3.25 Two categories of aquifer have been identified within the area, as defined by the Environment Agency:
- the bedrock of the Pennine Middle and Lower Coal Measures and the superficial alluvium are designated as Secondary A aquifers; and
 - the superficial head deposits are designated as a Secondary (undifferentiated) aquifer.
- 10.3.26 The Environment Agency reports that there is one groundwater abstraction licence located within 1km of the land required for construction of the Proposed Scheme. This is for industrial use of a heat pump by an energy generating company. There may be private groundwater abstractions that are not recorded by the Environment Agency or local authorities.

¹⁰⁰ Available at: <http://www.bgs.ac.uk/radon/hpa-bgs.html>. This dataset underpins Public Health England's Indicative Atlas of 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).

- 10.3.27 There are no groundwater source protection zones (SPZ)¹⁰¹ identified within the study area.
- 10.3.28 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 designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius for SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.
- 10.3.29 According to BDC, MDC and NEDDC records, there are no private groundwater abstractions within the study area that do not require a permit registered within the study area.
- 10.3.30 Further information on the groundwater in the Tibshelf to Shuttlewood area is provided in Section 15, Water resources and flood risk.

Surface water

- 10.3.31 The Proposed Scheme would intersect the following watercourses, from south to north. The WFD designation of each watercourse is shown in brackets.
- Tributaries of Doe Lea 1, 2, 4, 5, 6, 7, 8,9 (Ordinary Watercourses);
 - Tributary of The Goit 1 (Ordinary Watercourse);
 - The Goit (Ordinary Watercourse);
 - River Doe Lea (Main River); and
 - Tributaries of Doe Lea 13, 18, 16, 20 (Ordinary Watercourses).
- 10.3.32 The Proposed Scheme would also intersect or run adjacent to a number of surface water features, detailed below:
- Great Pond at Hardwick Hall;
 - Miller's Pond at Hardwick Hall;
 - Carr Vale Pond, to the south of Bolsover;
 - Lagoons at the former Bolsover Colliery;
 - Ponds and pools within Poolsbrook Country Park;
 - Staveley Canal Basin on Chesterfield Canal; and
 - Numerous unnamed ditches and drains.
- 10.3.33 There is one licensed surface water abstraction located within the study area at Carr Vale Pond, licensed to Vale Angling Club for maintenance of its fishing pond.

¹⁰¹ A groundwater SPZ is a defined area within which groundwater is extracted 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.

10.3.34 No private water supplies from surface water sources have been identified within the study area. However, there may be unrecorded abstractions near to the route of the Proposed Scheme.

10.3.35 Further information on surface water in the Tibshelf to Shuttlewood area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.36 Current potentially contaminative land uses within the study area include two recorded landfill sites (one of which is still recorded as active) and four industrial sites. The key potentially contaminative sites are:

- the industrial estate at Saw Pit Lane (including a zinc plating works and other activities requiring environmental permits or licences);
- petrol stations at Tibshelf services (between M1 junction 28 and 29) and Morrisons supermarket at Staveley; and
- industrial estates at Bolsover, Markham Vale and Staveley.

10.3.37 Historical land uses identified within the study area with the potential to have caused contamination include two historical landfill sites, numerous mining sites (overlapping both spatially and temporally) and two 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:

- a former gas works at Bolsover;
- the former Coalite Chemical Works;
- former opencast mines and collieries with associated spoil heaps and infrastructure; and
- two former fuel stations (Fourways Garage near Bolsover and a Heavy Goods Vehicle (HGV) fuel station south of Staveley).

10.3.38 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical coal mining activities, with historical mining operations having taken place throughout the Study Area, particularly to the north-west of Bolsover and to the south of Palterton Lane. The records show a mix of vertical and non-vertical shaft and adit entries, either extracting coal from surface outcrops or from shallow mining (<30 m below ground level) of coal seams. It should be noted, however, that areas that do not have recorded coal mine workings may have unrecorded historical workings, possibly at shallow depths (<30m).

10.3.39 Recorded opencast coal mines in the Tibshelf to Shuttlewood area are:

- Tibshelf Colliery;
- Hardwick Opencast site;
- Biggin Harehill Opencast site;

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- Austin / Astain Opencast sites;
- Unicass Peverel Opencast site;
- Gildage Forge Opencast site;
- Unicass Red Buildings Opencast site;
- Deeppringbell Opencast site;
- Woodside Opencast site;
- Markham Colliery; and
- Erin / Seymour Opencast site.

10.3.40 It is likely that other unrecorded, mining sites are located in the Tibshelf to Shuttlewood area. Details of opencast mines will be further reported in the formal Environmental Statement following further consultation with the Coal Authority.

10.3.41 Minor potential sources of contamination include former railways, former quarries, petrol stations and garages, former burial grounds, sewage works, and farms. Various infilled pits, ponds and quarries may also have been filled with a variety of waste materials, but have not been licensed.

10.3.42 Further details of these current and historical contaminative land uses within the study area are shown in Table 21, Table 22 and Table 23.

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

Name and Site Ref	Location	Description
New Byron Refuse Tip historical landfill LA10-163	South of Bolsover, at the end of Water Lane	Waste deposited between 1970 and 1986. The site accepted all types of waste and there is evidence for a gas management system at the site. Located within 250m of the land required for construction of the Proposed Scheme, and 600m east of the route of the Proposed Scheme
Chesterfield Road A632 authorised landfill LA10-244	Within a former railway cutting south of the Coalite site	The Environment Agency records that the first waste was received in 1965 and the last waste received in 1986. This landfill accepted inert and industrial waste. This is within a former railway cutting, approximately 200m west of the route of the Proposed Scheme and within the land required for construction of the Proposed Scheme. There are permits for Coalite Chemical Works, also known to have deposited factory waste (up to 25,000 tonnes) within the same cutting between 1991 and 2009
Former Coalite Smokeless Fuel historical landfill site LA10-244	Within railway cutting to the south of the Coalite site on Chesterfield Road	Industrial waste landfill partly located within the land required for construction of the Proposed Scheme and within 350m of the route of the Proposed Scheme
Poolsbrook Farm LA10-361	A6192, Poolsbrook Country Park	Commercial waste was deposited here at unknown dates. The historical landfill is located within 250m of the route of the Proposed Scheme, and 200m south of the land required for construction of the Proposed Scheme

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Name and Site Ref	Location	Description
Cemetery Lane LA10-361	Cemetery Lane, Poolsbrook Country Park	Industrial, commercial and household waste was deposited here between 1958 and 1975. The historical landfill is located within 250m of the route of the Proposed Scheme and 200m south of the land required for construction of the Proposed Scheme
Markham Colliery, Tip No 11-054 historical landfill LA10-197	Located between Shuttlewood and the M1, possibly as part of a former spoil heap.	Environment Agency records state that the landfill received special wastes and liquid and sludge waste between 1968 and 1986. Partly located within the land required for construction of the Proposed Scheme and within 150m of the route of the Proposed Scheme
Erin landfill EPR/BW0991X authorised landfill LA10-197	Markham Lane, Duckmanton	Viridor Waste Management Ltd depositing >10 tonnes per day. Unknown materials. Located immediately adjacent to the land required for construction of the Proposed Scheme and within 350m of the route of the Proposed Scheme

Table 22: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and Site Ref	Location	Description
Multiple opencast sites including Biggin Hill, Astain, Gildage Forge, Hardwick amongst others LA10 - 064, LA10 - 065, LA10 - 066, LA10 - 067, LA10 - 068, LA10 - 070, LA10 - 071, LA10 - 072, LA10 - 073, LA10 - 074, LA10 - 077, LA10 - 078, LA10 - 080, LA10 - 082, LA10 - 083, LA10 - 084, LA10 - 085, LA10 - 086, LA10 - 089, LA10 - 090, LA10 - 091, LA10 - 092, LA10 - 093, LA10 - 094, LA10 - 118, LA10 - 121, LA10 - 124, LA10 - 125, LA10 - 126, LA10 - 127, LA10 - 128, LA10 - 132, LA10 - 133, LA10 - 134, LA10 - 135, LA10 - 136, LA10 - 137, LA10 - 138, LA10 - 139, LA10 - 140, LA10 - 141, LA10 - 142, LA10 - 143, LA10 - 144, LA10 - 145, LA10 - 146, LA10 - 147, LA10 - 149, LA10 - 150, LA10 - 178, LA10 - 229, LA10 - 249, LA10 - 250, LA10 - 258, LA10 - 259, LA10 - 260, LA10 - 261, LA10 - 262, LA10 - 264, LA10 - 265, LA10 - 266, LA10 - 268, LA10 - 271, LA10 - 280	Numerous opencast areas between Tibshelf and Bolsover; most of these sites have been identified from abandonment / excavation plans and are otherwise included in the Coal Authority licenced / unlicensed workings areas.	Extractions and back-fill all completed before 1960s. Evidence of shallow underground workings also in this area from extraction plans. Area includes 83 mine entries, though not necessarily associated with these named coal sites.

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Name and Site Ref	Location	Description
Multiple underground mines including Bolsover, Palterton and Ramcroft Collieries LA10 - 017, LA10 - 018, LA10 - 019, LA10 - 020, LA10 - 023, LA10 - 024, LA10 - 025, LA10 - 026, LA10 - 171, LA10 - 240, LA10 - 253, LA10 - 254, LA10 - 266, LA10 - 272, LA10 - 271	Numerous underground mining areas within the Tibshelf to Shuttlewood area as derived from above ground infrastructure on historical OS maps and Britpits data	Most sites inactive before 1960s, having been operative during 1880s to 1930s. Includes 15 recorded mine entries/shafts in these named sites.
Erin, Seymour, Markham and Shuttlewood Collieries and the surrounding area LA10-235, LA10-273, LA10-252	Numerous opencast areas within the Markham / Shuttlewood / Poolsbrook area identified from OS mapping	Extraction continued from 1960s through 1990s. Part of this site also licensed as landfill (see Erin landfill in Table 21). 79 sites recorded by the Coal Authority in this area
Mining in the Staveley area, including Ireland Colliery LA10-363	Numerous underground mining areas identified by above ground infrastructure from OS mapping within the Staveley / Middlecroft / New Brimington area	Partly remediated and designated as Poolsbrook Country Park. Also partly deposited with waste (see Cemetery Lane landfill, Table 21) 80 mine shafts/entries in this area recorded by the Coal Authority.
Probable Shallow Mine Workings LA10 - 032, LA10 - 035, LA10 - 037, LA10 - 038, LA10 - 039, LA10 - 045, LA10 - 048, LA10 - 050, LA10 - 055, LA10 - 077, LA10 - 078, LA10 - 080, LA10 - 129, LA10 - 147, LA10 - 149, LA10 - 185, LA10 - 210, LA10 - 213, LA10 - 220, LA10 - 249, LA10 - 250, LA10 - 251, LA10 - 277, LA10 - 280, LA10 - 301, LA10 - 340, LA10 - 356, LA10 - 368, LA10 - 370	Located across the study area, often near/under those opencast sites named above.	Coal Authority's indication of where shallow (<30m deep) mine workings exist. Often indicated on 'dug plans' from subsequent opencast sites.

Table 23: Current and historical industrial sites located in the study area

Name	Location	Description
Saw Pit Lane Industrial Estate LA10-023, LA10-024, LA10-256	Mansfield Road, Tibshelf	Includes metal plating works and other activities requiring environmental permits. Located on the route of the Proposed Scheme
Former Coalite Chemical Works LA10-001, LA10-002, LA10-003, LA10-004, LA10-005, LA10-006,	Buttermilk Lane, between Bolsover and M1	Historical carbonisation and coal products works opened in 1937. Currently disused. Part of the site is on the route of the Proposed Scheme and within the land required for construction of the Proposed Scheme. The site is currently being investigated by a development joint venture for remediation/redevelopment.

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LA10-007, LA10-008, LA10-009		
Bolsover Industrial Estate LA10-255, LA10-176	A632 Station Road, Bolsover	Immediately adjacent to the route of the Proposed Scheme and within the land required for construction of the Proposed Scheme. Businesses include garage workshops and warehouses
Markham Vale Industrial Estate Former colliery LA10-252	Markham Lane, Bolsover	Within 250m of the land required for construction of the Proposed Scheme. New development partly on the site of Markham Colliery

10.3.43 Contaminants commonly associated with sites in Table 21 could include metals, semi-metals, asbestos, organic and inorganic compounds. Infilled pits and landfills could give rise to landfill gases such as methane or carbon dioxide and mobile contamination within leachate.

10.3.44 Contaminants associated with sites in Table 22 could include metals, semi-metals, asbestos, organic and inorganic compounds, acid mine drainage with low pH values and mine gases such as methane, carbon dioxide and hydrogen sulphide.

10.3.45 Contaminants commonly associated with industrial sites in Table 23 could include metals, semi-metals, asbestos, organic and inorganic compounds

Other regulatory data

10.3.46 The regulatory data reviewed included pollution incidents (major and significant categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences).

10.3.47 There are no Control of Major Accident Hazards (COMAH) sites within the study area.

10.3.48 There were six significant pollution incidents reported between 2003 and 2013 in the study area. No major pollution incidents have been reported since 2000. Two Category 2 significant incidents to land were reported at the former Doe Lea colliery at junction 29 of the M1 in 2003 on the substantiated pollution incident register. Two further significant incidents to land were reported in 2003 on the Environment Agency's environment pollution incident database which detailed the pollutants as inert construction waste and biodegradable waste. There have also been two Category 2 significant pollution incidents to water at the former Coalite Chemical Works near Bolsover both in 2005. One of these records contains details of the tar wastes released.

10.3.49 There are a number of expired hazardous substances consents and integrated pollution prevention and control (IPPC) records at the former Coalite Chemical Works near Bolsover and the Saw Pit Lane Industrial Estate. Active IPPC records are associated with metal plating processes at Saw Pit Lane Industrial Estate and landfilling at Erin Landfill.

10.3.50 There are also expired, rejected and active IPPC records located at Sutton Scarsdale and Deepdale Farm associated with Glapwell and Palterton Lane landfills. The sites

covered by these IPPC permits are registered within the study area, the landfills with which they are associated, are located near Stockley village outside the study area.

- 10.3.51 The Environment Agency reports that there are no discharges to groundwater within 250m of the proposed route. Further details on the groundwater in the Tibshelf to Shuttlewood area can be found in Section 15, Water resources and flood risk.
- 10.3.52 There are 34 discharge consents to surface water within the study area, of which up to five are currently active and within the land required for construction of the Proposed Scheme.
- 10.3.53 There are no nationally significant ecological designations as defined in the land quality section of the SMR¹⁰² located within the study area.

Mining/mineral resources

- 10.3.54 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 coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Mineral plans

- 10.3.55 DCC is responsible for the overall mineral and waste local plans for the county. The Minerals Local Plan (MLP) for Derbyshire (2000)¹⁰³ was adopted in April 2000 and sets out the DCC policies aimed at controlling mineral related developments within Derbyshire.
- 10.3.56 The MLP defines a proposed opencast constraint area covering part of the study area. This is the Hardwick Hall constraint area, so designated due to its historic landscape which provide the settings for the historic Hardwick Hall, Hardwick Old Hall and Hardwick Hall Park registered park and garden. This area also merits protection because "of the nature conservation and landscape that due to the relatively undisturbed mineral reserves, retain a greater range and diversity of landscape features and wildlife interests". Proposals for opencast working of coal and associated minerals will be "generally resisted" in this area as it "deserves to be protected in order to avoid unacceptable damage to the environment".
- 10.3.57 The location of specific mineral and mining resources within the study area are described below.

Coal mining

- 10.3.58 The study area is within the larger North Derbyshire Coalfield. The study area has been subject to extensive open cast and deep coal mining. It is also likely that unrecorded shallow workings are present. Key coal seams outcropping in the study

¹⁰² Sensitive ecological receptors are defined as national designations such as SSSIs.

¹⁰³ Derby and Derbyshire Minerals Local Plan Derbyshire County Council (2000). *Adopted Edition April 2000. Incorporating First Alteration: Chapter 13-Coal November 2002.*

area are listed in Paragraphs 10.3.15-10.3.16, and it is likely that all these seams have been worked economically in the past.

Opencast coal mining

10.3.59 There is one area designated by the Coal Authority for future opencast coal licensing in the far north of the Tibshelf to Shuttlewood area. This is located west of Clowne Road between Stanfree and Shuttlewood Common. The licence is for the Hoodcroft Opencast Licensed Area and lies 200m east of the land required for construction of the Proposed Scheme. This, however, is not noted within the North Derbyshire Local Minerals Plan.

10.3.60 Historic opencast coal mines in the Tibshelf to Shuttlewood area are described above.

Deep coal mining

10.3.61 There are no areas within the Tibshelf to Shuttlewood area that have been identified by the DCC Minerals Plan or by the Coal Authority as containing future underground coal resources.

Petroleum exploration development licence (PEDL/hydrocarbons)

10.3.62 The Tibshelf to Shuttlewood area is within PEDL areas 299 and 300. There is a licence for hydrocarbon extraction held by the Duke of Devonshire, issued in 1923 and still extant. The Tibshelf to Shuttlewood area also lies within land parcels offered within the 14th Onshore Oil and Gas Licensing Round in 2014. The eastern part of the area is also within the Bowland Prospective Shale Gas Area. As such, it is considered that the study area is within an area where hydrocarbon resources could be identified and extracted in the future.

Geo-conservation resources

10.3.63 One SSSI designated for its geological features has been identified within the study area. This is the Doe Lea Stream Section, located just north of the Doe Lea Bridge on Palterton Lane. This section exposes an internationally significant section through the Pennine Upper Coal Measures. The exposure includes a fossiliferous marker stratum that acts as a common standard section across Europe.

10.3.64 Consultation with Local Geological Conservation Groups will continue as part of development of the design and assessment.

Receptors

10.3.65 The sensitive receptors that have been identified within the study area are summarised in Table 24. A definition of receptor sensitivity is given in the SMR.

Table 24: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, occupants and users of nurseries, schools, play areas and public open spaces at	High
		Users of allotments, commercial areas, retail parks and hotels.	Moderate

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Issue	Receptor type	Receptor description	Receptor sensitivity
		Users of industrial land.	Low
	Groundwater	Secondary A aquifer in The Middle and Lower Pennine Coal Measures bedrock	Moderate
		Secondary A aquifer within alluvium deposits	
		Secondary (undifferentiated) aquifer within head deposits	Low
	Surface waters	River Doe Lea and tributaries (Water Framework Directive (WFD) Status: Moderate)	Moderate
		River Rother (WFD Status: Moderate)	
Pools Brook (WFD Status: Moderate)			
Designated Sites	Doe Lea Stream Section geological SSSI, south of Bolsover	High	
Built environment	Underground structures and buried services	Low	
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Bowland Shale Gas Prospective Area, Hoodcroft Licensed Coal 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)¹⁰⁴. 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 and 15);

¹⁰⁴ Supporting document: Draft Code of Construction Practice

- 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 roads 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 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 CLR11¹⁰⁵ and British Standards BS10175¹⁰⁶ and BS8576¹⁰⁷.

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 and social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK¹⁰⁸. 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 and ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA10 Map Book.

¹⁰⁵ Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.

¹⁰⁶ British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*.

¹⁰⁷ British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.

¹⁰⁸ Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

Land contamination

- 10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.
- 10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:
- 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 25. 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 25: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference ¹⁰⁹	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On site ¹¹⁰						
LA10-CSM-01	Coalite Chemical Works, including railway and former landfill	Moderate/low risk	Moderate risk	High risk	Moderate/low risk	High risk

¹⁰⁹ Each potentially contaminated site is allocated a unique reference number, and these are combined in to similar groups that can be assessed as a single CSM.

¹¹⁰ 'On site' is within the area of land required for construction of the Proposed Scheme.

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Area reference ¹⁰⁹	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
LA10-CSM-02	Railway	Low risk	Very low risk	Very low risk	Very low risk	Very low risk
LA10-CSM-03	Colliery spoil heaps, residential, cutting	Moderate risk	High risk	Moderate/low risk	N/A ¹¹¹	Moderate risk
L10-CSM-104	Farms	Moderate/low risk	Moderate/low risk	Very low risk	N/A ¹¹¹	Very low risk
LA10-CSM-05	Underground coal, residential, embankment	Moderate risk	High risk	Very low risk	Very low risk	Moderate risk
LA10-CSM-06	Saw Pit Lane Industrial Estate	Moderate risk	Moderate/low risk	Very low risk	Very low risk	Very low risk
LA10-CSM-07	Opencast coal mining, rural, cutting	Moderate/low risk	Moderate/low risk	Moderate risk	Low risk	Very low risk
LA10-CSM-08	Opencast coal mining, rural, embankment	Moderate/low risk	Moderate/low risk	Moderate risk	Low risk	Very low risk
LA10-CSM-09	Garage	Very low risk	Very low risk	Very low risk	Very low risk	Very low risk
LA10-CSM-12	Markham Colliery Landfill	Moderate/low risk	Low risk	Low risk	Low risk	Low risk
LA10-CSM-15	Probable shallow workings (on site)	Low risk	Moderate/low risk	Moderate risk	Very low risk	Low risk
Off site ¹¹²						
LA10-CSM-10	Sewage works	Low risk	Low risk	Moderate risk	Low risk	Very low risk
LA10-CSM-11	Gas works	High risk	Moderate/low risk	Low risk	Very low risk	Low risk
LA10-CSM-12	Former colliery landfills (Cemetery Lane and Markham Colliery landfills)	Moderate/low risk	Moderate/low risk	Moderate/low risk	N/A ¹¹³	Low risk
LA10-CSM-13	Petrol station	Moderate/low risk	Moderate risk	N/A	N/A ¹¹³	High risk
LA10-CSM-14	Waste transfer sites	Moderate risk	Moderate risk	Moderate risk	Very low risk	Low risk

¹¹¹ Receptor too far away

¹¹² 'Off site' is beyond the land required for construction of the proposed scheme but within 250m of it.

¹¹³ Receptor too far away

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Area reference ¹⁰⁹	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
LA10-CSM-16	Probable Shallow Workings (off-site)	Low risk	Moderate/low risk	Moderate risk	Very low risk	Low risk

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. Once updated this will also include mining related contamination.
- 10.4.14 All of the sites set out in Table 25 have been assessed for the change in impact associated with the construction stage of the work. Table 26 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 25 were found to have non-significant effects.

Table 26: Summary of construction CSM effects

Name and area ref ¹¹⁴	Receptor	Main baseline risk	Main construction risk	Temporary effect
Probable shallow mining LA10-CSM-17	Human Health (direct contact, inhalation and ingestion of contaminated materials)	Low risk	Moderate risk	Low risk
	Surface water (lateral migration through hydrologically-linked groundwater and direct runoff from site)	Moderate risk	High risk	Moderate Adverse

¹¹⁴ Each potentially contaminated site is allocated a unique reference number.

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Name and area ref ¹²⁴	Receptor	Main baseline risk	Main construction risk	Temporary effect
	Groundwater (leaching, vertical and lateral migration from contaminated soils and waters)	Moderate/low risk	High risk	Moderate Adverse

10.4.15 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.

10.4.16 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 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 resulting in no significant effects.

Permanent effects

10.4.18 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.

10.4.19 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 negligible 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 negative effects and an improvement would result in positive effects.

10.4.20 All of the sites set out in Table 6 have been assessed for the change in impact associated with the permanent post-construction stage. The assessment demonstrates that there would be no significant permanent effects in the study area.

10.4.21 In relation to the potential significant effects associated with mining sites at construction stage, there would 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.

- 10.4.22 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 and property from gas and vapours in the ground, the principal risk in this area, would be controlled to an acceptable level.

Mining/mineral resources

- 10.4.23 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 severance¹¹⁵ or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

Temporary effects

Coal mining

- 10.4.24 As there are no currently worked opencast sites within the study area, there are no effects on opencast coal mining.
- 10.4.25 An area identified for future coal extraction is located partly within LA10 – this is the Hoodcroft Opencast Area. The effect of construction of the Proposed Scheme on the future opencast coal mining areas would be minor adverse. Temporary adverse effects may occur where construction compounds are proposed within these licenced areas. In such cases, there may 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.

Petroleum Exploration Development Licences/Hydrocarbons

- 10.4.26 The route of the Proposed Scheme would cross an area underlain by two PEDLs licenced by the OGA. The Bowland Shale Prospective area also lies within the study area. The PEDLs and Prospective Shale area identify the deep areas of hydrocarbons resources, specifically, potential sources of shale gas. The construction of the Proposed Scheme is unlikely to place a constraint on future exploitation of potential sources of shale gas. The resource is potentially present, deep underground and would remain accessible across the licenced area. The effect of construction of the Proposed Scheme on the identified PEDLs and Shale Prospective area would therefore be negligible.

Permanent effects

Coal mining

- 10.4.27 The effects of the Proposed Scheme on the future licensed opencast coal mine areas would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. Mitigation measures (if any) would be discussed

¹¹⁵ 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.

in advance of the works with the Mineral Planning Authority, the Coal Authority, DCC, RMBC and the mineral owner.

Petroleum Exploration Development Licences /Hydrocarbons

- 10.4.28 The effects of the Proposed Scheme on the identified PEDLs would be negligible.
- 10.4.29 The route of the Proposed Scheme would cross an area underlain by two PEDLs of the Bowland Shale Prospective Area. The PEDLs identify the deep areas of hydrocarbon resources, specifically potential sources of shale gas. Operation of the Proposed Scheme is unlikely to place a constraint on future exploitation of potential sources of shale gas.
- 10.4.30 Table 27 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 27: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Hoodcroft Opencast Area	Mineral Search Area	Shallow Coal (Approx. 2 ha within LA10 – the rest within LA11)	Medium	Minor	Negligible (N)
Bowland Prospective Shale Gas Area	Land parcels offered within Onshore Oil and Gas Licensing Round	An area of identified shale gas potential	Low	Minor	Negligible (N)
PEDL 299 and 300 within North Derbyshire Coalfield	Licensed by UK Oil and Gas Authority	Licence to Search and bore for and get petroleum Licensing areas, due to be renewed 2021.	Low	Minor	Negligible (N)

- 10.4.31 There would be negligible effects on mining, mineral and gas resources, which would not be significant.

Geo-conservation sites

- 10.4.32 There is one geological SSSI within the study area; however, it is considered that there would be no impacts on this SSSI as there would be no work in the vicinity.

Other mitigation measures

- 10.4.33 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.

- 10.4.34 Mitigation of the effects on mineral resources 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 at DCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSA.

Summary of likely residual significant effects

- 10.4.35 Based on the information currently available and with the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

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 likely include auto-transformer stations. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.
- 10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

- 10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

- 10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

- 10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or 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 Tibshelf to Shuttlewood 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 the presence of the new permanent infrastructure associated with the Proposed Scheme.
- 11.1.3 Engagement with Derbyshire County Council (DCC), Bolsover District Council (BDC), North East Derbyshire District Council (NEDDC) and Natural England 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: LA10 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 operational (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 The Volume 2: LA10 Map Book also includes Map Series LV-03 (Construction phase viewpoints) and Map Series LV-04 (Operation phase viewpoints) showing viewpoints that would potentially be significantly affected.
- 11.1.6 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)¹¹⁶.
- 11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July to September 2017 and winter surveys between October 2017 and March 2018. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly

¹¹⁶ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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.

- 11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTVs 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 ZTVs, and professional judgement will be used to further refine the study area to focus on likely significant effects.
- 11.2.4 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.
- 11.2.5 Landscape and visual receptors within approximately 1.5km of the route of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at settlements, such as at Tibshelf, Hardstoft, Astwith, Stainsby, Bramley Vale and Glapwell, Palterton, Sutton Scarsdale, Bolsover, Duckmanton, Shuttlewood and Stanfree.
- 11.2.6 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 landscape and visual effects during construction covers the situation in winter of year 1. The assessment of visual effects during construction covers the situation in winter of year 1. 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.
- 11.2.7 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.
- 11.2.8 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 study area extends from Tibshelf in the south to Shuttlewood, north of Bolsover, in the north. The area comprises a landscape that is strongly defined by the underlying geology, predominantly Pennine Middle Coal Measures, with land rising to the east towards a limestone plateau. The topography is undulating, with higher ground to the south, east and west and lower lying ground around the River Doe Lea valley, which widens to the north. The limestone escarpment and ridge affords long views west, across the study area towards the Pennines, and increases the sense of landscape scale.
- 11.3.2 The area is characterised by a series of historic properties, described as the 'Millionaires Row of the 17th century'¹¹⁷, including most notably Hardwick Hall, Hardwick Old Hall, the ruins of Sutton Scarsdale Hall, and Bolsover Castle. Further historic features include Owlcotes House, Stainsby defended manorial complex and the villages of Hardstoft, Astwith, Sutton Scarsdale, Heath, Stanley, Ault Hucknall and Teversal. The historic villages are typically well maintained and in good condition, with some covered by National Trust management covenants. Astwith, Hardstoft, Stainsby, Heath, Palterton and Bolsover include conservation areas.
- 11.3.3 The landscape is predominantly rural, with medium scale fields to the south and a distinctive historic estate landscape around the Hardwick Hall estate. A more complex landscape of wooded tributaries and woodland blocks characterises the land around Ault Hucknall. The field pattern around Sutton Scarsdale typically consists of larger fields, with degraded boundaries, with the former Sutton Scarsdale Hall deer park evident in remnant fish ponds and the deer house. To the north of Bolsover, the field pattern is medium to larger scale and strongly influenced by the settlement pattern.
- 11.3.4 The area is bisected from south to north by the M1, which is partly screened by roadside planting. In some places the M1 exerts a strong influence on the surrounding landscape with the associated noise of traffic movement influencing the otherwise rural character. There are notable views west from the M1 to Sutton Scarsdale and east to Bolsover Castle and Hardwick Hall.
- 11.3.5 The influence of the past industrial legacy on the landscape is also evident through disused rail lines and the distinctive shapes of restored spoil/ landfill heaps, which now provide popular local recreational resources. There are also a large number of Public Rights of Way (PRoW) across the area, including the Stockley Trail.
- 11.3.6 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

¹¹⁷ National Trust, March 2016, *Hardwick Hall Setting Study*.

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 Areas¹¹⁸ and The Landscape Character of Derbyshire (4th Edition, March 2014)¹¹⁹.

- 11.3.7 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.
- 11.3.8 For the purposes of this assessment, the Tibshelf to Shuttlewood study area has been subdivided into 19 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.
- 11.3.9 Five of the 19 LCAs would not be significantly affected by the Proposed Scheme on account of their relationship with the Proposed Scheme and its effects on the key characteristics of each landscape. Newtonwood and Blackwell Coalfield Village Farmlands LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report LA08 Pinxton to Newton and Huthwaite as it is located for the most part within the Pinxton to Newton and Huthwaite area. Tibshelf LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report LA09 Stone broom to Clay Cross. Staveley, Poolsbrook Valley Restored Coalfields, Staveley Post Industrial River Valley and Maston Moor Settled Farmlands LCAs would be significantly affected by the Proposed Scheme and are included in Volume 2: Community area report LA11 Staveley to Aston as they are located for the most part within the Staveley to Aston area. A summary of the remaining seven LCAs that would be significantly affected within the Tibshelf to Shuttlewood area is provided in Table 28: Summary of significantly affected LCAs.

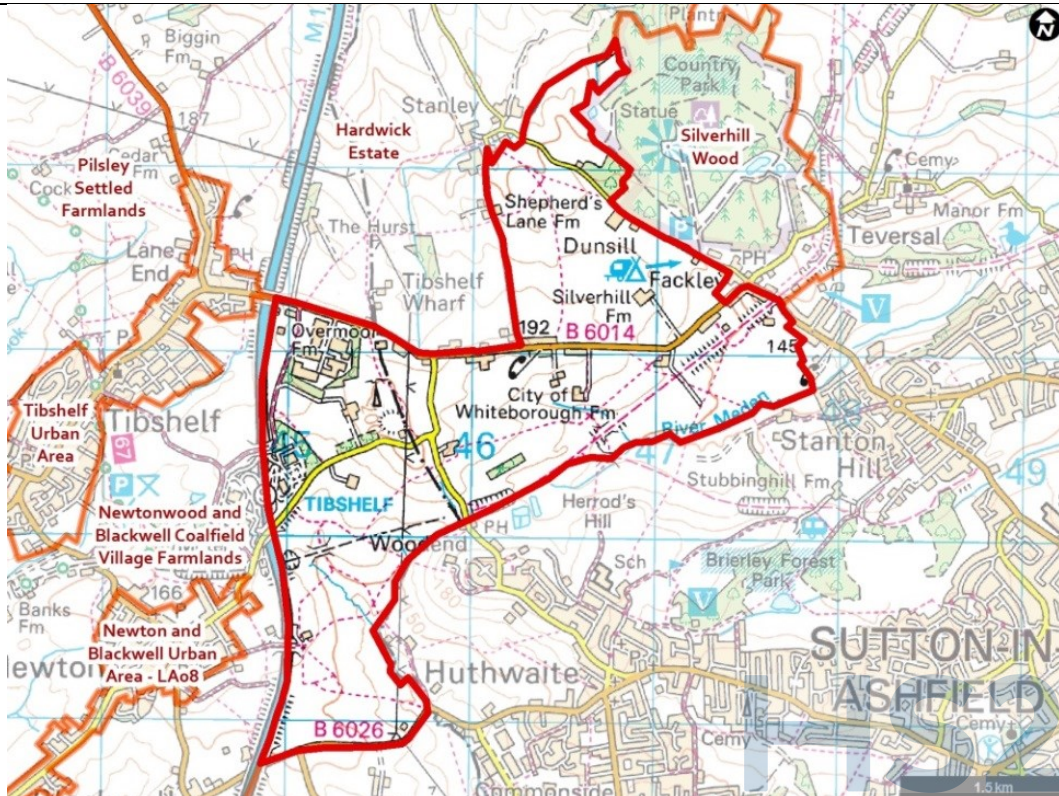
¹¹⁸ Natural England (2013, 2014), *National Character Area profiles*. Available online at: <https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles>

¹¹⁹ Derbyshire County Council, (2014), *The Landscape Character of Derbyshire* (4th Edition, March 2014) Available online at: <http://www.derbyshire.gov.uk/environment/conservation/landscapecharacter/>

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Table 28: Summary of significantly affected LCAs

Newtonwood Farmlands



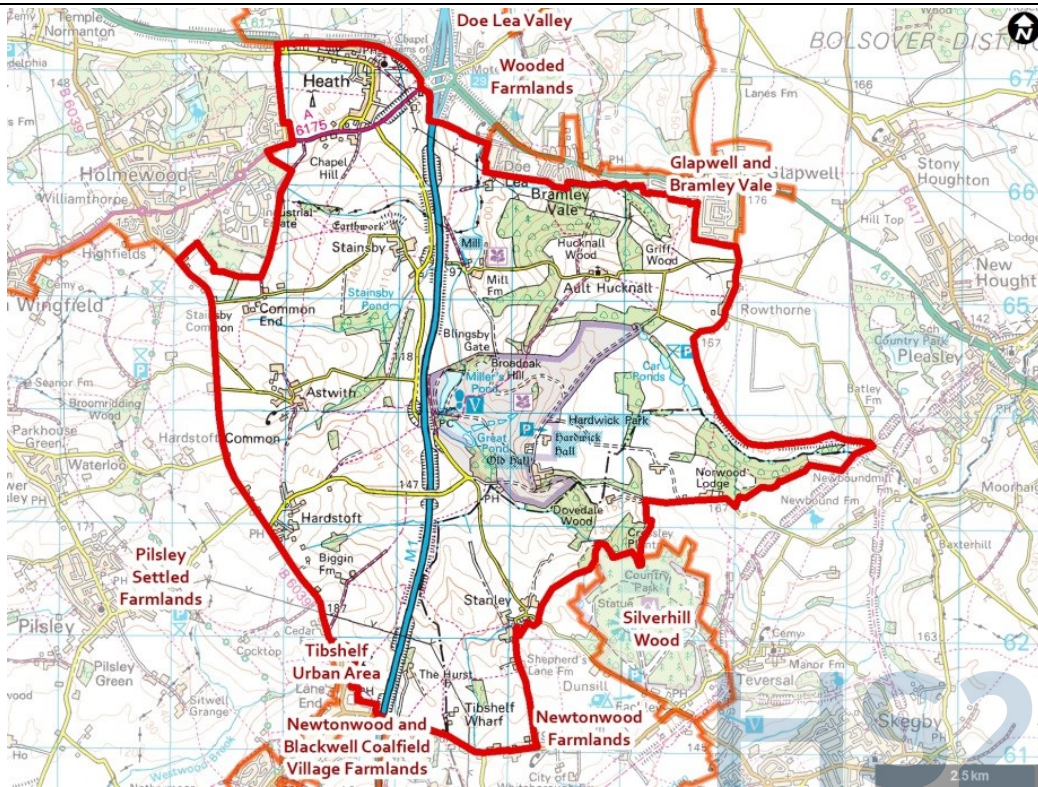
Overview of Newtonwood Farmlands from Shepherds Lane.



The Newtonwood Farmlands LCA lies to the south of Hardwick Estate LCA and is bounded to the west by the M1. The terrain is undulating with a ridgeline extending in a west-east direction across the LCA, which includes a local high point of 204m AOD on Newtonwood Lane. Land use within the LCA is predominantly arable farmland with pasture occupying the lower lying land. Fields generally have low trimmed hedgerow boundaries and a few mature trees. There are few areas of woodland within the LCA, lending an open character to the landscape. However, on the western side of the LCA there are belts of deciduous woodland extending along the M1 corridor, around the Tibshelf Motorway Services Area, and into the Tibshelf Business Park. The LCA includes the sites of numerous former coal mines including the Five Acre Pit and Blackwell Coal Mine, located to the north of Huthwaite Lane on the higher land (near the M1 corridor). The Newtonwood Farmlands LCA is influenced by the noise of traffic on the M1, which adversely affects the rural qualities and local tranquillity.

Based on the terrain, landcover, associations and perceptual qualities described above the value of this LCA is medium-low.

Hardwick Estate



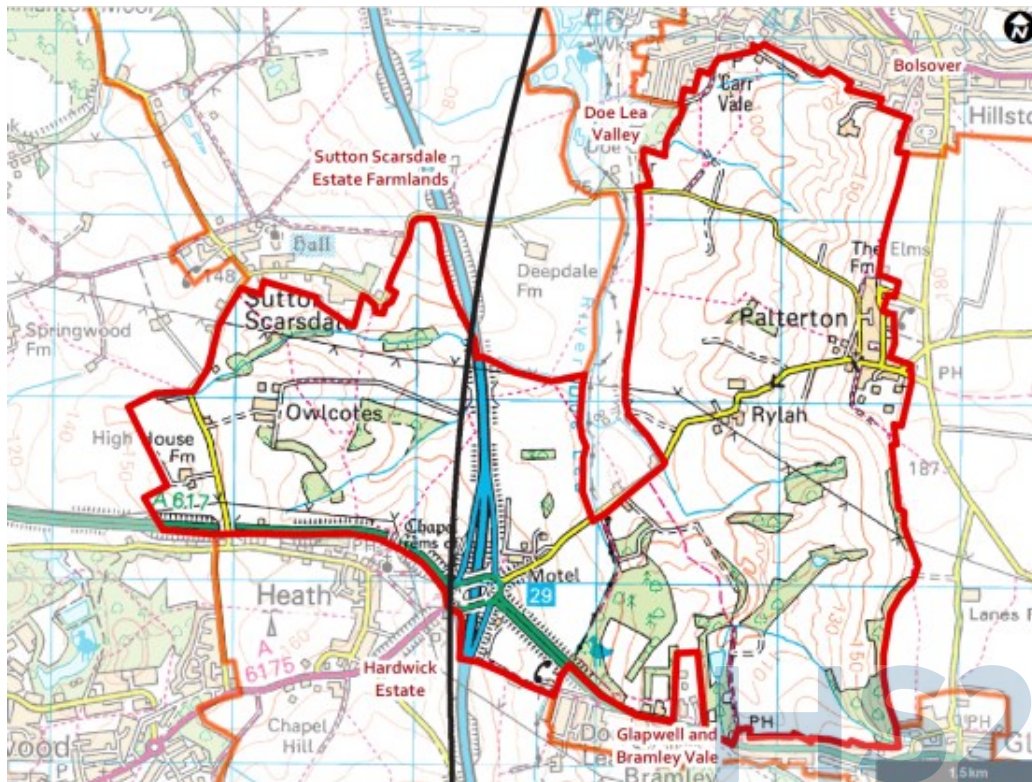
View across Hardwick Park from the entrance drive to the wider estate to the west



This Hardwick Estate LCA lies between Tibshelf and the B6014 to the south and Glapwell and the A617 to the north. The terrain is complex, as the area surrounds the River Doe Lea valley and extends to the edge of the limestone plateau escarpment to the east, which offers a strategic position for Hardwick Hall, Hardwick Old Hall and park looking west across the river valley. Land use is characterised by the historic estate with areas of designed parkland, mature tree avenues and individual trees, farmland with mature species diverse hedgerows and areas of natural woodland and estate woodland. This, combined with the complex terrain, contributes to a smaller scale landscape with a sense of enclosure below the escarpment. The M1 bisects the landscape from south to north and the presence of traffic can be intrusive in this otherwise rural landscape. Beyond the M1, the road network is characterised by minor roads and country lanes which have retained their historic alignment. There is also a well-developed network of PRoW across and around the Hardwick Estate. Numerous listed buildings, structures and historic villages (including Conservation Areas) with a strong local vernacular architecture (traditional limestone buildings with pitched slate roofs) contribute to the historic character of the area.

Based on the terrain, landcover, cultural/ heritage and perceptual qualities described above the value of this LCA is high.

Wooded Farmlands



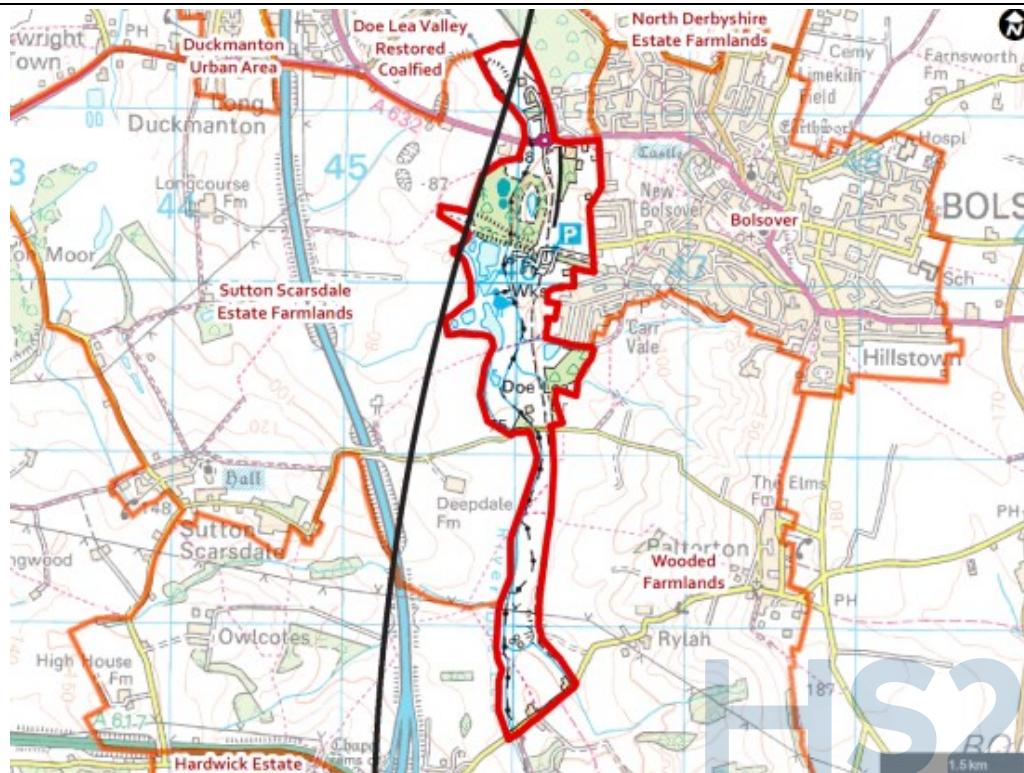
View across LCA from Palterton, showing woodland around Heath roundabout



The Wooded Farmlands LCA spans the M1 at Junction 29 contained by Sutton Scarsdale to the west, Bolsover to the north and Glapwell and the A617 to the south. The River Doe Lea flows north through the eastern half of the LCA, with the terrain rising on the other side of the valley. The LCA terrain falls to the west, to the Muster Brook valley. Land use is predominately farmland but there is a distinctive and high level of woodland cover, including a number of ancient woodlands (Carr Wood, Terrace Wood, Owlcotes Wood, Heath Wood and Sutton Springs Wood). Hedgerows tend to be in good condition but with few hedgerow trees. The valley landscape and woodland cover combine to create a smaller sense of scale. The LCA is comparatively inaccessible as there are few roads beyond the winding and sunken Rylah Hill which climbs towards Palterton to the east; Shire Lane to Sutton Scarsdale; and the B625 to the far west of the landscape. The M1 bisects the landscape from south to north with the M1 Junction 29, heavily screened by woodland, recognisable from adjacent LCAs. The landscape has a rural character with scattered farmsteads and small settlements limited to the historic village of Palterton, which display a strong local character. Whilst views are often foreshortened by woodland and terrain within the lower valleys and when looking east, there are panoramic views to the west from elevated areas on the limestone escarpment including from Palterton.

Based on the terrain, landcover and perceptual qualities described above the value of this LCA is high.

Doe Lea Valley



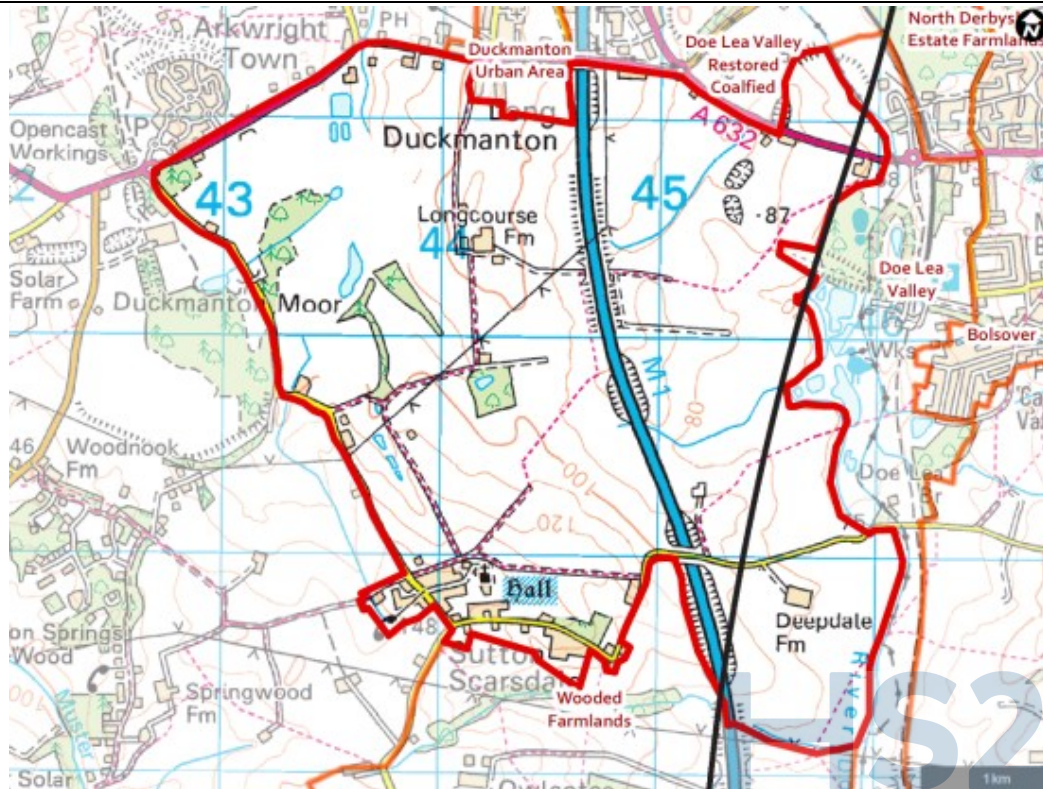
View across Doe Lea Valley from Bolsover, showing Carr Vale ponds



The Doe Lea Valley LCA is located approximately 1km north of Bramley Vale, extending north to the A632. North of this point the River Doe Lea is surrounded by industrial development, where it becomes almost imperceptible. The terrain consists of a gentle river valley, which rises gradually to the east and west. The area is sparsely populated, and land cover comprises grassland habitats, woodlands, fens and reed beds. The ribbon of vegetation which follows the watercourse often screens the narrow river itself. Pools within Carr Vale Nature Reserve in the north of the LCA form notable features in the landscape. The landscape scale is enclosed especially by vegetation cover associated with the river and Stockley Trail, but longer distance views of the wider surrounding valley can be gained from the nature reserve pools. The landscape has a tranquil character with the underlying restored industrial character evident in many places.

Based on the landcover, social and perceptual qualities described above the value of this LCA is medium-high.

Sutton Estate Farmland



View across LCA from Palterton, showing Deepdale Farm and Sutton Scarsdale Hall

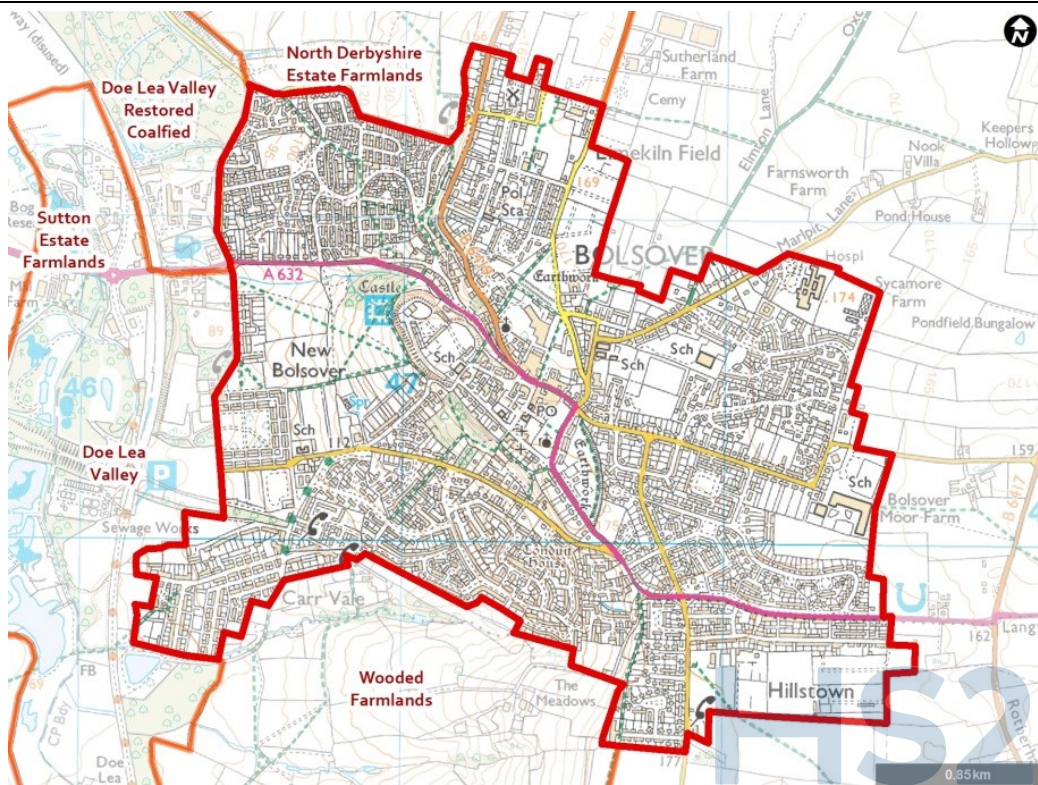


The Sutton Estate Farmlands LCA is located to the north of Heath and west of Bolsover and comprises the village of Sutton Scarsdale and former estate land of Sutton Scarsdale Hall. The area is defined by the remnant parkland associated with Sutton Scarsdale Hall, which is now degraded by hedgerow removal but still legible. Land use outside the village is predominantly arable farmland, with a larger sized field pattern and few hedgerow trees in field boundaries. This open character combined with the rising topography contributes to a larger sense of landscape scale, and visibility with Bolsover Castle and the Carr Vale Nature Reserve ponds reinforces the perception of the valley landscape and its relationship with the historic features. The view across the LCA from Bolsover Castle makes the strategic positions of the Castle and Sutton Scarsdale Hall clear. The village has a strong historic estate character (including the notable landmarks of Sutton Scarsdale Hall, the Church of St Mary and further listed buildings in the village) and mature tree cover and woodland. While the prominent location offers long distance views, particularly over the river valley to the east and south from Palterton Lane, tree cover and built form in the village combine to create an intimate scale. The road network is restricted to three of the boundaries and the area is sparsely settled, but there are numerous PRow (including a circular walk between Sutton Scarsdale Hall and Bolsover Castle) which provide links to the surrounding settlements. The M1 bisects the area from south to north and is often highly visible from the surrounding, higher land, influencing a wide area and with impacts on tranquillity.

Based on the terrain, landcover, heritage and perceptual qualities described above the value of this LCA is high.

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Bolsover



Bolsover Market square



View to Bolsover Castle from Palterton Lane

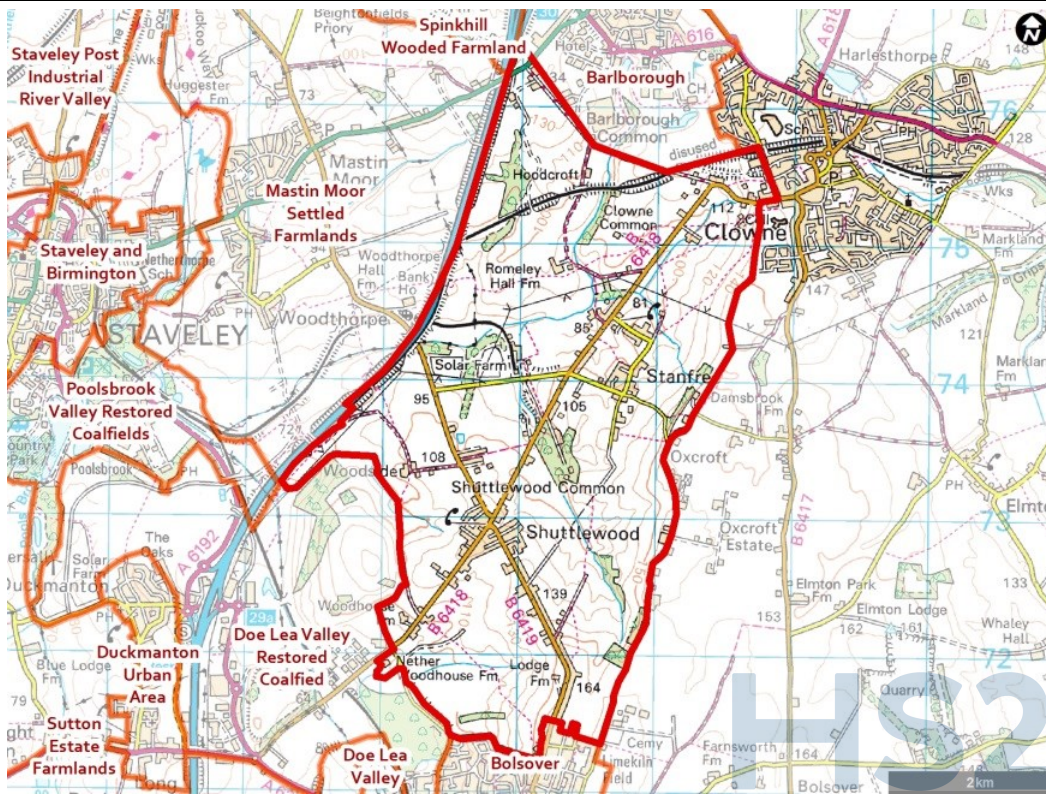


The Bolsover LCA is focused around the town of Bolsover, located to the east of the M1, and includes the notable Bolsover Castle. The town is located prominently on the escarpment to the east of the River Doe Lea valley. This position affords long views west, across the valley floor and the M1, from numerous locations in the town and creates strong visibility with Sutton Scarsdale Hall to the south-west. Land cover is characterised by predominantly residential built form around a historic centre and there are large areas of open space, including play areas and open ground to the west of Bolsover Castle. The open ground to the west of the castle and to the east of Villas Road (Castle Fields) is very important to the setting of the castle. Prominent landmarks include Bolsover Castle, New Bolsover model village, the market square and the water tower located off the A632. The town core has an intimate, historic character and there are no large scale modern developments or major roads. New residential areas around the edges of the town feel detached from the historic core and have a quiet, suburban and indistinct character.

Based on the landcover, cultural, social, heritage and perceptual qualities described above the value of this LCA is high.

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North Derbyshire Estate Farmlands



View from escarpment edge towards Bolsover Road and Clowne Road



The North Derbyshire Estate Farmlands LCA extends north from Bolsover with the M1 forming the western boundary. The LCA is located on the valley sides to the west of the limestone escarpment, with the land generally rising from west to east. This is a predominately farmed landscape, although strongly influenced by settlement between Bolsover to the south and Clowne to the north. Residential development at Shuttlewood and Stanfree, and numerous scattered farmsteads and properties in the LCA reduce the rural character and are generally of indistinct character. There are some notable areas of woodland along Hawke Brook, the disused railway line, Romeley Wood and an area associated with the restoration of the colliery north of Mill Lane (now Oxcroft Solar Farm). The LCA is crossed by the B6419 and B6418 which are both lined by residential properties of predominantly post-war character (Shuttlewood) in contrast to the surrounding rural landscape. The position of the LCA on rising land affords long views across the LCA and beyond. The relatively modern housing development and clearly evident busy B-road network detract from the rural character.

Based on the terrain, landcover and perceptual qualities described above the value of this LCA is medium.

Visual baseline

- 11.3.10 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: LA10 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: Recreational¹²⁰, 4: Transport, 5: Hotels/healthcare/education and 6: Employment.
- 11.3.11 Views within the Tibshelf to Shuttlewood area are generally gained from public highways, PRoW, settlements, residential properties and employment areas.
- 11.3.12 Elevated, longer distance views can be gained from the escarpment and ridgeline to the east which includes the settlements of Bramley Vale and Glapwell, Palterton, Bolsover and Shuttlewood. From here the sloping ground offers outward looking views west from the edges and in some cases from locations within the settlements. Similarly, elevated views from the west can also be gained from the settlements of Duckmanton, Sutton Scarsdale, Stainsby, Hardstoft and Astwith. The River Doe Lea valley topography and escarpment edges to the east and west are the historical reason for the strategic and prominent siting of heritage features including Hardwick Hall and Old Hall, Sutton Scarsdale and Bolsover Castle. These historic assets are all key recreational features within the study area.
- 11.3.13 Views from PRoW can be gained from across the study area. From south to north this includes views from the footpath network around Tibshelf (Footpath 32); Hardwick Estate Walks; Ault Hucknall (Footpaths 11, 12 and 15, 20 and Bridleway 22); Heath and Homewood (Footpaths 1, 9 and 14); Scarcliffe (Footpaths 37, 40, 42 and 44); open sections of the Stockley Trail; Sutton cum Duckmanton (Footpaths 16, 17 and 19); and the footpath network around and footpaths north of Bolsover (Footpaths 34, 40 and 43 and Bridleway 59). Localised hedgerows, vegetation and woodland play varying roles in screening views from parts of the footpath network. Where open views are available from footpaths on the higher valley sides, these tend to offer elevated views over a wider area of the surrounding countryside.
- 11.3.14 Views for users of the road network, including the M1 which runs from south to north through the centre of the study area, are often restricted by roadside vegetation/built form and local variations in terrain. Mature vegetation along the M1 corridor typically screens outward views. Where the M1 passes Duckmanton, industrial development typically foreshortens views. Views over the surrounding countryside from the wider road network can be gained from certain sections of road including the B6039, A617, A632, B6418 and B6419.
- 11.3.15 The most notable area of employment is focused around the large industrial estate at Markham Vale. Views from here tend to be restricted by large industrial warehouses in the area. The larger settlements of Tibshelf, Bramley Vale and Glapwell, Palterton, Sutton Scarsdale, Bolsover and Shuttlewood also offer employment opportunities

¹²⁰ 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.

through retail, accommodation and education etc. The nature of views from the majority of these settlements is discussed above.

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 end of 2024 and towards the end of 2030. 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)¹²¹ 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 construction¹²²;
 - use of well-maintained hoardings and fencing;
 - prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles; and
 - designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses.
- 11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

¹²¹ Supporting document: Draft Code of Construction Practice

¹²² BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

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: the excavation of cuttings and tunnels (including Tibshelf cut and cover tunnel and Heath central cutting); construction of viaducts (Stainsby, M1 and Bolsover viaducts); construction of embankments; temporary structures, haul roads and construction compounds; construction activity associated with the removal of existing landscape elements such as woodland, trees and hedgerows; and the closure and diversion of existing public highways and PRoW. Other key changes include construction works associated with the overbridges and underbridges; utility diversions; the presence of transfer nodes and pre-cast yards and the demolition of buildings and structures.

Landscape assessment

- 11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 29 would be significantly affected during construction of the Proposed Scheme.

Table 29: Summary description and assessment of effects on LCAs

<p>Newtonwood Farmlands</p>	<p>Medium susceptibility and sensitivity</p>
<p>Susceptibility to change: The rural and open character of this LCA and recreational interest, provided through the PRoW network, result in this area having a medium susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by the construction works associated with realignment of the B6026 Huthwaite Lane and Silverhill Trail; Silverhill Trail overbridge and Hilcote East embankment (both in the Pinxton to Newton and Huthwaite LA08 study area); and Tibshelf cutting (which is also partly within the Pinxton to Newton and Huthwaite LA08 study area). Works would also include the construction of an access road for the movement of excavated materials and Newtonwood Lane satellite construction compound, situated south of Tibshelf Services adjacent to Newtonwood Lane. These works would result in the removal of agricultural land, farm buildings, trees, hedgerow boundaries, and vegetation including trees associated with the watercourse in the valley between Red Barn Farm and Spring Farm, and also beside the Silverhill Trail. The presence of equipment and movement of construction vehicles would also detract from the tranquillity of the landscape. The large scale of construction activity and changes to local terrain and landcover would affect the character of the undulating and predominantly rural landscape and create increased physical (and visual) severance.</p> <p>Based on the above the construction of the Proposed Scheme would therefore result in a high magnitude of change and major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Hardwick Estate</p>	<p>High susceptibility and sensitivity</p>
<p>Susceptibility to change: The historic character, mature vegetation pattern and level of tranquillity have a high susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by construction works associated with changes to the land cover, through loss of farmland, feature trees, woodland and hedgerows within the wider estate. Earthworks including Tibshelf cut and cover tunnel and large cuttings at Tibshelf, Hardstoft and</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>

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<p>Heath would alter the undulating natural terrain, introducing large scale, engineered forms. The introduction of temporary stockpiles of materials would further change the perception of the rolling, farmed and well vegetated landscape. Construction activity associated with the demolition of 'The Hurst' and removal of an avenue of mature trees on the southern approach to the property would affect the rural historic landscape. The realignment of Mill Lane would result in construction works associated with the removal of the historic lane and clearance of associated mature trees and vegetation, changing the historic landscape and removing the remnant designed approach to Hardwick Hall. Construction of a haul route to west of M1 would result in further temporary effects on the surrounding rural character to the east of Stainsby, Hardstoft and Astwith. These effects would largely be focused to the western half of the LCA. This would result in increased severance to the Hardwick Estate and wider LCA, beyond that resulting from the M1, with islanded land (containing site construction compounds and materials stockpiles) created between the Proposed Scheme and the M1. Heath South cutting main compound, to the east of Mill Lane, and soil stockpiles west of Mill Lane, would be visible from the Hardwick estate and adjacent LCAs, introducing large scale construction activities to the rural landscape and affecting the setting of Stainsby. The rural and tranquil perceptual qualities of the wider LCA would also be affected by the nature of the construction activity which would include the presence of equipment, movement of construction vehicles and work associated with the erection of viaduct piers and spans at Stainsby viaduct.</p> <p>This would change the tranquil, historic and rural character of the landscape. These changes would therefore result in a high magnitude of change and a major adverse effect.</p>	
<p>Wooded Farmlands</p>	<p>Medium susceptibility and sensitivity</p>
<p>Susceptibility to change: The rural character, mature vegetation pattern, valley terrain and level of tranquility have a medium susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by construction works associated with the Heath north cutting, Heath embankment, temporary materials stockpiles and a haul route to the western side of the Proposed Scheme. These works would result in the removal of woodland (including an area of the Owlcotes Ancient Woodland), mature trees, hedgerows and farmland. Construction activity would also include the demolition of Old Heath Church. Earthworks and stockpiles would be introduced to the valley landscape and the historic setting of Owlcotes. As the LCA rises to the east and west the presence of equipment and movement of construction vehicles would be clearly visible and further change the perception of the wider rural landscape.</p> <p>While the large scale works would be confined to a narrow band across the centre of the LCA, the valley landscape would result in construction having an influence on the rural character across the whole LCA. Therefore, these changes would result in a medium magnitude of change and a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Sutton Estate Farmlands</p>	<p>Medium susceptibility and sensitivity</p>
<p>Susceptibility to change: The open character and role this landscape plays in providing a rural setting to Bolsover and other historic landscapes result in this area having a medium susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by construction works associated with the M1 Motorway south viaduct, Bolsover South embankment, Bolsover South viaduct, Carr Vale embankment, Palterton Lane underbridge, A632 Chesterfield Road underbridge, construction site compounds, temporary materials stockpiles and a haul route which mainly passes along the western side of the Proposed Scheme. These works would result in the removal of woodland and mature trees associated with the M1 and the Peter Fidler and Carr Vale Nature Reserves, along with further hedgerows and farmland. Earthworks and stockpiles would alter the terrain in the wide valley floor to the east of this LCA. The presence of equipment, movement of construction vehicles, construction of viaducts</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>

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<p>at two locations and construction of engineered land forms would introduce noticeable change in this rural landscape.</p> <p>Within the village itself, beyond the use of Palterton Lane for construction traffic, no direct landscape effects would be experienced during construction. However, the scale of vehicle movements through the tranquil historic village would be a noticeable change to the LCA and affect the approach to Sutton Scarsdale Hall.</p> <p>Due to the terrain which rises to the west of the Proposed Scheme, changes would be apparent over a large part of this LCA including the setting of Sutton Scarsdale Hall. Therefore, these changes would result in a medium magnitude of change and a moderate adverse effect.</p>	
<p>Doe Lea Valley</p>	<p>High susceptibility and sensitivity</p>
<p>Susceptibility to change: The wooded and tranquil character and recreational (and ecological) interest this landscape provides result in this area having a high susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by construction works associated with the Bolsover South embankment, Bolsover South viaduct, Carr Vale embankment, construction site compounds, temporary materials stockpiles and a haul route which passes along the western side of the Proposed Scheme. These works would result in the removal of woodland and mature trees along the western fringes of the nature reserves and direct impacts on the New Flash pools and The Goit watercourse. Earthworks, stockpiles and the construction of viaducts would alter the existing flatter terrain and the views towards Sutton Scarsdale Estate. Construction activity would also reduce tranquillity changing the character of the nature reserve.</p> <p>Based on the above construction works would therefore result in a high magnitude of change and a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Bolsover</p>	<p>High susceptibility and sensitivity</p>
<p>Susceptibility to change: The historic character and strong visibility with rural landscapes to the west result in this area having a high susceptibility to change arising from the Proposed Scheme.</p> <p>No direct landscape effects would be experienced during construction other than the use of Woodhouse Lane as a construction access route. However, construction works associated with the Bolsover South embankment, Bolsover South viaduct, Carr Vale embankment, Bolsover North viaduct, Bolsover North embankment, Bolsover cutting, A632 Chesterfield Road underbridge, construction site compounds, temporary materials stockpiles and a haul route which mainly passes along the western side of the Proposed Scheme would affect the setting of the town due to its position on the valley side and long views across the landscape to the west. The majority of the historic core of Bolsover, being predominantly focused around Market Place, would not be affected.</p> <p>Due to the change to the setting of Bolsover Castle and the importance of its location in the landscape, construction works would therefore result in a medium magnitude of change and a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>North Derbyshire Estate Farmlands</p>	<p>Low-medium susceptibility and medium sensitivity</p>
<p>Susceptibility to change: The rural but indistinct character and influence of residential development and transport infrastructure result in this area having a low-medium susceptibility to change arising from the Proposed Scheme.</p> <p>The LCA would be directly affected by construction works associated with the Shuttlewood embankment, Shuttlewood viaduct, Shuttlewood cutting, Stanfree embankment, M1 Motorway North viaduct, B6418 Chesterfield Road underbridge, construction site compounds, temporary</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>

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materials stockpiles and a haul route which mainly passes along the eastern side of the Proposed Scheme. These works would result in the removal of farmland, hedgerows and mature tree cover along with the grade II listed Woodhouse Farmhouse, which would detract from some of the key landscape features of the landscape. Earthworks and stockpiles would alter the undulating terrain to the west of Shuttlewood. The presence of equipment, movement of construction vehicles and erection of viaducts would introduce noticeable change detracting from the rural character.

As the terrain rises to the east of the Proposed Scheme, these effects would be experienced over a large area of the LCA. Therefore, construction works would result in a high magnitude of change and a major adverse effect.

Visual assessment

Introduction

- 11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.
- 11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.
- 11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.
- 11.4.11 Table 30 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: LA10 Map Book.

Table 30: Construction phase potentially significant effects

Views north-west from recreational users of PRow near The Hurst (VP 390-03-004) (Map Number LV-03-390b)	Medium-high sensitivity receptors
Users of recreational footpaths to the east of The Hurst (Tibshelf Footpaths 35 and 36) would experience substantial changes in near to middle distance elevated views as a result of construction activity associated with the Proposed Scheme. In the foreground, Tibshelf cutting satellite compound and a materials stockpile would be the key element of the view. Beyond this construction works associated with Hardstoft South cutting would be seen against the rising landscape behind, to the north-west, along with closer distance views of the works associated with the clearance of an avenue of mature trees along the access road to The Hurst (trees which are currently seen on the horizon in views to the west). Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.	Level of effect: Major adverse (significant)
Views east from residences and road users north of Tibshelf and Hardstoft and PRow to the east of Hardstoft (VP 391-04-004, 390-02-007, 391-03-001 and 391-03-012) (Map Number LV-03-391)	High to medium sensitivity receptors
Residents on the north-east edge of Tibshelf and the eastern edge of Hardstoft with open elevated views looking east, and users of recreational footpaths to the east of Hardstoft (including Tibshelf Bridleway 31 and Ault Hucknall Footpath 18 and road users) would experience substantial changes to	Level of effect:

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<p>middle distance views as a result of construction works associated with Hardstoft South cutting, Hardstoft South embankment, Hardstoft North cutting, Deep Lane overbridge and Hawking Lane diversion. Site construction compounds and temporary materials stockpiles, located on either side of the Proposed Scheme to the west of the M1, and would also temporarily alter the appearance of the undulating farmed landscape. The presence of equipment and movement of construction vehicles, including along the haul route to the west side of the Proposed Scheme, would also be apparent. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Major adverse (significant)</p>
<p>Views west from PRoW and recreational users in and around Hardwick Estate (VP391-04-002, 391-03-005, 391-03-007, 391-03-009, 391-03-008, 391-03-014, 392-03-001 and 392-03-002) (Map Number LV-03-391 and 392)</p>	<p>Medium-high sensitivity receptors</p>
<p>Users of footpaths and recreational visitors to the estate would experience substantial changes in close to medium distance elevated views as a result of construction works associated with Hardstoft North cutting, Hardstoft North embankment and Astwith cutting, which cross the view on the western side of the M1. Site construction compounds and temporary materials stockpiles located on either side of the Proposed Scheme would also temporarily change the character of outward views over the undulating farmed and well vegetated landscape. Construction activity associated with Deep Lane overbridge and Hawking Lane diversion, along with the presence of equipment and movement of construction vehicles would also be apparent in views to the west. Construction activities would be the key elements in the views, many of them being historic, designed views across the estate. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Level of effect: Major adverse (significant)</p>
<p>Views west from PRoW near Astwith Lane (Ault Hucknall Footpath 19) (VP391-03-015) (Map Number LV-03-391 and 392)</p>	<p>Medium-high sensitivity receptors</p>
<p>Recreational users of the PRoW with open slightly elevated views to the east, would experience substantial changes in near distance views as a result of construction activity mainly associated with Astwith cutting and Hawking Lane realignment. A temporary materials stockpile would be apparent to the immediate south-east of the view. The presence of equipment and movement of construction vehicles, including vehicles along the haul route on the western side of the Proposed Scheme, would add further activity into close distance views. This would alter the rural character of the view bringing large areas of disturbed ground in proximity to the viewer. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Level of effect: Major adverse (significant)</p>
<p>Views east and north-east from residences at Stainsby (VP 392-03-006 and 392-03-008) (Map Number LV-03-392)</p>	<p>High to medium-high sensitivity receptors</p>
<p>Residents (as represented through views from the PRoW) near Stainsby, with open slightly elevated views to the east, would experience substantial changes in near distance as a result of construction activity associated with Stainsby viaduct and Stainsby embankment. Construction activity associated with Heath South cutting, including site construction compounds, Heath South cutting main compound and temporary materials stockpiles, would also be apparent in largely open views to the north-east. The presence of equipment and movement of construction vehicles, including vehicles along the haul route on the western side of the Proposed Scheme, would add further activity into close distance views. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Level of effect: Major adverse (significant)</p>
<p>Views east and north from residences at Heath (VP 393-02-003, 393-03-002 and 393-02-004) (Map Number LV-03-393)</p>	<p>High to medium-high sensitivity receptors</p>
<p>Residents on the edge of Heath, with open views east and north (represented by 393-03-002 and 393-02-004), would experience changes in near distance views as a result of the Proposed Scheme due to</p>	<p>Level of effect:</p>

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<p>construction activity associated with Heath junction realignment. Works here would include the clearance of mature woodland and vegetation around the junction and extensive excavation works on the western side of the M1 and the A617. The elevated position of the village would also allow longer views north (393-02-003) looking over construction activity associated with Heath North cutting, Heath embankment and beyond, towards the M1 South viaduct. In these views materials stockpiles would add to changes to the valley side terrain to the west of the M1. The presence of equipment and movement of construction vehicles, including vehicles along the haul route on the western side of the Proposed Scheme, would add further activity into middle distance views. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Major adverse (significant)</p>
<p>Views west from residences at Palterton and Rylah Farm and the Stockley Trail (VP 394-02-002, 393-04-007, 393-03-005 and 394-03-005) (Map Number LV-03-393 and 394R1)</p>	<p>High to medium-high sensitivity receptors</p>
<p>Residents at Palterton (394-02-002) and Rylah Farm (represented by 393-04-007), with open views west, would experience noticeable changes in longer distance elevated views as a result of construction activity associated with Heath embankment, M1 South viaduct and Bolsover South embankment. These construction works would extend across the full view and be seen against the rising landscape behind. Construction site compounds, material stockpiles and the presence of equipment and movement of construction vehicles would detract from these predominately rural views. Similar, albeit closer proximity and lower elevation views would also be available from sections of the Stockley Trail, with open views to the north-west and west (393-03-005 and 394-03-005). Due to the high visibility of construction works within the predominantly rural view, construction of the Proposed Scheme would therefore result in a medium magnitude of visual change and moderate adverse effect.</p>	<p>Level of effect: Moderate adverse (significant)</p>
<p>Views east and south-east from PRow and residences at Sutton Scarsdale (VP 394-03-006, 394-04-007, 393-03-008, 394-02-003 and 394-02-004) (Map Number LV-03-394)</p>	<p>High to medium sensitivity receptors</p>
<p>From viewpoint 394-03-006 and 394-04-007 residents with open views to the east, users of recreational footpaths to the east of Sutton Scarsdale and recreational visitors to the hall would experience noticeable changes in short to longer distance elevated views. This would arise from construction works associated with the Proposed Scheme between the M1 South viaduct to the south, and Shuttlewood cutting to the north. Temporary materials stockpiles, construction site compounds and the presence of equipment and movement of construction vehicles would detract from the setting of a historic designed view across the valley towards Bolsover Castle.</p> <p>From viewpoint 393-03-008 similar longer distance elevated views would be experienced from PRow (Heath and Holmwood Footpath 14) to the south of the village, near Owlcotes, and include views of Heath embankment, the accommodation underbridge and the M1 Motorway south viaduct satellite compound.</p> <p>From viewpoints 394-02-003 and 394-02-004 residents on the southern edge of the village, with open views to the south-east, would experience changes in middle distance views as a result of construction works associated with Heath embankment.</p> <p>Construction of the Proposed Scheme would therefore result in a medium magnitude of visual change and moderate adverse effect.</p>	<p>Level of effect: Moderate adverse (significant)</p>
<p>Views east from PRow near Carr Vale Nature Reserve (VP 395-03-003) and from Carr Vale Nature Reserve (394-03-013) (Map Number LV-03-395)</p>	<p>Medium-high sensitivity receptors</p>
<p>Users of recreational footpaths including Sutton cum Duckmanton Footpath 18, passing through open farmland to the west of Carr Vale Nature Reserve, would experience substantial changes in near distance slightly elevated views. This would arise from construction works associated with Bolsover South viaduct, embankments to the north and south of this feature, material stockpiles and site construction compounds visible in views east towards the escarpment and Bolsover Castle. The</p>	<p>Level of effect: Major adverse (significant)</p>

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<p>presence of equipment and movement of construction vehicles, including vehicles along the haul route on the western side of the Proposed Scheme, would add activity into near distance views.</p> <p>In more open views looking west, over the ponds to the south of the nature reserve (VP 394-03-013) substantial changes would arise due to construction works associated with Bolsover South embankment and temporary materials stockpiles on the eastern side of the Proposed Scheme. Disturbed ground and engineered landforms would alter the rural setting and affect a large proportion of the view in this direction.</p> <p>Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	
<p>View east for residents on Chesterfield Road (VP 395-02-12) (Map Number LV-03-395)</p>	<p>High sensitivity receptors</p>
<p>Residents on Chesterfield Road would experience substantial changes, in proximity and direct views north, as a result of realignment works on Chesterfield Road. In more oblique view to the north-east and east construction works associated with Bolsover North viaduct, the embankments either side of this features and the A632 Chesterfield Road underbridge would also be apparent. These works would affect a large proportion of the view, alter the rural setting and partially obscure views towards the settlement of Bolsover (and the castle) seen on the horizon in views to the east. Temporary materials stockpiles, construction compounds and the presence of equipment and movement of construction vehicles, including vehicles along the haul route on the western side of the Proposed Scheme, would add activity into near distance views.</p> <p>Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.</p>	<p>Level of effect: Major adverse (significant)</p>
<p>Views west from PRoW and residences at Bolsover (VP 395-03-005, 395-02-001, 395-02-004, 395-02-008 and 395-02-007) (Map Number LV-03-395)</p>	<p>High to medium-high sensitivity receptors</p>
<p>Residents, recreational footpath users and visitors in and around Bolsover would experience noticeable changes in medium to longer distance elevated views. This would arise from construction activity between the M1 South viaduct, to the south, and Shuttlewood cutting, to the north. Temporary materials stockpiles, construction site compounds and the presence of equipment and movement of construction vehicles would detract from the setting of a historic designed view across the valley, looking towards Sutton Scarsdale. Due to the extent of the construction works which would be visible across these elevated views; the introduction of construction activity to the rural landscape; and the associated change of the view towards Sutton Scarsdale Hall, construction of the Proposed Scheme would therefore result in a medium magnitude of visual change and moderate adverse effect.</p>	<p>Level of effect: Moderate adverse (significant)</p>
<p>Views west from residences and roads near Shuttlewood (VP 396-02-003 and 396-04-008) (Map Number LV-03-396a)</p>	<p>High to medium sensitivity receptors</p>
<p>Residents (and road users) in and around Shuttlewood would experience noticeable changes in short to longer distance elevated views as a result of construction activity associated with the M1 North viaduct, B6418 Chesterfield Road underbridge, Shuttlewood embankment, Shuttlewood cutting, construction site compounds and materials stockpiles. For the viewpoints at increased distance and elevation, a longer section of construction works associated with the Proposed Scheme would be seen, including sections of the Staveley Spur further north-west (within LA11). The presence of equipment and movement of construction vehicles, including vehicles along the haul route on the eastern side of the Proposed Scheme, would add activity into views. Construction of the Proposed Scheme would therefore result in a medium magnitude of visual change and moderate adverse effect.</p>	<p>Level of effect: Moderate adverse (significant)</p>

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View east from PRow (Bolsover Footpath 34 and 35) near Woodside Farm (VP 396-03-010) (Map Number LV-03-396a)	Medium-high sensitivity receptors
Users of recreational footpaths (Bolsover Footpath 34 and 35) passing through largely open farmland to the east of Woodside Farm, would experience substantial changes in near distance slightly elevated views. This would arise from construction works associated with Shuttlewood cutting and the Bolsover Footpath 35 Accommodation overbridge. Temporary materials stockpiles to the south would also introduce large areas of disturbed ground and change the terrain and agricultural land cover. Construction of the Proposed Scheme would therefore result in a high magnitude of visual change and major adverse effect.	Level of effect: Major adverse (significant)
Views west from residences north of Shuttlewood (VP 396-02-005, 396-02-006 and 397-02-001) (Map Number LV-03-396a and 397a)	High sensitivity receptors
Residents north of Shuttlewood, including from Bentinck Road and the smaller settlements of Stanfree and Oxcroft would experience noticeable changes in short to longer distance elevated views as a result of construction activity associated with the M1 North viaduct, Shuttlewood embankment, Shuttlewood cutting, construction site compounds and materials stockpiles. For the viewpoints at increased distance and elevation, a longer section of construction works associated with the Proposed Scheme would be seen, including sections of the Staveley Spur further north-west (within LA11). The presence of equipment and movement of construction vehicles, including vehicles along the haul route on the eastern side of the Proposed Scheme, would add activity into views. Construction of the Proposed Scheme would therefore result in a medium magnitude of visual change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Other mitigation measures

- 11.4.12 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

- 11.4.13 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents, and users of PRow and main and minor roads within the study area.
- 11.4.14 The significant effects that would remain after implementation of construction phase mitigation are summarised below:
- major adverse landscape effects in relation to four LCAs;
 - moderate adverse landscape effects in relation to four LCAs;
 - major adverse visual effects on views from seven residential viewpoint locations;
 - major adverse visual effects on views from 15 recreational viewpoint locations;

- major adverse visual effects on views from two transport viewpoint locations;
- moderate adverse visual effects on views from eight residential viewpoint locations;
- moderate adverse visual effects on views from six recreational viewpoint locations; and
- moderate adverse visual effects on views from three transport viewpoint locations.

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.

11.5.3 Measures that would be integrated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments (such as Heath, Bolsover, Owlcoates Wood, Carr Vale, Shuttlewood and Stanfree embankments) and cuttings into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where practicable;
- compensatory woodland planting in areas of loss, using locally appropriate species composition and planting types including woodland associated with M1, Carr Vale Nature Reserve, north-west of Bolsover, M1 Junction 29 and Hurst Farm, and to provide habitat connectivity, enhanced landscape connectivity, as well connectivity of historic landscape features, where practicable, and to soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; and
- provision of new areas of informal semi natural greenspace at the intersection of the Proposed Scheme with the M1 to provide new uses for areas of islanded landscape which are no longer viable for their original use and to compensate for loss of existing greenspace.

Assessment of impacts and effects

- 11.5.4 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 viaducts, underbridges, overbridges and the presence of large scale permanent earthworks. Other aspects include the presence of overhead line equipment and the movement of trains.

Landscape assessment

- 11.5.5 Based on the current design, it is currently anticipated that the LCAs described in Table 31 would be significantly affected during operation of the Proposed Scheme.

Table 31: Operational phase significant landscape effects

Newtonwood Farmlands	Medium susceptibility and sensitivity
<p>Susceptibility to change: The rural open character and recreational interest provided through the PRoW network result in this LCA having a medium susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected by the Proposed Scheme mainly through increased separation of the landscape and changes to the terrain, landscape features and vegetation cover. The introduction of Hilcote East embankment and the Tibshelf cutting would result in a substantial change to the pattern and scale of the undulating terrain. The introduction of deep cuttings and embankments would create permanent increased severance in the landscape. Elements such as overhead line equipment associated with the Proposed Scheme would add further infrastructure features beyond those associated with the M1, and would alter the predominantly rural characteristics of the LCA. The presence of trains would also affect the tranquillity of the rural landscape, which is already adversely affected by the M1.</p> <p>Based on the above there would therefore be an overall high magnitude of change and major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Year 15: Planting would contribute to the integration of structures into the landscape by the summer of year 15. However, the operational railway, large-scale embankments and cuttings would remain as uncharacteristic, new features in the rural landscape. Planting would help to reduce the magnitude of change to medium.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
Hardwick Estate	High susceptibility and sensitivity
<p>Susceptibility to change: The historic character, mature vegetation pattern and level of tranquillity have a high susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected, mainly through increased severance of the landscape; changes to the terrain, historic features and vegetation cover; and changes to the historic rural character. The Proposed Scheme encloses parcels of land between it and the M1 to the east. Large cuttings and some smaller embankments would result in major changes to the complex terrain and the loss of distinctive features (including the 'The Hurst' and parts of the historic lane network and pattern), mature hedgerows, trees and woodland. Visibility of infrastructure from rural villages and the Hardwick Hall estate would alter the landscape setting, influencing the historic rural character of the area. The Proposed Scheme would also result in permanent changes to the western approach to Hardwick Hall and the introduction of a busy road to the immediate north of Stainsby Mill and War Memorial area. This would further alter this historic and rural character, already subject to effects associated with the M1.</p> <p>These effects would largely be focused to western half of the LCA with wider effects on the perception of the landscape also being experienced from the wider LCA. There would therefore be a high magnitude of change and major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>

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<p>Year 15: Mitigation planting would assist with some integration of structures into the landscape and replace some of the vegetation removed during construction. However, the increased severance of the landscape and changes to the terrain, landscape pattern and historic character of the LCA would remain significant. Planting associated with the Proposed Scheme is unlikely to be sufficiently mature to offer notable restoration of character at this stage.</p> <p>Based on the above the magnitude of change would reduce to medium and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Sutton Estate Farmlands</p>	<p>Medium susceptibility and sensitivity</p>
<p>Susceptibility to change: The open character and role this landscape plays in providing a rural setting to Bolsover and other historic landscapes result in this area having a medium susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected, mainly through increased severance of the landscape, changes to the terrain, introduction of large scale engineered features (including two viaducts) and changes to vegetation cover. The sections of embankment between the M1 South viaduct, to the south of this LCA, and the Bolsover South viaduct (Bolsover South embankment), to the north of this LCA, would contrast with the relatively flat topography in this part of the LCA. There would be a loss of farmland, hedgerows and vegetation, including woodland on the western fringes of the Carr Vale Nature Reserve. The tranquillity and perception of the historic landscape would be altered. The movement of trains would also be readily apparent from the viaducts and embankments from more elevated locations in this LCA.</p> <p>These effects would largely be focused within the eastern half of the LCA, with the ridge to the north of Sutton Scarsdale helping to contain effects on the landscape further to the west. Changes would also affect the setting of Sutton Scarsdale Hall. There would therefore be an overall medium magnitude of change and a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15: Established mitigation woodland planting on the embankments would help reinstate the character in the eastern extent of the LCA, replacing the wooded backdrop of Carr Vale Nature Reserve with a wooded embankment. Planting within the Sutton Scarsdale deer park boundary would be sufficiently established to contribute to the perception of the historic park and provide additional benefits through screening the M1 as well as the Proposed Scheme. However, the viaducts and movement of trains would continue to influence the rural character of the landscape and setting this provides to Sutton Scarsdale Hall. The overall medium magnitude of change and moderate adverse effects would remain.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Doe Lea Valley</p>	<p>High susceptibility and sensitivity</p>
<p>Susceptibility to change: The wooded and tranquil character and recreational (and ecological) interest this landscape provides result in this area having a high susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected, mainly through the introduction of large scale engineered features (two viaducts), changes to the terrain, changes to vegetation cover and the restored industrial character, which can be tranquil in places. The Bolsover South viaduct will alter the perception of the LCA, especially to the north of this LCA, where close distance changes in the terrain (embankment south of Bolsover viaduct) and the loss of restored woodland and vegetation cover would also be apparent.</p> <p>These effects would be at their most intense to the north of the LCA, but are predicted to influence the majority of the LCA, where breaks in vegetation cover (and seasonal changes) would allow open views to the west. Changes in landscape context, and effects associated with a reduction in landscape tranquillity, would be apparent. There would therefore be an overall high magnitude of change and major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Year 15: The viaducts and effects associated with the movement of trains would continue to influence tranquillity and landscape character, particularly to the north of this LCA. However,</p>	<p>Level of effect:</p>

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<p>established mitigation planting would help to screen the Proposed Scheme reducing the magnitude of change to medium and giving rise to a moderate adverse effect.</p>	<p>Moderate adverse (significant)</p>
<p>Bolsover</p>	<p>High susceptibility and sensitivity</p>
<p>Susceptibility to change: The historic character and strong visibility to rural landscapes to the west result in this area having a high susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be indirectly affected, mainly through the introduction of large scale engineered features (Bolsover North and South viaducts), changes to the terrain, changes to vegetation cover and the rural character of the landscape to the west of this LCA, which provides an important setting in views from and to this area.</p> <p>Based on the above there would therefore be an overall medium magnitude of change and moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15: Whilst the viaducts and movement of trains would continue to influence the rural context in views looking to the west, established mitigation woodland planting on the embankments would help reinstate the character of views. As such, the overall magnitude of change would therefore reduce to low-medium resulting in a minor adverse effect.</p>	<p>Level of effect:</p> <p>Non- significant</p>
<p>North Derbyshire Estate Farmlands</p>	<p>Low-medium susceptibility and medium sensitivity</p>
<p>Susceptibility to change: The rural but indistinct character and influence of residential development and transport infrastructure result in this area having a low-medium susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected, mainly through the introduction of large scale engineered features (M1 North viaduct), changes to the terrain, changes to vegetation cover, loss of some historic features and associated effects on the rural character of the landscape. The M1 North viaduct would introduce further large scaled engineered features, seen next to and crossing the M1, into this landscape. The embankment and cuttings to the south of this feature would alter and run against the grain of the undulating terrain to the west of Shuttlewood. There would be a direct loss of farmland, hedgerows and mature tree cover along with the historic Woodhouse Farm, which would alter and contrast with rural character of the landscape.</p> <p>These changes will be focused on the western edge of this LCA. However, the rising terrain to the east would offer longer distance views of the Proposed Scheme. The additional large scale infrastructure (seen in proximity to the M1) would further reduce the rural character of the landscape. There would therefore be an overall medium magnitude of change and moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15: Established mitigation planting would help integrate the wider Proposed Scheme with existing woodland in the LCA, including planting associated with the M1 corridor to northwest. This would therefore help reduce the magnitude of change to low and the level of effect to minor adverse.</p>	<p>Level of effect:</p> <p>Non- significant</p>

Visual assessment

Introduction

- 11.5.6 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.

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- 11.5.7 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.
- 11.5.8 Table 32 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: LA10 Map Book.

Table 32: Operation phase significant visual effects

Views north-west from PRoW near the Hurst (Medium-high sensitivity receptors)	
(VP 390-03-004) (Map Number LV-04-390b)	
<p>Year 1 – winter and summer:</p> <p>At year 1, users of recreational footpaths to the east of the Hurst would experience noticeable changes to middle distance slightly elevated views as a result of the Proposed Scheme. The Hardstoft South cutting would be seen against the rising landscape behind in views to the north-west. The cutting would alter the appearance of the rolling farmed landscape, change the field boundary pattern and result in the loss of a locally distinctive mature field tree off Deep Lane. Closer distance views of the loss of an avenue of mature trees along the access road to the Hurst, the trees of which are currently seen on the horizon in views to the east, would also be apparent. The rising terrain would screen closer distance views of Tibshelf cutting and Tibshelf cut and cover tunnel in views directly east. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for footpath users and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15 – summer:</p> <p>By summer of year 15, views of the Proposed Scheme would be partially screened by mitigation planting, however the level of visibility (including features such as Hardstoft South cutting) would be similar to those assessed in year 1. Therefore, effects would remain moderate and adverse.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
Views east from residences north of Tibshelf and PRoW to the east of Hardstoft (High to medium-high sensitivity receptors)	
(VP 390-02-007, 391-03-001 and 391-03-012) (Map Number LV-04-391)	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents on the north-eastern edge of Tibshelf and users of recreational footpaths to the east of Hardstoft would experience noticeable changes to middle distance slightly elevated views as a result of the Proposed Scheme. Various sections of the Hardstoft South cutting, Hardstoft South embankment and Hardstoft North cutting would be seen in front of the M1 (where visible) against the rising landscape behind in views to the east. The cuttings and embankments would alter the appearance of the undulating farmed landscape, change the field boundary pattern and result in the loss of a locally distinctive mature field tree off Deep Lane in certain views. Overhead line equipment and the movement of trains would also be apparent, particularly along visible sections of the Hardstoft South embankment. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for both residents and footpath users and there would be a moderate adverse effect for highest sensitivity receptors.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>

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<p>Year 15 – summer:</p> <p>By summer of year 15, views of the cuttings and embankments would be partially screened by mitigation planting, which would be most effective along visible sections of the Hardstoft South embankment.</p> <p>However, the wide proportion of the view affected by the Proposed Scheme would result in the magnitude of change remaining medium. There would be a moderate adverse effect for highest sensitivity receptors.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
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Views west from PRow and recreational users in and around Hardwick Estate (High sensitivity receptors)

(VP391-04-002, 391-03-005, 391-03-007, 391-03-009, 391-03-008, 391-03-014, 392-03-001 and 392-03-002) (Map Number LV-04-391 and 392)

<p>Year 1 – winter and summer:</p> <p>At year 1, users of footpaths and recreational visitors to the estate would experience substantial changes in close to medium distance elevated views as a result of the Proposed Scheme. From these more elevated and open vantage points Hardstoft North cutting, Hardstoft North embankment and Astwith cutting, which cross the view on the western side of the M1, would alter the terrain and contrast with the underlying complex topography. The irregular field pattern and vegetation cover to the west of the M1 would also change, including the loss of a locally distinctive mature field tree off Deep Lane which is apparent from numerous local vantage points. Infrastructure such as overhead line equipment and trains moving across more elevated sections of the Proposed Scheme would also be apparent. Mitigation planting would not provide any screening or landscape integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be high for footpath users and recreational visitors and there would be a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
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<p>Year 15 – summer:</p> <p>By the summer of year 15, established mitigation planting would reduce the magnitude of change helping to tie the Proposed Scheme into the surrounding landscape pattern and provide screening in some locations. However, from viewpoint 391-03-005 the Proposed Scheme would be seen running against the grain of the landscape crossing a small valley and then cutting across Deep Lane. From the more elevated viewpoints 391-03-008 and 391-03-009, looking west from Hardwick Estate, mitigation planting would also be less effective in screening views looking across Hardstoft North cutting.</p> <p>Based on the above a high magnitude of change and major adverse effects would remain from certain viewpoints.</p>	<p>Level of effect:</p> <p>Major adverse (significant) from viewpoints 391-03-005 and 391-03-008 and 391-03-009</p> <p>Non- significant from remaining viewpoints</p>
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Views west from PRow near Astwith Lane (Ault Hucknall Footpath 19) (Medium-high sensitivity receptors)

(VP391-03-015) (Map Number LV-03-391 and 392)

<p>Year 1 – winter and summer:</p> <p>Recreational users of the PRow with open slightly elevated views to the east would experience substantial changes in near distance views as a result of the Proposed Scheme. Astwith cutting and Hawking Lane realignment would be apparent. These features would result in changes to the terrain, which falls in elevation towards the M1; changes to the agricultural vegetation pattern and would bring linear infrastructure in closer proximity to the viewer. Overhead line equipment and train movements would also be apparent, more so where the Proposed Scheme runs at grade to the south-east of view. The mitigation planting would not provide any screening or visual integration at this stage.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
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<p>Based on the above, the magnitude of change would therefore be high for footpath users and there would be a major adverse effect.</p>	
<p>Year 15 – summer:</p> <p>By summer of year 15, established mitigation between the realigned Hawking Lane and the Proposed Scheme would provide some screening. This would help to reduce the magnitude of change to medium. However, the Hawking Lane realignment would still be apparent in close distance views. Due to the elevated nature of the viewpoint and depth of mitigation planting the movement of trains is also likely to be apparent.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Views east and north-east from residences at Stainsby (High to medium-high sensitivity receptors)</p> <p>(VP392-03-006 and 392-03-008) (Map Number LV-04-392)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents in Stainsby (and users of the PRoW), with more open views to the east, would experience substantial changes in near distance slightly elevated views as a result of the Proposed Scheme. Stainsby viaduct and Stainsby embankment would be apparent, seen within the open fields to the east and north-east of the settlement and within approximately 150m of certain properties. This would result in changes to the terrain, which falls in elevation towards the M1; and changes to the vegetation pattern, including views of the loss of mature vegetation along Mill Lane. Views towards the M1 would also be obscured by the embankment with overhead line equipment and train movements being apparent. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be high for residents and there would be a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Year 15 – summer:</p> <p>By summer of year 15, established mitigation planting on Stainsby embankment would help to reinstate the character of existing views. However, this new woodland would be closer to the village than that currently seen along Mill Lane. Train movements would largely be screened/ filtered on the sections of embankment. Views towards the Stainsby viaduct, and associated movement of trains, would likely remain.</p> <p>The magnitude of change would reduce to medium for residents and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Views east and north from residences at Heath (High to medium-high sensitivity receptors)</p> <p>(VP393-02-003, 393-03-002 and 393-02-004) (Map Number LV-04-393)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents in Heath, with open views east and north (as represented by 393-03-002 and 393-02-004), would experience noticeable changes in near to middle distance views as a result of the Proposed Scheme. Heath junction realignment would be apparent from the eastern edge of the village. Vehicles on the new Heath roundabout would be closer to properties in the village and the loss of mature vegetation around the junction, including woodland at Heath Church, would also be apparent.</p> <p>Furthermore, the villages elevated position allows longer views north (393-02-003) looking over Heath North cutting/ Heath embankment towards the M1 South viaduct and further north along the Proposed Scheme. In these views the Proposed Scheme would alter the terrain and vegetation pattern as well as</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>

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<p>introduce overhead line equipment and the movement of trains into views. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for residents and there would be a moderate adverse effect.</p>	
<p>Year 15 – summer:</p> <p>By summer of year 15, established mitigation planting would help to screen and filter views of the Proposed Scheme to the east and north of the village. This is also likely to screen views from certain locations towards the M1 South viaduct.</p> <p>As such, the magnitude of change would reduce and there would be a minor adverse effect.</p>	<p>Level of effect:</p> <p>Non- significant</p>
<p>Views west from residences at Palterton and Rylah (High sensitivity receptors) and the Stockley Trail (Medium-high sensitivity receptors)</p> <p>(VP 394-02-002, 393-04-007 and 393-03-005) (Map Number LV-04-394R1)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents at Palterton and Rylah (as represented by 393-04-007), with open views west, would experience noticeable changes in longer distance elevated views as a result of the Proposed Scheme. The Heath embankment, M1 South viaduct and Bolsover South embankment would cross a large part of these predominately rural views, seen back dropped by the rising landscape behind. Along with this large scale infrastructure, overhead line equipment and trains movements would also be apparent. Similar, albeit closer proximity and lower elevation views would also be available from sections of the Stockley Trail, with open and direct views orientated to the north-west (394-03-005) and in which the M1 South viaduct forms a notable feature. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for residents and recreational users of the footpaths and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15 – summer:</p> <p>By summer of year 15, established planting would help to screen the Proposed Scheme including train movements and overhead line equipment. The Proposed Scheme would continue to be seen in proximity to the M1 and in combination these linear transport corridors would fragment the landscape and alter the rural perception of the view. The M1 south viaduct would continue to be a degrading element in the view, however it is recognised that the longer viewing distance would result in this being a smaller feature of the overall view.</p> <p>Nevertheless, the magnitude of change would remain medium for residents and footpath users and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Views east and south-east from PRow and residences at Sutton Scarsdale (High to medium sensitivity receptors)</p> <p>(VP393-03-008, 394-02-003, 394-02-004, 394-03-006 and 394-04-007) (Map Number LV-04-394)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents with more open views to the east, users of recreational footpaths to the east of Sutton Scarsdale and recreational visitors to Sutton Scarsdale Hall (Viewpoints 394-03-006 and the representative view from 394-04-007) would experience noticeable changes in short to longer distance elevated views as a result of the Proposed Scheme. In these views parts of the Proposed Scheme between the M1 South viaduct, to the south, and Shuttlewood cutting, to the north, would be apparent. Where the Proposed Scheme runs on embankment this would obscure views of the pools at the Carr Vale Nature</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>

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<p>Reserve. The Proposed Scheme would also introduce a large scale transport corridor, seen on embankment and viaduct, within the setting of a historic designed view across the valley towards Bolsover Castle. Vegetation loss alongside the M1 would also be perceptible along with overhead line equipment and the movement of trains. From viewpoint 393-03-008 similar longer distance elevated views would be experienced from PRow (Heath and Holmwood Footpath 14) to the south of the village, near Owlcotes, and include views of Heath embankment. From viewpoints 394-02-003 and 394-02-004 residents on the southern edge of the village, with more open views to the south-east, would also experience changes in middle distance views as a result of Heath embankment. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for both residents and footpath users and there would be a moderate adverse effect for highest sensitivity receptors.</p>	
<p>Year 15 – summer:</p> <p>By summer of year 15, established planting would provide partial screening of the Proposed Scheme. However, from this elevated vantage point trains would still be visible, especially on the sections of viaduct. Furthermore, views towards Carr Vale Nature Reserve and the historic view across the valley to Bolsover would be permanently altered.</p> <p>The magnitude of change would remain medium for both residents and footpath users and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Views east from PRow at Carr Vale Nature Reserve and from Carr Vale Nature Reserve (Medium-high sensitivity receptors)</p> <p>(VP395-03-003 and 394-03-13) (Map Number LV-04-395)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, users of recreational footpaths, in open farmland to the west of Carr Vale Nature Reserve, would experience substantial changes in near distance slightly elevated views as a result of the Proposed Scheme. The most notable change in the view would relate to Bolsover South viaduct, which would introduce a large scale engineered feature in close distance views to the east. Visible parts of the embankments either side of the viaduct would also change the terrain and foreshorten views in this direction.</p> <p>In more open views looking west, over the ponds to the south of the nature reserve (VP 394-03-013) Bolsover South embankment would alter the rural setting, with changes to the terrain and agricultural vegetation pattern. This feature would affect a large proportion of the view.</p> <p>The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be high for footpath users and there would be a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>Year 15 – summer:</p> <p>By summer of year 15, established mitigation planting would help to integrate the visible sections of embankment into the landscape. However, Bolsover South viaduct and Bolsover South embankment would continue to form new and prominent features in close distance views.</p> <p>The magnitude of change would remain high for footpath users and there would be a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>View east for residents on Chesterfield Road (High sensitivity receptor)</p>	

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(VP 395-02-12) (Map Number LV-04-395)

At year 1, residents on Chesterfield Road would experience substantial changes in proximity and direct views, as a result of the realignment of Chesterfield Road. In more oblique view to the north-east Bolsover North viaduct, the embankments either side of this feature and the A632 Chesterfield Road underbridge would also be apparent. These features would change a large proportion of the view, alter the rural setting and partially obscure views towards the settlement of Bolsover (and the castle) seen on the horizon in views to the east. The Proposed Scheme would also introduce overhead line equipment and the movement of trains into views. The mitigation planting would not provide any screening or visual integration at this stage.

Level of effect:

Major adverse
(significant)

Based on the above, the magnitude of change would therefore be high for residents and there would be a major adverse effect.

Year 15 – summer:

By summer of year 15, established mitigation planting would help to integrate the visible sections of embankment into the landscape. However, Bolsover North viaduct would continue to form new and prominent feature in close distance oblique views to the north-east.

Level of effect:

Major adverse
(significant)

The magnitude of change would remain high for footpath users and there would be a major adverse effect.

Views west from PRow and residences at Bolsover (Medium-high to High sensitivity receptors)

(VP 395-03-005, 395-02-001, 395-02-004, 395-02-008 and 395-02-007) (Map Number LV-04-395)

Year 1 – winter and summer:

At year 1, residents and recreational footpath users/ visitors in and around Bolsover would experience noticeable changes in medium to longer distance elevated views as a result of the Proposed Scheme. In these views parts of the Proposed Scheme between the M1 South viaduct, to the south, and Shuttlewood cutting, to the north, would be apparent. The view towards Sutton Scarsdale would also be altered by the Proposed Scheme, which would introduce a large scale transport corridor on embankment and viaduct, seen within the setting of a historic designed view across the valley. Vegetation loss alongside the western edge of Carr Vale Nature Reserve and overhead line equipment and the movement of trains would also be apparent. The mitigation planting would not provide any screening or visual integration at this stage.

Level of effect:

Moderate adverse
(significant)

Based on the above, the magnitude of change would therefore be medium for residents and recreational visitors and there would be a moderate adverse effect.

Year 15 – summer:

By summer of year 15, established planting would provide partial screening of the Proposed Scheme. However, from this elevated vantage point trains would still be visible, especially on the sections of viaduct. Furthermore, the historic view across the valley to Sutton Scarsdale would be permanently altered.

Level of effect:

Moderate adverse
(significant)

The magnitude of change would remain medium for residents and recreational visitors/ footpath users and there would be a moderate adverse effect.

Views west from residences near Shuttlewood (High to medium sensitivity receptors)

(VP396-02-003 and 396-04-008) (Map Number LV-04-396a)

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<p>Year 1 – winter and summer:</p> <p>At year 1, residents (and road users) in and around Shuttlewood would experience noticeable changes in short to longer distance elevated views as a result of the Proposed Scheme. In these views, parts of the M1 North viaduct, B6418 Chesterfield Road underbridge, Shuttlewood embankment and Shuttlewood cutting would be apparent. Due to the elevated nature of the viewpoints sections of the Staveley Spur, further north-west, would also be apparent in certain views. Overhead line equipment and the movement of trains would also contribute to a further alteration of the rural view. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be medium for residents and road users and there would be a moderate adverse effect for highest sensitivity receptors.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Year 15 – summer:</p> <p>By the summer of year 15, established planting would help integrate the Proposed Scheme with vegetation on the restored spoil heaps in places, and provide screening of train movements and overhead line equipment in others. Whilst the viaduct would remain a large structure in views, its position across an area in which the M1 is also highly visible would reduce the degree of change to the affected views. Maturing planting on the embankment would also slightly reduce the extent of the viaduct visible. As such, the magnitude of change would reduce to low and there would be a minor adverse effect.</p>	<p>Level of effect:</p> <p>Non-significant</p>
<p>View east from PRoW (Bolsover Footpath 34 and 35) near Woodside Farm (Medium-high sensitivity receptor)</p> <p>(VP 396-03-010) (Map Number LV-03-396a)</p>	
<p>At year 1, users of recreational footpaths (Bolsover Footpath 34 and 35) passing through largely open farmland to the east of Woodside Farm, would experience substantial changes in near distance slightly elevated views as a result of the Proposed Scheme. Shuttlewood cutting would alter the terrain and landcover. Bolsover Footpath 35 Accommodation overbridge would introduce further engineered features into the view. Elevated views looking over overhead line equipment and the movement of trains would also be available. The mitigation planting would not provide any screening or visual integration at this stage.</p> <p>Based on the above, the magnitude of change would therefore be high for footpath users and there would be a major adverse effect.</p>	<p>Level of effect:</p> <p>Major adverse (significant)</p>
<p>By the summer of year 15, mitigation planting would provide some localised screening in views orientated to the south-east. However, framed views through gaps in the mitigation planting to the east, including views of the Bolsover Footpath 35 Accommodation overbridge, are likely to remain. The magnitude of change would be medium for footpath users and there would be a moderate adverse effect.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>
<p>Views west from residences north of Shuttlewood (High sensitivity receptors)</p> <p>(VP396-02-005, 396-02-006 and 397-02-001) (Map Number LV-04-396 and 397)</p>	
<p>Year 1 – winter and summer:</p> <p>At year 1, residents and road users to the north of Shuttlewood, including Bentick Road and the smaller settlements of Stanfree and Oxcroft, would experience noticeable changes in short to longer distance elevated views as a result of the Proposed Scheme. In these views parts of the M1 North viaduct and Shuttlewood embankment would represent the main change in view. From the more elevated viewpoints sections of the Staveley Spur, further north-west, would also be apparent in certain views. Overhead line equipment and the movement of trains would also contribute to a further alteration of the predominately rural view. The mitigation planting would not provide any screening or visual integration at this stage.</p>	<p>Level of effect:</p> <p>Moderate adverse (significant)</p>

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Based on the above, the magnitude of change would therefore be medium for residents and there would be a moderate adverse effect.	
<p>Year 15 – summer:</p> <p>By the summer of year 15, established planting would help integrate the Proposed Scheme and provide screening of train movements and overhead line equipment. Whilst the viaduct would remain a large structure in views, its position across an area in which the M1 is highly visible would reduce the change to the nature of affected views. As such, the magnitude of change would reduce to low and there would be a minor adverse effect.</p>	<p>Level of effect:</p> <p>Non-significant</p>

Other mitigation measures

- 11.5.9 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 greenspace 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

- 11.5.10 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:
- moderate adverse landscape effects in relation to four LCAs;
 - major adverse visual effects on views from one residential viewpoint location;
 - major adverse visual effects on views from five recreational viewpoint locations;
 - moderate adverse visual effects on views from eight residential viewpoint locations;
 - moderate adverse visual effects on views from 11 recreational viewpoint locations; and
 - moderate adverse visual effects on views from two transport viewpoint locations.

Monitoring

- 11.5.11 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 11.5.12 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area (LA10). The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.
- 12.1.2 Engagement with Bolsover District Council (BDC) and North East District Derbyshire District Council (NEDDC) 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.
- 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: LA10 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)¹²³.
- 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. Businesses may experience significant isolation effects as a result of the Proposed Scheme. Likely significant isolation effects 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 Tibshelf to Shuttlewood area. It lies within the administrative areas of BDC and NEDDC. In addition, the area includes small parts of two further administrative areas – Ashfield District Council and Chesterfield District Council, where the effects are considered to be marginal in relation to the local economies concerned and are therefore not reported in this

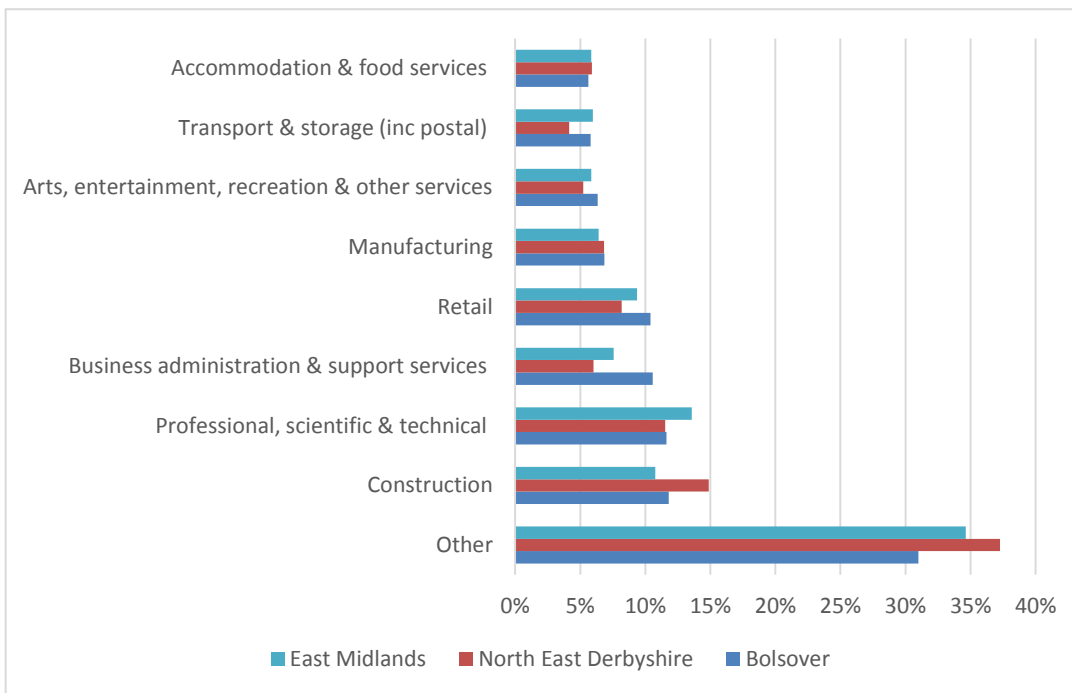
¹²³ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

baseline analysis. It also falls wholly within both the Sheffield City Region Local Enterprise Partnership (LEP) area¹²⁴; D2N2 Local Enterprise Partnership¹²⁵ and East Midlands region.

Business and labour market

12.3.2 Within the Tibshelf to Shuttlewood area, socio economic impacts are likely to fall across the local economies covered by two administrative areas – BDC and NEDDC. Within the BDC area, construction accounts for the largest proportion of businesses (12%) with professional, scientific and technical (12%) and business administration and support services (11%) sectors also accounting for relatively large numbers of businesses. In the NEDDC area, the construction sector accounts for the largest proportion of businesses (15%) with professional, scientific and technical (12%) and agriculture, forestry and fishing (9%) sectors also accounting for large proportions. This is shown below in Figure 8. For comparison, within the East Midlands region¹²⁶, professional, scientific and technical sector (14%) accounts for the largest number of businesses with construction (11%) and retail (9%) accounting for relatively large numbers of businesses.

Figure 8: Business sector composition in BDC and NEDDC areas and the East Midlands region ¹²⁷



¹²⁴ Sheffield City Region (2014) *Strategic Economic Plan Summary*. Available online at: <https://sheffieldcityregion.org.uk/wp-content/uploads/2018/01/Strategic-Economic-Plan-2015-2025.pdf>

¹²⁵ D2N2, (2014), *Strategic Economic Plan*. Available online at: http://www.d2n2lep.org/write/Documents/D2N2_SEP_March_31st.pdf

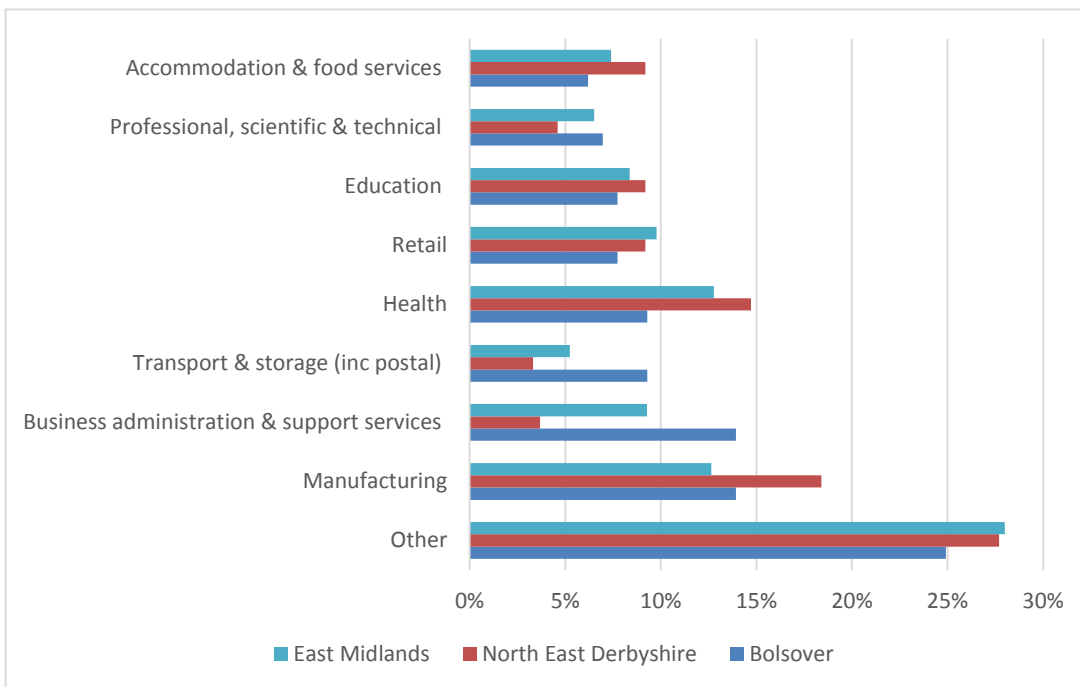
¹²⁶ Office for National Statistics (ONS), *UK Business count – Local Units 2017*. Available online at: <https://www.nomisweb.co.uk>

¹²⁷ "Other" includes: Health; Motor trades; Property; Agriculture, forestry and fishing; Wholesale; Education; Information and communication; Financial and insurance; Public administration and defence; and Mining, quarrying and utilities

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12.3.3 In 2016¹²⁸, approximately 33,000 people worked in the BDC area and 28,000 in the NEDDC 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 BDC were: manufacturing (14%); business administration and support services (14%); transport and storage (including postal) (9%); health (9%); and retail (8%). In the NEDDC area, the top five sectors were: manufacturing (18%); health (15%); construction (9%); retail (9%); and accommodation and food services (9%). These compare with the top five sectors for the East Midlands region, which were: health (13%); manufacturing (13%); retail (10%); business administration and support services (9%); and education (8%). This is shown in Figure 9¹²⁹.

Figure 9: Employment by industrial sector in the BDC and NEDDC areas and the East Midlands region¹³⁰



12.3.4 According to the Annual Population Survey (2016)¹³¹, the employment rate¹³² within the BDC area was 75% (36,600 people) and within the NEDDC area the rate was 77% (45,100). These rates compare with recorded rates for the East Midlands (75%) and England (74%) respectively. In 2016, unemployment¹³³ in the BDC area was 4% and

¹²⁸ Office for National Statistics; 2016; Business Register and Employment Survey; <http://www.nomisweb.co.uk> - This number includes both residents and non-residents of BDC and NEDDC who work within their boundaries.

¹²⁹ Office for National Statistics, (2015), *Business Register and Employment Survey*. Available online at <http://www.nomisweb.co.uk> - This number includes both residents and non-residents of BDC and NEDDC who work within their boundaries.

¹³⁰ "Other" includes: Construction; Wholesale; Arts, entertainment, recreation and other services; Public administration and defence; Information and communication; Motor trades; Mining, quarrying and utilities; Property; Financial and insurance and Agriculture, forestry and fishing.

¹³¹ Office for National Statistics (ONS), (2016), *Annual Population Survey*. Available online at: <http://www.nomisweb.co.uk>

¹³² The proportion of working age (16-64 year olds) residents that is in employment.

¹³³ 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.

NEDDC areas was also 4%. These rates compare with the East Midlands region (4%) and England (5%).

- 12.3.5 According to the Annual Population Survey (2016)¹³⁴, 22% of BDC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the East Midlands region and 38% in England, while 8% of residents had no qualifications, which was the same as both for the East Midlands and England. In the NEDDC area, 32% of residents aged 16-64 were qualified to NVQ4 and above, with 5% of its residents having no qualifications.

Property

- 12.3.6 A review of employment land in 2018 identified a supply for 68ha of employment land in the BDC¹³⁵ area compared to an employment land target of 80 to 100ha to meet local needs. According to the latest update of the BDC employment land review, this is considered sufficient to enable the Council to meet their employment targets. A review in 2017 identified an available supply of 91ha¹³⁶ against a need for 28 - 41ha¹³⁷ identified in the NEDDC area.
- 12.3.7 The average vacancy rate for industrial and warehousing property in the BDC area has been assessed as 4% based on marketed space against known stock¹³⁸. The NEDDC area had an equivalent vacancy rate of 6%.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The draft Code of Construction Practice (CoCP)¹³⁹ 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 (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
 - site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road

¹³⁴ Office for National Statistics (ONS), (2016), *Annual Population Survey*. Available online at: <http://www.nomisweb.co.uk>

¹³⁵ Bolsover District Council, (2018), *Employment and Land Availability Assessment*. Available online at: http://www.bolsover.gov.uk/images/LIVE/P/Plan_EB_EmplAAreport_1803.pdf

¹³⁶ North East Derbyshire District Council, (2017), *Employment Sites Study*. Available online at: <https://www.ne-derbyshire.gov.uk/images/Repository/IN/North-East-Derbyshire-Employment-Sites-Study.pdf>

¹³⁷ North East Derbyshire District Council, (2017), *Employment Land Review Update*. Available online at: <https://www.ne-derbyshire.gov.uk/images/Repository/E/ELR-Update-08.17.pdf>

¹³⁸ 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).

¹³⁹ Supporting document: Draft Code of Construction Practice

vehicles, including goods vehicles (Section 14);

- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14); and
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 15).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, both will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

In-combination effects

12.4.3 Businesses within the Tibshelf to Shuttlewood area may experience air quality, noise and vibration or construction traffic impacts as a result of construction of the Proposed Scheme. Taken in combination, the residual effects from these other topic assessments may amount to a significant change in the environment. In-combination effects will be reported in the formal ES.

Isolation

12.4.4 Non-agricultural businesses may experience significant isolation effects on non-agricultural businesses as a result of the Proposed Scheme in the Tibshelf to Shuttlewood area. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 It is currently expected that there would be one main construction compound (Heath South cutting) and nine satellite compounds in the Tibshelf to Shuttlewood area. These sites would result in the creation of up to 2,550 person years of construction employment opportunities¹⁴⁰, broadly equivalent to 260 full-time jobs¹⁴¹, 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

¹⁴⁰ 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.

¹⁴¹ Based on the convention that 10 employment years is equivalent to one full time equivalent job.

the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

- 12.4.6 Direct construction employment could also lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).
- 12.4.7 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

- 12.4.8 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.
- 12.4.9 Sixteen business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 16 units or sites, together, form four defined resources comprising:
- Saw Pit Lane Industrial Estate (ten units engaged in the manufacture of plastic products, manufacture of fabricated metal products; tour operator activities; maintenance and repair of motor vehicles; other construction installation; renting and leasing of machinery equipment and tangible goods; product sales and distribution and logistics; garage services; engineering services; and a building materials store);
 - Heath (four units engaged in the provision of police services, motorway maintenance and an ambulance depot);
 - Bolsover Business Park (one unit engaged in the wholesale of wood, construction materials and sanitary equipment); and
 - Woodthorpe (one unit engaged in non-agricultural services located in a farm).
- 12.4.10 Of the four defined resources, only one of the resources is expected to experience direct impacts leading to potentially significant effects on business activities and employment. Table 33 sets out the resource which could potentially experience significant direct effects.

Table 33: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Saw Pit Lane Industrial Estate	Ten units engaged in the manufacture of plastic products, manufacture of fabricated metal products; tour operator activities; maintenance and repair of motor vehicles; other construction installation; renting and leasing of machinery equipment and tangible goods; product sales and distribution and logistics; garage services; engineering services; and a building materials store.

Impact magnitude

- 12.4.11 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

- 12.4.12 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

- 12.4.13 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resultant effects would be as set out in Table 34.

Table 34: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Saw Pit Lane Industrial Estate	High	Moderate	Major adverse - significant

- 12.4.14 The construction of the Tibshelf cutting would require the demolition of businesses located in the western part of the Saw Pit Lane Industrial Estate and the acquisition of employment land. Ten business units would experience direct impacts as a result of the Proposed Scheme. This constitutes a loss of employment important for the local community. Engagement with some of the largest businesses impacted revealed that they would prefer to stay in the local area, although relocation could also bring new business opportunities. The effect on this resource and its employees is assessed to be major adverse and would, therefore, be significant.
- 12.4.15 Across all of the employment areas reviewed, it is currently expected that an estimated 250 jobs¹⁴² would either be displaced or possibly lost within the Tibshelf to Shuttlewood 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 areas¹⁴³ 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 loss and/or relocation of jobs is considered to be relatively modest in the

¹⁴² 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.

¹⁴³ A Travel to Work Area or TTWA is a statistical tool used by UK Government agencies and local authorities, especially by the Department for Work and Pensions and Jobcentres, to indicate an area where the population would generally commute to a larger town, city or conurbation for the purposes of employment.

context of the total number of people employed in the District authority (approximately 33,000 jobs in BDC and 28,000 in NEDDC) and the scale of economic activity and opportunity in the area.

- 12.4.16 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

- 12.4.17 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.
- 12.4.18 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

- 12.4.19 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 expected 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 are proposed in relation to business resources during operation of the Proposed Scheme.

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 Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood 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 areas¹⁴⁴; and
 - 'non-residential receptors'¹⁴⁵ such as:
 - community facilities including schools, hospitals, places of worship and 'quiet areas'¹⁴⁶; 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 policy¹⁴⁷, planning policy, planning practice guidance on noise (PPGN)¹⁴⁸ and EIA Regulations as described in the Scope and Methodology Report¹⁴⁹ (SMR).
- 13.1.3 Engagement has been undertaken with Derbyshire County Council (DCC), Bolsover District Council (BDC) and North East Derbyshire District Council (NEDDC) 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 Tibshelf to Shuttlewood area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and / or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: LA10 Map Book. Map series SV-01

¹⁴⁴ '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.

¹⁴⁵ 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.

¹⁴⁶ '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.

¹⁴⁷ Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)

¹⁴⁸ Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: <https://www.gov.uk/guidance/noise--2>

¹⁴⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 a 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 area is characterised by a mix of towns, villages, hamlets and isolated residential properties in a predominantly semi-rural setting. The sound environment is generally dominated by local and distant road traffic and local neighbourhood sources, with contributing natural and agricultural sounds.
- 13.3.3 There are several main roads within the Tibshelf to Shuttlewood area that contribute to the sound environment, including: the M1, which runs broadly parallel to the route of the Proposed Scheme for much of this area; the A617, which connects Chesterfield and Mansfield to the M1 Junction 29; the A6175, which connects Danesmoor with the

M1 junction 29; and the A632, which connects Chesterfield and Bolsover with the M1 junction 29A.

- 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 Agglomerations¹⁵⁰, Roads¹⁵¹ or Railways¹⁵². HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA10 Map Book) shows any noise Important Areas in the Tibshelf to Shuttlewood 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)¹⁵³. 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 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

- 13.4.3 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP¹⁵⁴ (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

¹⁵⁰ Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs

¹⁵¹ Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs

¹⁵² Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs

¹⁵³ Supporting document: Draft Code of Construction Practice

¹⁵⁴ Additional Documents: HS2 Phase 2b: Crewe to Manchester and West Midlands to Leeds Environmental Impact Assessment, Draft Code of Construction Practice

neighbouring residential properties and other sensitive receptors¹⁵⁵.

- As part of BPM, mitigation measures are applied in the following order:
 - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
 - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
 - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- Lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- Contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities.
- Contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.4 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.

13.4.5 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

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed

¹⁵⁵ Including local businesses and quiet areas designated by the local authority.

Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA10 Map Book):

- Tibshelf, arising from construction activities such as demolition, road realignment, cut and cover tunnel construction, cutting formation, balancing pond construction and landscape bund construction;
- Stainsby, arising from construction activities such as cutting formation, embankment formation, viaduct construction, balancing pond construction and landscape bund construction;
- Doe Lea, arising from construction activities such as cutting formation, ecological pond construction, balancing pond construction and landscape bund construction;
- Heath, arising from construction activities such as demolition, use of transfer nodes, cutting formation, road realignment and landscape bund construction;
- Carr Vale, arising from construction activities such as balancing pond construction and embankment formation;
- Shuttlewood, arising from construction activities such as demolition, cutting formation, road realignment, balancing pond construction and landscape bund construction;
- Poolsbrook, arising from construction activities such as embankment formation and landscape bund construction; and
- Staveley, arising from construction activities such as cutting formation, balancing pond construction, IMD formation, use of transfer node, and landscape bund construction.

13.4.7 Map Series SV01 (Volume 2: LA10 Map Book) shows key non-residential properties that have been identified within the study area. Of these, all Saints church in Heath is likely to experience significant effects (to be confirmed in the formal ES).

13.4.8 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.

13.4.9 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- the B6014 Mansfield Road/High Street between the B6025 Alfreton Road in the Stonebroom to Clay Cross area (LA09) and Wharf Lane;
- the B6039 Chesterfield Road/Tibshelf Road between the B6014 Mansfield Road/High Street and the A6175 Heath Road/Williamthorpe Road;
- Deep Lane between Hardstoft and Stanley Lane;
- Mill Lane between Stainsby and A6175 Heath Road;

- Palterton Lane, Sutton Lane, between Proposed Scheme on Palterton Lane and A632 Chesterfield Road roundabout with Sutton Lane;
- B6418 Chesterfield Road/Buttermilk Lane between the A6192 Markham Lane and the southern fringe of Shuttlewood; and
- Woodhouse Lane between A632 Station Road and Shuttlewood viaduct.

13.4.10 The magnitude and extent of effect will depend on the level of construction traffic using the road. Any residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.11 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

13.4.12 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary indirect effects from construction traffic.

13.4.13 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. Any likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

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 Tibshelf to Shuttlewood area.

13.5.2 Passenger services would 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 would progressively increase to nine trains per hour in each direction on the main lines with an operating speed of 330kph for 90% of services and 360kph for 10% of services. This number of services is assumed would operate every hour from 07:00 to 21:00. The number of services would progressively decrease after 21:00 and the last service would arrive at terminal stations by midnight. Further information is presented in Volume 1, Section 4.

Local assumptions – Staveley Infrastructure Maintenance Depot (IMD)

- 13.5.3 Whilst within the Staveley to Poolsbrook area, the Staveley IMD, located in the Staveley to Aston area (LA11) would affect residents in LA10. The Staveley IMD would operate 24 hours a day, 7 days a week. The majority of the activities that produce the highest noise levels would occur during the daytime, when the inspection and maintenance trains would be maintained and prepared. In general, it is expected that maintenance materials would be received during the day. However, it is possible that deliveries of maintenance materials could occur by road or rail at any time of the day or night.
- 13.5.4 Where appropriate, consideration of the potential increase in operational airborne noise generated by the train operating on the curves with tighter radius than is typical for a high speed railway shall be included in the formal ES.
- 13.5.5 As soon as possible after the close of passenger service, inspection trains would depart from the Staveley IMD travelling the length of the eastern leg of the Proposed Scheme whilst inspecting the railway infrastructure and equipment. After the departure of inspection trains, trains required for any planned maintenance would depart from the Staveley IMD to travel to the required maintenance location.
- 13.5.6 Trains required for urgent, unplanned maintenance identified by an inspection would depart from the Staveley IMD when required. Inspection and maintenance trains would return to the Staveley IMD before the start of passenger services.

Avoidance and mitigation measures

- 13.5.7 The development of the Proposed Scheme alignment has sought to reduce noise impact as far as reasonably practicable.
- 13.5.8 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1, Section 9.

Airborne noise

- 13.5.9 Through the procurement process for the trains and the track, the use of proven international technology would enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise would be provided in the formal ES. This would include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards¹⁵⁶.
- 13.5.10 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

¹⁵⁶ Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014

available information are shown on Map Series SV-01 (Volume 2: LA10 Map Book) and described in Section 2.2.

- 13.5.11 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier alone because the crest of the earthwork would be further than 5m from the outer rail.
- 13.5.12 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.
- 13.5.13 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 where¹⁵⁷ 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 Europe¹⁵⁸ or the maximum noise level criteria¹⁵⁹ 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.

Ground-borne noise and vibration

- 13.5.14 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

- 13.5.15 Map Series SV-01 (Volume 2: LA10 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 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.
- 13.5.16 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

¹⁵⁷ Following Government's National Planning Practice Guidance. Available online at: <https://www.gov.uk/government/collections/planning-practice-guidance>

¹⁵⁸ World Health Organization (2010), *Night time Noise Guidelines for Europe*.

¹⁵⁹ Dependent on the number of train passes.

brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

- 13.5.17 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.
- 13.5.18 Likely significant airborne noise effects arising from permanent changes to existing roads, will be reported in the formal ES.
- 13.5.19 Likely significant noise or vibration effects arising from the operation of the Staveley IMD will be reported in the formal ES.

Other mitigation measures

- 13.5.20 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

- 13.5.21 Mitigation, including noise barriers, described in Volume 1, Section 9, section 2.2 and presented in Map Series SV-01 (Volume 2: LA10 Map Book) and Map Series CT-06 (Volume 2: LA10 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.
- 13.5.22 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:
- Carr Vale: occupants of residential properties on Sutton Hall Road, Pearson Gardens, Charlesworth Street and North View Street, located closest to the Proposed Scheme, identified by LA10-Co1 on Map SV-01-379;
 - Bolsover Woodhouse: occupants of residential properties on Chesterfield Road, located closest to the Proposed Scheme, identified by LA10-Co2 on Map SV-01-380a; and
 - Shuttlewood: occupants of residential properties on B6418, B6419, Chesterfield Road, Adin Avenue and Pretoria Street, located closest to the Proposed Scheme, identified by LA10-Co3 on Map SV-01-380a.
- 13.5.23 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:
- Stainsby in the vicinity of Hawking Lane (identified on Map SV-01-378 in Volume 2: LA10 Map Book);

- Deepdale Farm in the vicinity of Palterton Lane (identified on Map SV-01-379 in Volume 2: LA10 Map Book);
- Bolsover in the vicinity of the A632 Chesterfield Road (identified on Map SV-01-379 in Volume 2: LA10 Map Book);
- Shuttlewood in the vicinity of the B6418 Buttermilk Lane / Chesterfield Road (identified on Map SV-01-380a in Volume 2: LA10 Map Book);
- Woodside Farm in the vicinity of Woodthorpe Road (identified on Map SV-01-380a in Volume 2: LA10 Map Book); and
- Lodge Farm in the vicinity of Woodthorpe Road (identified on Map SV-01-380a in Volume 2: LA10 Map Book).

13.5.24 The initial assessment indicates that there are no significant effects identified at any non-residential receptors in the Tibshelf to Shuttlewood area as a result of operational noise.

13.5.25 Further assessment work is being undertaken to identify operational sound and vibration significant effects. This will be reported in the formal ES.

13.5.26 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

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

13.5.28 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.

13.5.29 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 Tibshelf to Shuttlewood area.
- 14.1.2 Engagement with Highways England, Derbyshire County Council (DCC) and Sheffield City Region (SCR) 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: LA10 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)¹⁶⁰.
- 14.2.2 The study area for traffic and transport includes: Tibshelf; Hardstoft; Astwith; Stainsby; North Wingfield; Holmewood; Doe Lea; Heath; Sutton Scarsdale; Bolsover; Arkwright Town; Duckmanton; Poolsbrook; and Shuttlewood.
- 14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including the M1, which is the only strategic route in the Tibshelf to Shuttlewood area. It also includes the following local roads: the A617/Mansfield Road; the A619 Duke Street/Market Street/Chesterfield Road; the A632 Chesterfield Road/Station Road; the A6175 Heath Road/Williamthorpe Road/St Lawrence Road; the A6192 Markham Lane/Erin Road; the B6014 Mansfield Road/High Street; the B6039 Chesterfield Road/Tibshelf Road; the B6418 Chesterfield Road/Buttermilk Lane; the B6419 Bolsover Road; the B6425 Hassocky Lane; Deep Lane; Hardstoft Road; Astwith Lane; Station Road; Hawking Lane; Mill Lane (near Stainsby); Church Lane; Mansfield Road; Palterton Lane; Sutton Lane; Woodhouse Lane; Mill Lane (near Shuttlewood) and Troughbrook Road.
- 14.2.4 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.
- 14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

¹⁶⁰ 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, DCC and SCR (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 and DCC. Assessment of the data indicates that the peak hours in the area are 07:45-08:45 and 16:15-17:15. However, there are only small differences (2% to 6%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, which are the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 periods have been used as the assessment hours representing a reasonable worst case.
- 14.3.3 PRoW surveys were undertaken in July and August 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 M1 is the only strategic route which passes through the area. The strategic road network, around M1 junctions 29 and 29a, 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 A617/ Mansfield Road; the A619 Duke Street/Market Street/Chesterfield Road; the A632 Chesterfield Road/Station Road; the A6175 Heath Road/Williamthorpe Road/St Lawrence Road; the A6192 Markham Lane/Erin Road; the B6014 Mansfield Road/High Street; the B6039 Chesterfield Road/Tibshelf Road; the B6418 Chesterfield Road/Buttermilk Lane; the B6419 Bolsover Road; the B6425 Hassocky Lane; Astwith Lane; Church Lane; Deep Lane; Hardstoft Road; Hawking Lane; Mansfield Road; Mill Lane (near Shuttlewood); Mill Lane (near Stainsby); Palterton Lane; Station Road; Sutton Lane; Troughbrook Road; and Woodhouse Lane. The local road network, in particular the routes connecting with the M1 at junctions 29 and 29a are busy at peak times. The remainder of the local road network generally operates well although some localised delays can be experienced.

- 14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport¹⁶¹. Data for the three-year period (December 2014 to December 2017) 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 One accident cluster was identified within the Tibshelf to Shuttlewood area, at the M1 junction 29 (29 accidents, including one with serious casualties).
- 14.3.8 The route of the Proposed Scheme would cross three roads with footways within the Tibshelf to Shuttlewood area. These are: the A632 Chesterfield Road; the B6014 Mansfield Road; and the B6418 Chesterfield Road. In addition, the B6419 Bolsover Road, Deep Lane, Astwith Lane, Hawking Lane, Mill Lane, Palterton Lane and Woodhouse Lane have no footways, but were observed to be used by pedestrians.

Parking and loading

- 14.3.9 There is no parking or loading identified in the Tibshelf to Shuttlewood area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

- 14.3.10 Six bus routes operate on four roads that are crossed by the route of the Proposed Scheme in the Tibshelf to Shuttlewood area. There are also bus stops primarily located to serve the main built up areas. The bus routes that could be affected by the Proposed Scheme include:
- the B6014 Mansfield Road: Bus service 1 (Alfreton - Newton - Tibshelf - Sutton – Mansfield), SP1 (Chesterfield - Clay Cross - Tibshelf – Sutton);
 - the A6175 Heath Road/A617 Mansfield Road: Bus service 49 (Clay Cross - Holmewood - Glapwell – Bolsover);
 - the A632 Chesterfield Road: Bus service 82 (Chesterfield - Duckmanton - Bolsover - Hillstown – Langwith), 83 (Chesterfield - New Bolsover - Bolsover – Hillstown); and
 - the B6419 Bolsover Road: Bus service 81 (Bolsover - Staveley - Markham Vale).
- 14.3.11 National and local rail services are accessible via Chesterfield Station and local rail services are accessible via Mansfield Woodhouse Station, Shirebrook Station and Langwith-Whaley Thorns Station. Chesterfield Station provides access to national services to London, Sheffield, Birmingham, Newcastle, Plymouth, Edinburgh/Glasgow, Nottingham and Liverpool. Mansfield Woodhouse Station, Shirebrook Station and Langwith-Whaley Thorns Station provide access to local services to Worksop, Mansfield and Nottingham.

¹⁶¹ Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

Non-motorised users

- 14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Tibshelf, North Wingfield, Holmewood, Doe Lea, Heath, Arkwright Town, Bolsover, Duckmanton, Poolsbrook and Shuttlewood. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.
- 14.3.13 The route of the Proposed Scheme would cross the route of 20 PRoW within the Tibshelf to Shuttlewood 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 surveys undertaken to date to inform the assessment showed that there were fewer than 10 people a day recorded on 13 of the PRoW. The routes with the greatest usage during the survey day were: the B6014 Mansfield Road used by 52 pedestrians and 11 cyclists; Mill Lane (near Stainsby) used by three pedestrians and 47 cyclists; and the M1 junction 29 subway used by 15 pedestrians and 30 cyclists.
- 14.3.14 In the Tibshelf to Shuttlewood area, a section of National Route 67 (part of the National Cycle Network) follows the 'the Five Pits Trail' (which is part of DCC's Phoenix Greenways network), passing through the area to the west of the route of the Proposed Scheme and connecting Tibshelf to Holmewood, forming the 'Holmewood Loop'. These are off-road routes. To the east of the route of the Proposed Scheme the 'Stockley Trail', which is an off-road route, connects the A632 Chesterfield Road to the A617 Mansfield Road. Further off-road routes are located in the north of the Tibshelf to Shuttlewood area where the Trans Pennine Trail runs between Staveley and Chesterfield, where it connects into National Route 67.

Waterways and canals

- 14.3.15 There are no navigable waterways in the Tibshelf to Shuttlewood area. Consequently, this topic is not considered further in this assessment.

Air transport

- 14.3.16 There is no relevant air transport in the Tibshelf to Shuttlewood area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

- 14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:
- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
 - the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;

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- 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)¹⁶² 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

¹⁶² Supporting document: Draft Code of Construction Practice

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 08:00-18:00 on weekdays and 08:00-13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.
- 14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans¹⁶³ to be produced and implemented by all contractors that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

Assessment of impacts and effects

Temporary effects

- 14.4.7 The traffic and transport impacts during the construction period within the Tibshelf to Shuttlewood area are likely to include:
- construction vehicle movements to and from the various construction compounds;
 - road closures and associated realignments and diversions; and
 - alternative routes for PRow.
- 14.4.8 The construction assessment has also considered any impacts in the Tibshelf to Shuttlewood area that arise from construction of the Proposed Scheme in the adjoining community areas.
- 14.4.9 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.
- 14.4.10 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: LA10 Map Book.

Strategic and local road network traffic

- 14.4.11 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

¹⁶³ 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.

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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 junctions 29 and 29a;
- the A617/Mansfield Road between the M1 junction 29 and the B6425 Hassocky Lane;
- the A619 Duke Street/Market Street/Chesterfield Road between Troughbrook Road and the A619 Lowgates in the Staveley to Aston area;
- the A632 Chesterfield Road/Station Road between Sutton Lane and Woodhouse Lane;
- the A6175 Heath Road/Williamthorpe Road/St Lawrence Road between the M1 junction 29 and the A6175 Market Street in the Stonebroom to Clay Cross area;
- the A6192 Markham Lane/Erin Road between the B6418 Buttermilk Lane and the A619 Lowgates in the Staveley to Aston area;
- the B6014 Mansfield Road/High Street between the B6025 Alfreton Road in the Stonebroom to Clay Cross area and Wharf Lane;
- the B6039 Chesterfield Road/Tibshelf Road between the B6014 Mansfield Road/High Street and the A6175 Heath Road/Williamthorpe Road;
- the B6418 Chesterfield Road/Buttermilk Lane between the A6192 Markham Lane and the southern fringe of Shuttlewood;
- the B6419 Bolsover Road between the M1 in the Staveley to Aston area and Mill Lane (near Shuttlewood);
- the B6425 Hassocky Lane between the A617 westbound off-slip and the A617 eastbound on-slip;
- Deep Lane;
- Hawking Lane;
- Hardstoft Road;
- Station Road;
- Mill Lane (near Stainsby);
- Mansfield Road;
- Sutton Lane;
- Palterton Lane between Sutton Lane and the Stockley Trail;
- Woodhouse Lane;
- Mill Lane (near Shuttlewood); and
- Troughbrook Road.

- 14.4.12 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. These are expected to include:
- local realignment of the M1 between junctions 28 and 29, and junctions 29 and 29a;
 - local realignment of the A617 at the M1 junction 29;
 - local realignment of the A6175 Heath Road at the M1 junction 29;
 - the B6014 Mansfield Road between the B6039 Chesterfield Road and Chesterfield Road;
 - local realignment of the B6419 Bolsover Road between Mill Lane (near Shuttlewood) and the M1 in the Staveley to Aston area;
 - local realignment of Deep Lane between The Green and Hawking Lane;
 - closure of Astwith Lane on approach to the junction with Hawking Lane, with local diversion routes available; and
 - closure of Woodhouse Lane between the B6418 Buttermilk Lane and Blind Lane, with local diversion routes available.
- 14.4.13 Permanent changes to highways are reported under operation.
- 14.4.14 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.
- 14.4.15 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

- 14.4.16 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Public transport network

- 14.4.17 It is expected that construction of the Proposed Scheme would require temporary bus route diversions, including bus routes 1, SP1, 49, and 81. This could result in increased journey times and the need to relocate bus stops. In addition, bus routes could be affected where they run on proposed construction routes. Any consequent effects will be reported in the formal ES.

Non-motorised users

- 14.4.18 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.

14.4.19 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 or realigned:

- Tibshelf Footpath 46 (near southbound Tibshelf motorway services area);
- Tibshelf Footpath 35 (off the B6014 Mansfield Road near The Hurst);
- Tibshelf Footpath 33 (near Hawthorne Avenue);
- Tibshelf Footpath 32 (near Biggin Lane);
- Ault Hucknall Footpath 18 (near Hawking Lane, Hardstoft);
- Ault Hucknall Footpath 17 (near Hawking Lane, Astwith);
- Ault Hucknall Footpath 16 (north of Astwith Lane);
- Heath and Holmewood Footpath 14 (south of Palterton Lane near Owlcotes);
- Sutton cum Duckmanton Footpath 19 (north of Palterton Lane near The Goit);
- Sutton cum Duckmanton Footpath 18 (between The Goit and the A632 Chesterfield Road);
- Bolsover Footpath 34 (near the B6418 Chesterfield Road, Shuttlewood);
- Bolsover Footpath 27 (near the B6418 Chesterfield Road, Shuttlewood); and
- Bolsover Footpath 35 (near Woodside Farm, Shuttlewood).

14.4.20 Permanently diverted PRoW are reported under effects arising from operation, although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.21 The changes to PRoW are likely to result in some increases in travel distance with the potential for significant adverse effects. The assessment of these will be reported in the formal ES.

Permanent effects

14.4.22 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

14.4.23 The implementation of the measures in the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

- 14.4.24 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

- 14.4.25 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; the A617/ Mansfield Road; the A619 Duke Street/Market Street/Chesterfield Road; the A632 Chesterfield Road/Station Road; the A6175 Heath Road/Williamthorpe Road/St Lawrence Road; the A6192 Markham Lane/Erin Road; the B6014 Mansfield Road/High Street; the B6039 Chesterfield Road/Tibshelf Road; the B6418 Chesterfield Road/Buttermilk Lane; the B6419 Bolsover Road; the B6425 Hassocky Lane; Deep Lane; Hawking Lane; Hardstoft Road; Astwith Lane; Station Road; Mill Lane (near Stainsby); Mansfield Road; Sutton Lane; Palterton Lane; Woodhouse Lane; Mill Lane (near Shuttlewood) and Troughbrook 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 changes in accident risk.
- 14.4.26 Construction of the Proposed Scheme is also likely to result the temporary closures and diversions or realignments of the following: the M1; the A617; the A6175 Heath Road; the B6014 Mansfield Road; the B6419 Bolsover Road; Deep Lane; Astwith Lane; and Woodhouse Lane.
- 14.4.27 Construction of the Proposed Scheme would require bus route diversions, including: bus routes 1, 49 and 81
- 14.4.28 Construction of the Proposed Scheme would require the temporary closure or diversion/realignment of PRow, including: Tibshelf Footpath 46, Tibshelf Footpath 35, Tibshelf Footpath 33, Tibshelf Footpath 32, Ault Hucknall Footpath 18, Ault Hucknall Footpath 17, Ault Hucknall Footpath 16, Sutton cum Duckmanton Footpath 14, Sutton cum Duckmanton Footpath 19, Sutton cum Duckmanton Footpath 18, Bolsover Footpath 34, Bolsover Footpath 27, and Bolsover Footpath 35.
- 14.4.29 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:
- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
 - replacement, diversion or realignment of PRow.

Assessment of impacts and effects

- 14.5.2 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 operational transport issues

- 14.5.3 The Proposed Scheme would have beneficial effects for rail passengers including increased rail capacity on the Proposed Scheme and associated substantial reductions in journey times between Chesterfield, the Midlands and London.
- 14.5.4 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Tibshelf to Shuttlewood area. The Staveley Infrastructure Maintenance Depot is located a short distance to the north in the Staveley to Aston area, but the maintenance of the Proposed Scheme would generate limited vehicular trips and the effect in the Tibshelf to Shuttlewood area would not be significant.
- 14.5.5 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

- 14.5.6 The Proposed Scheme would result in a number of permanent highway changes. These include:
- Hawking Lane would be permanently diverted where it crosses the Proposed Scheme, reconnecting Deep Lane with a modified Astwith Lane and the northern retained section of Hawking Lane;
 - Mill Lane (near Stainsby) would be permanently closed between the A6175 Heath Road and the eastern spur of Mill Lane which passes under the M1. Mill Lane would be to connect into Mansfield Road to the north, east of the M1;
 - junction 29 of the M1 including the A6175 Heath Road and A617 approaches would be modified in order to accommodate the Proposed Scheme;
 - the eastern end of Church Lane in Heath would be permanently closed;
 - the northbound carriageway of the M1 (north of junction 29) near Sutton Scarsdale would be realigned;
 - the A632 Chesterfield Road would be permanently realigned to the north. The new alignment would maintain access to existing properties; and
 - Woodhouse Lane and the B6418 Chesterfield Road would be permanently realigned, with a new junction provided to reconnect the roads.
- 14.5.7 The permanent highway changes are not expected to result in significant changes in travel distances with the exception of Hawking Lane and Mill Lane. In addition, the changes to travel patterns as a result of people travelling to Chesterfield station and the Staveley Infrastructure Maintenance Depot are not expected to lead to significant effects in the Tibshelf to Shuttlewood area. The effects of these changes will be reported in the formal ES.

Accidents and safety

- 14.5.8 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Public transport network

- 14.5.9 It is expected that the Proposed Scheme would generate significant beneficial effects for rail passengers that use Chesterfield Station, as a result of:

- the increase in rail capacity at Chesterfield Station and from the introduction of HS2 services; and
- significantly improved journey times between Chesterfield, the Midlands and the south of England, as detailed in Volume 1, Section 4.

- 14.5.10 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 Tibshelf to Shuttlewood area.

Non-motorised users

- 14.5.11 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Tibshelf Footpath 46 would be diverted to the west and would reconnect with Newtonwood Lane to the south;
- Tibshelf Bridleway 21 (Saw Pit Lane) would be permanently diverted to the west, with a new junction provided onto the B6014 Mansfield Road;
- Tibshelf Footpath 35 would be diverted to the east and would reconnect to the B6014 Mansfield Road at its southern extent;
- Tibshelf Footpath 33 would be realigned to the south and east, and over the Tibshelf Footpath 33 overbridge;
- Tibshelf Footpath 32 would be diverted to the south, via the realignment of Tibshelf Footpath 33 and over the Tibshelf Footpath 33 overbridge;
- Tibshelf Bridleway 31 and Ault Hucknall Bridleway 35 would be diverted to the west before reconnecting to Deep Lane;
- Ault Hucknall Footpaths 17 and 18 would be diverted to the south onto Deep Lane and the retained southern section of Hawking Lane;
- Ault Hucknall Footpath 16 would be diverted to the west of its existing alignment and would reconnect to Hawking Lane, north of Mill Lane;
- Ault Hucknall Footpath 37 would be diverted to the south where it would connect with the reinstated Mill Lane to cross the Proposed Scheme;
- Footways within Junction 29 of the M1 would be realigned via Heath and Holmewood Footpath 25 underbridge as part of the modification works at the

junction;

- Heath and Holmewood Footpath 1 would be realigned to the west, and beneath an accommodation underbridge;
- Sutton cum Duckmanton Footpath 19 would be realigned via a new accommodation underbridge;
- Sutton cum Duckmanton Footpath 18 would be diverted to the west, and would tie in with the realigned A632 Chesterfield Road;
- Bolsover Footpath 34 would be diverted to the west, with the southern end connecting into the realigned B6418 Chesterfield Road; and
- Bolsover Footpath 35 would cross the Proposed Scheme via an accommodation overbridge.

14.5.12 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increases in journey distance (likely to be in excess of an additional 500m) would affect the users of Tibshelf Footpath 32, Ault Hucknall Footpath 17 and Ault Hucknall Footpath 18. The assessment of changes to PRoW will be reported in the formal ES.

Other mitigation measures

14.5.13 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.

14.5.14 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

14.5.15 Operation of the Proposed Scheme would require the permanent diversion or realignment of sections of: Hawking Lane; Mill Lane (near Stainsby); the M1 junction 29; Church Lane; the M1 (north of junction 29); the A632 Chesterfield Road; Woodhouse Lane; and the B6418 Chesterfield Road, and the closure of sections of: Hawking Lane; Mill Lane (near Stainsby); Church Lane and the A632 Chesterfield 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 changes in accident risk.

14.5.16 It is expected that the Proposed Scheme would have beneficial effects for rail passengers including increased rail capacity on the Proposed Scheme and associated substantial reductions in journey times between Chesterfield, the Midlands and London.

14.5.17 Operation of the Proposed Scheme would require the permanent closure or diversion/realignment of 18 PRoW, including: Tibshelf Footpath 46; Saw Pit Lane; Tibshelf Bridleway 21; Tibshelf Footpath 35; Tibshelf Footpath 33; Tibshelf Footpath

32; Tibshelf Bridleway 31; Ault Hucknall Bridleway 35; Ault Hucknall Footpath 17; Ault Hucknall Footpath 18; Ault Hucknall Footpath 16; Ault Hucknall Footpath 37; Heath and Holmewood Footpath 25; Heath and Holmewood Footpath 1; Sutton-cum-Duckmanton Footpath 19; Sutton-cum-Duckmanton Footpath 18; Bolsover Footpath 34; and Bolsover Footpath 35.

- 14.5.18 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

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

- 14.5.20 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Tibshelf to Shuttlewood 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 Tibshelf to Shuttlewood area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.
- 15.1.2 Engagement has been undertaken with the Environment Agency, Canal & River Trust (CRT), North East Derbyshire District Council (NEDDC), Bolsover District Council (BDC), and Derbyshire County Council (DCC), which is the Lead Local Flood Authority (LLFA). Engagement has also been undertaken with Severn Trent Water Limited and Yorkshire Water Limited (the local water and sewerage undertakers). 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: LA10 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)¹⁶⁴.

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 Part B, Section 21 of the SMR¹⁶⁵.
- 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 of the route of the Proposed Scheme, as described in Section 2.2 of this report.

¹⁶⁴ National Planning Policy Framework, DCLG, 2015.

¹⁶⁵ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology 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 a section of River Doe Lea and two of its tributaries.
- 15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.
- 15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.
- 15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

- 15.3.1 All surface water bodies in the study area fall within the Don and Rother management catchment of the Humber river basin district (RBD).
- 15.3.2 The river basin management plan¹⁶⁶ identifies the chemical¹⁶⁷ and ecological¹⁶⁸ status of surface water bodies, and the quantitative¹⁶⁹ and chemical¹⁷⁰ 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 good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

¹⁶⁶ Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.

¹⁶⁷ The chemical status of surface waters reflects concentrations of priority and hazardous substances present.

¹⁶⁸ 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 Section 7, Ecology and biodiversity;
- 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.

¹⁶⁹ 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.

¹⁷⁰ 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.

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- 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 35. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 35: Surface water body receptors

Water body name and location ¹⁷¹	Designation	Q95 value (m ³ /s) ¹⁷²	Receptor value	Parent WFD water body name and identification number ¹⁷³	Current WFD Status/Objective ¹⁷⁴
Pond – at Tibshelf Business Park WR-36ob E4	Static water body	n/a	Low	Doe Lea from source to Hawke Brook GB104027057290	Moderate/ Moderate by 2015
Saw Pit Lane Drain 3 WR-36ob E4	Minor ditch	n/a	Low		
Saw Pit Lane Drain 2 WR-36ob E4	Minor ditch	n/a	Low		
Tributary of River Doe Lea 1 WR-01-36ob F4	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 2 WR-01-36ob F4	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 3 WR-01-36ob F5	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 4 WR-01-36ob G4	Ordinary watercourse	0.002	Moderate		
Deep Lane Drain 1 WR-01-36ob G4	Minor ditch	n/a	Low		
Deep Lane Drain 2 WR-01-36ob G4	Minor ditch	n/a	Low		
Tributary of River Doe Lea 5	Ordinary watercourse	0.2	Low		

¹⁷¹ The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA10 Map Book figure (in this case WR-01).

¹⁷² This is the flow within the watercourse that is exceeded for 95% of the time.

¹⁷³ The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

¹⁷⁴ Status and objectives are based on those set out in the 2015 River basin management plan.

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Water body name and location ¹⁷¹	Designation	Q95 value (m ³ /s) ¹⁷²	Receptor value	Parent WFD water body name and identification number ¹⁷³	Current WFD Status/Objective ¹⁷⁴
WR-01-360b H5					
Hawking Lane Drain	Minor ditch	n/a	Low		
WR-01-360b H5 & I5					
Tributary of River Doe Lea 6	Ordinary watercourse	0.005	Moderate		
WR-01-360b I5					
Tributary of River Doe Lea 7	Ordinary watercourse	0.002	Moderate		
WR-01-360b J5					
Mill Lane Drain	Minor ditch	n/a	Low		
WR-01-361a B5					
Mansfield Road Drain	Minor ditch	n/a	Low		
WR-01-361a B5					
Tributary of River Doe Lea 8	Ordinary watercourse	0.003	Low		
WR-01-361a C5					
Tributary of River Doe Lea 9	Ordinary watercourse	0.002	Low		
WR-01-361a C5					
Tributary of The Goit	Ordinary watercourse	0.003	Low		
WR-01-361a E5					
The Goit	Ordinary watercourse	0.003	Low		
WR-01-361a E5					
Tributary of River Doe Lea 10	Ordinary watercourse	0.003	Low		
WR-01-361a F6					
Tributary of River Doe Lea 11	Ordinary watercourse	<0.002	Low		
WR-01-361a F6					
Tributary of River Doe Lea 12	Ordinary watercourse	0.003	Low		
WR-01-361a F5					
River Doe Lea	Main river	0.07	High		
WR-01-361a F6					

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Water body name and location ¹⁷¹	Designation	Q95 value (m ³ /s) ¹⁷²	Receptor value	Parent WFD water body name and identification number ¹⁷³	Current WFD Status/Objective ¹⁷⁴
Tributary of River Doe Lea 13 WR-01-361a G5 & G6	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 14 - at Snipe Bog WR-01-361a G6	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 15 WR-01-361a G6	Ordinary watercourse	<0.002	Low		
Bolsover Drain WR-01-361a G6	Minor ditch	n/a	Low		
Tributary of River Doe Lea 16 WR-01-361a G6	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 17 WR-01-361a G6	Ordinary watercourse	<0.002	Low		
Tributary of River Doe Lea 18 WR-01-361a H7 & G6	Ordinary watercourse	0.002	Low		
Buttermilk Lane Drain WR-01-361a H6	Minor ditch	n/a	Low		
Tributary of River Doe Lea 19 WR-01-361a H6	Ordinary watercourse	<0.002	Low		

Abstractions and permitted discharges (surface water)

- 15.3.6 There is one licensed surface water abstraction in the study area, located outside the land required for the construction and operation of the Proposed Scheme. This is considered to be a high value receptor.
- 15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. This data indicates that there are no registered private unlicensed surface water abstractions within the study area. 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.

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15.3.8 There are 23¹⁷⁵ consented discharges to surface waters within the study area, none of which are within the land required for construction of 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 36. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 36 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 36: Summary of geology and hydrogeology in the study area

Geology ¹⁷⁶	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ¹⁷⁷	WFD status objective ¹⁷⁸	Receptor value
Superficial deposits						
Alluvium	Along the River Doe Lea and tributaries	Gravel, sand, silt and clay	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head	In the upper reaches of the Doe Lea tributaries near Hardwick Hall and Pools Brook	Diamicton	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Cadeby Formation	South of Hodmire Lane at The Grange, within the construction boundary 1km buffer	Magnesian limestone with bands of mudstone siltstone and sandstone	Principal	Derwent - Secondary Combined (GB40402G99 04,00) Poor	Good by 2027	High
Pennine Middle Coal Measures	Along the majority of the route of the Proposed Scheme. Three cycles with sandstone bands at	Mudstone, siltstone and sandstone Numerous coal seams outcrop along the	Secondary A	South of Overmoor Farm: Derwent - Secondary Combined	Both good by 2027	Moderate

¹⁷⁵ The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended where the potential for wider pathways exists.

¹⁷⁶ In recent years the British Geological Survey (BGS) 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.

¹⁷⁷ As stated in the 2015 River basin management plan.

¹⁷⁸ As stated in the 2015 River basin management plan.

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Geology ¹⁷⁶	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ¹⁷⁷	WFD status objective ¹⁷⁸	Receptor value
	the top of the sequence.	alignment (Second Ell, First Waterloo, Second Waterloo, Third Waterloo, Dunsil, High Hazles, Top Hard, Two-Foot, Clowne, Lowbright)		(GB40402G99 0400) Poor Where present along the rest of the route: Don and Rother Millstone grit and Coal Measures (GB40402G99 2300) Poor		
Pennine Lower Coal Measures	Small outcrop as part of an anticline around the Hardstoft area.	Cyclical mudstone, siltstone and sandstone. Clay Cross Soft Coal outcrops. The boundary between the Middle and Lower Pennine Coal Measures is defined as the Vanderbeckei Marine Band; a fossiliferous blue clay.	Secondary A	Don and Rother Millstone grit and Coal Measures (GB40402G99 2300) Poor	Good by 2027	Moderate

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 36, is outlined briefly as alluvium and head deposits, which are classified as Secondary A and Secondary (undifferentiated) aquifers respectively by the Environment Agency. These deposits may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of base flow to rivers. They have therefore been classified moderate value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 36 is outlined briefly as follows:

- the Cadeby Formation has been classified as a Principal aquifer by the Environment Agency. This aquifer can also provide an important component of base flow to rivers. It has therefore been assessed as a high value receptor; and

- the Pennine Lower Coal Measures and the Pennine Middle Coal Measures have been classified as a Secondary A aquifer by the Environment Agency. These aquifers are capable of supporting water supplies at a local scale, and can provide an important component of base flow to rivers. It has therefore been assessed as a moderate value receptor.

WFD status of groundwater bodies

- 15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 36. The value attributed to each of these receptors is also indicated.
- 15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

- 15.3.14 There are no groundwater abstractions licenced for public water supply in the study area. There are no source protection zones (SPZ) associated with licensed public water supplies within the study area.
- 15.3.15 There is one private groundwater abstraction licence registered in the study area. This abstraction is located 738m west of the land required for construction of the Proposed Scheme. It is registered to Alkane Water and is used for the purpose of industrial / commercial / public services.
- 15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. This data indicates that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.
- 15.3.17 There are eight¹⁷⁹ consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

Groundwater – surface water interactions

- 15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 24 features within the study area that had potential to be springs. Access was possible to inspect seven of these features, of which:
- one was verified as being minor land drainage feature of low value;

¹⁷⁹ The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended where the potential for wider pathways exists.

- one appeared to be piped into a trough which may be used for agricultural purposes, and so was also verified as a feature of low value;
- three of these springs were determined to have low value with respect to water resources, reflecting the WFD status of the watercourses these springs supply (all supply unnamed tributaries of the River Doe Lea); these are the springs north west of The Hurst, east of Park Gate Cottages and east of Harehill Wood; and
- two springs (springs east of Snipe Bog (i) and (ii)) were determined to have a high ecological value as these springs feed into a reedbed habitat (which is listed as a priority habitat under the Natural Environment and Rural Communities Act (NERC)) located on the eastern side of the River Doe Lea, north of the A632. These springs are spatially located within the extent of the made ground of Bolsover Tip but are considered to emerge from the underlying Middle Coal Measures Formation. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and Biodiversity. The remaining seventeen potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. However, none of these potential spring features are within the land required for the Proposed Scheme.

15.3.19 There are nine ponds within the land required for construction of 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

15.3.20 There are no potentially groundwater dependent nature conservation sites within the study area.

15.3.21 The following nature conservation site within the study area is potentially dependent on surface water flows, for example periodic flooding from a watercourse. The Doe Lea LNR is located 240m north-east of the land required for construction of the Proposed Scheme. It is designated for its reedbed and wet woodland.

15.3.22 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

15.3.23 The Environment Agency's Flood map for planning (rivers and sea)¹⁸⁰ 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).

¹⁸⁰ Environment Agency, *Flood map for planning*. Available online at: <https://flood-map-for-planning.service.gov.uk/>

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15.3.24 The updated Flood map for surface water¹⁸¹ 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 dataset¹⁸². The British Geological Survey's (BGS) Groundwater flooding susceptibility data set¹⁸³, has been used to assess the future risk of groundwater flooding.

15.3.25 The following reports were used to help determine the baseline flood risk within the study area:

- Chesterfield, Bolsover and North East Derbyshire Strategic Flood Risk Assessment (SFRA) (2009)¹⁸⁴;
- Derbyshire County Council and Derby City Council SFRA (2012)¹⁸⁵;
- Derbyshire County Council Local Flood Risk Management Strategy (LFRMS) (2015)¹⁸⁶; and
- Derbyshire County Council Preliminary Flood Risk Assessment for Derbyshire (PFRA) (2011)¹⁸⁷.

River flooding

15.3.26 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Doe Lea and its tributaries including The Goit. Table 37 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 37: River flood risk sources and receptors

Source	Location description and figure/coordinate ¹⁸⁸	Receptor potentially affected	Receptor value / sensitivity to flooding
Tributary of River Doe Lea 4 - at Ridlocks Wood culvert	Stanley WR-01-360b G4	Commercial property located off Stanley Lane	High
		Agricultural land south of Hardstoft	Moderate
		Stanley Lane (road designation)	Moderate
Tributary of River Doe Lea 5 - at the Cockshutt Woods drop inlet culvert	Stanley WR-01-360b H5	Miller's Pond and Great Pond	Low

¹⁸¹ Environment Agency (2018), *Long term flood risk map for England*. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

¹⁸² Environment Agency (2018), *Long term flood risk map for England*. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

¹⁸³ British Geological Survey (2017) *BGS Groundwater flooding*. Available online at: <http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html>

¹⁸⁴ Chesterfield, Bolsover and North East Derbyshire (2009) *Chesterfield, Bolsover and North East Derbyshire Strategic Flood Risk Assessment*

¹⁸⁵ Derbyshire County Council & Derby City Council (2012). *Strategic Flood Risk Assessment for Minerals and Waste Local Development Framework*.

¹⁸⁶ Derbyshire County Council (2015). *Local Flood Risk Management Strategy*

¹⁸⁷ Derbyshire County Council (2011). *Preliminary Flood Risk Assessment*.

¹⁸⁸ This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA10 Map Book figure (in this case WR-01).

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Source	Location description and figure/coordinate ¹⁸⁸	Receptor potentially affected	Receptor value / sensitivity to flooding
Tributary of River Doe Lea 6 - at Stainsby viaduct	Stainsby WR-01-360b I5	More than 10 residential properties located on Mill Lane	High
		Sewage works located on Mill Lane	Moderate
		Stainsby Mill (National Trust – Hardwick Estate)	High
Tributary of the River Doe Lea 8 & 9 - at the Owlcotes Wood culvert and associated diversion	Stockley WR-01-361a c5	Sewage works in Stockley	Very High
		Residential property	High
		Stockley Brook	Low
		Rylah Hill (road)	Moderate
		Agricultural land	Moderate
River Doe Lea and The Goit - at Bolsover South viaduct	Carr Vale and New Bolsover WR-01-361a F6	Ponds along the length of The Goit at New Bolsover	Low
River Doe Lea - at Bolsover North viaduct	Bolsover WR-01-361a F6	Snipe Bog	Low
		Commercial buildings on B6148	Moderate
		B6148 (Buttermilk Lane)	Moderate
		Sewage works on B6148	Very High

Surface water flooding

15.3.27 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 38. The value of these receptors, based on Table 57 of the SMR, is also indicated.

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Table 38: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate ¹⁸⁹	Receptor potentially affected	Receptor value
Surface water flow path at Lane End drop inlet culvert	Tibshelf WR-01-360b F4	Agricultural land	Moderate
Surface water flow path at Gildageforge culvert	Stainsby WR-01-360b I5	Agricultural land	Moderate
Surface water flow path at Owlcotes Wood culvert and associated diversion	Heath WR-01-361a C5	Commercial properties on A6175	Moderate
		A6175	Moderate
		More than five residential properties in Heath	High
		Agricultural land	Moderate
Surface water flow paths between Carr Vale culvert and Snipe Bog culvert	Carr Vale WR-01-361a E5	More than 100 residential properties and roads in Carr Vale and New Bolsover	High
		Agricultural land	Moderate
		M1	Very High
Surface water flow paths at Nether Woodhouse drop inlet culvert	Carr Vale WR-01-361a E5	Commercial properties on B6148 (Buttermilk Lane)	Moderate
		Agricultural land	Moderate
		Woodhouse Lane	Moderate
		Two residential properties in Shuttlewood	High

Artificial water bodies

15.3.28 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. Artificial water bodies with potential implications for flood risk within the study area include Great Pond and Miller's Pond at Hardwick Park on the River Doe Lea. However, as these are large raised reservoirs, subject to the requirements of reservoir safety legislation¹⁹⁰, the inundation risk posed by these reservoirs is considered negligible.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the Tibshelf to Shuttlewood area is provided within the Chesterfield, Bolsover and North East Derbyshire SFRA¹⁹¹. The SFRA states that there is a history of groundwater flooding

¹⁸⁹ This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA10 Map Book figure (in this case WR-01).

¹⁹⁰ Gov.uk (2014) Reservoirs Owner and Operator Requirements. Available at: <https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements>

¹⁹¹ Environment Agency (2018), *Long term flood risk map for England*. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

within the areas underlain by the Cadeby Formation. The route of the Proposed Scheme does not cross this formation, but this formation does outcrop within the study area in several locations to the east of the Proposed Scheme including at the southern end of the Tibshelf to Shuttlewood area in the vicinity of Newton Lodge Farm, Hardwick Hall, and between Broadcock Hill and Hucknall Wood, and in the northern part of the study area between New Bolsover and Brockley Wood.

- 15.3.30 The BGS's Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur where the Cadeby Formation is present and where alluvium deposits are present along the watercourses in this area. It also indicates that there is a limited potential for groundwater flooding to occur along the route where the Proposed Scheme is underlain by bands of sandstone within the Pennine Middle Coal Measures (known as the Top Hard Rock), and where the route is underlain by the Pennine Lower Coal Measures.

Land drainage

- 15.3.31 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)¹⁹² 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.

Water resources and WFD

- 15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:
- avoidance of channels and floodplain areas, where reasonably practicable - the route of the Proposed Scheme would avoid the floodplains associated with the River Doe Lea and The Goit. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the

¹⁹² Supporting document: Draft Code of Construction Practice

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: LA10 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed at the following locations: tributary of the River Doe Lea 7, realigned through two new culverts, one at Gildageforge culvert, the other at Mill Lane diversion and an existing culvert under the M1; and the Goit at Carr Vale culvert. The aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme would also incorporate design measures that 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 condition¹⁹³.

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 seven diversions proposed within this study area:

- tributary of River Doe Lea 1 is to be diverted along the east side of the Proposed Scheme to rejoin the main channel to the north east of Lane End drop inlet culvert;
- tributary of River Doe Lea 2, is to be diverted to the west side of the Proposed Scheme to pass through the Lane End drop inlet culvert;
- tributary of River Doe Lea 8 is to be diverted north to Owlcotes Wood culvert;
- tributary of River Doe Lea 9 is to be diverted south to Owlcotes Wood culvert;
- The Goit is to be diverted to follow a course parallel to the existing channel 50m to the west at the Bolsover South viaduct;
- tributary of River Doe Lea 14 is to be diverted south to Snipe Bog culvert; and
- tributary of River Doe Lea 16 is to be diverted northwards along the eastern

¹⁹³ "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.

side of the cutting to Nether Woodhouse drop inlet culvert at the southern end of the Shuttlewood viaduct prior to Woodhouse Lane.

- 15.4.7 For watercourses that are not in their natural condition, the design aim for realignments and diversions will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.
- 15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, 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 Permanent culverts proposed on the smaller watercourse crossings within this study area include: Carr Vale culvert; Lane End drop inlet culvert; Ridlocks Wood culvert; Cockshutt Woods drop inlet culvert; Gildageforge culvert; Mill Lane diversion culvert; Owlcotes Wood culvert; Snipe Bog culvert; Nether Woodhouse drop inlet culvert; and Shuttleworth culvert. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:
- drop inlet culverts and/or inverted siphons have been avoided wherever

reasonably practicable and are proposed on minor headwater channels or ditches only;

- culvert lengths have 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 these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points will 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 will follow the latest good practices. This principle will 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 and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off¹⁹⁴ 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 or cutting locations.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those

¹⁹⁴ Impermeable barrier preventing water flow

associated with the intermediate pier structures on the Stainsby viaduct, the Bolsover South viaduct and the Bolsover North viaduct and the southern end of the Bolsover North embankment. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers, viaduct approach embankment and highway realignment;

- the temporary works shown on Map Series CT-05 in the Volume 2: LA10 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 will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency¹⁹⁵;
- 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 will 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 will 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.

¹⁹⁵ Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- 15.4.17 The nominated undertaker will, as far 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 will be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:
- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
 - location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
 - construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
 - design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
 - having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.
- 15.4.18 In accordance with Section 16 of the draft CoCP, monitoring will 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 will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

- 15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

- 15.4.21 The proposed cuttings in the study area would intersect the Pennine Middle Coal Measures Secondary A aquifer and the Pennine Middle Coal Measures Secondary A aquifer. A number of the cuttings and tunnels would also intersect the Top Hard Rock Secondary A aquifer, which comprises sandstone within the Pennine Middle Coal Measures. Whilst there are likely to be minor localised impacts from the dewatering associated with the cuttings, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.
- 15.4.22 Where the cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

- 15.4.23 No groundwater abstractions have been identified that have potential to be affected by the Proposed Scheme.

Groundwater - surface water interactions

- 15.4.24 The assessment has not identified any temporary significant effects on groundwater - surface water interactions.

Water dependent habitats

- 15.4.25 The assessment has not identified any temporary significant effects on water dependent habitats.

Temporary effects - flood risk and land drainage

- 15.4.26 Construction of the Stainsby viaduct, Bolsover South viaduct and the Bolsover North viaduct 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 will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – water resources and WFD

- 15.4.27 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

- 15.4.28 The assessment has not identified any localised impacts on surface water receptors that would give rise to permanent significant effects on surface water quality and channel hydromorphology in the Tibshelf to Shuttlewood area.

Groundwater

Aquifers

- 15.4.29 It is currently anticipated that implementation of the avoidance and mitigation measures described in the draft CoCP would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

- 15.4.30 No groundwater abstractions have been identified that have potential to be affected by the Proposed Scheme.

Groundwater - surface water interactions

- 15.4.31 The spring feature east of Snipe Bog (ii) would be permanently lost due to the construction of Bolsover North embankment, this feature provides water flow to a downstream ecological receptor, which results in a major hydrological impact. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

Water dependent habitats

- 15.4.32 The assessment has not identified any permanent significant effects on water dependent habitats.

Permanent effects - Flood risk and land drainage

- 15.4.33 The southern end of the Bolsover North embankment is located within an area of flood zone 2 based on the Environment Agency's Flood map for planning (rivers and sea). The Proposed Scheme makes provision for a replacement floodplain storage area to mitigate the loss of flood storage. There are commercial buildings and a sewage works located near the B6148. Until hydraulic modelling has been undertaken to verify the effectiveness of this proposed replacement floodplain storage area, the potential for a minor impact on these moderate to very high value receptors cannot be discounted. This minor impact would result in a moderate adverse impact, which is significant.

Other mitigation measures

- 15.4.34 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.

Groundwater-surface water interactions

- 15.4.35 Further surveys of the spring features north-west of The Hurst and east of Harehill Wood will be undertaken to identify suitable mitigation measures, which may involve relocating the springs nearby.

Flood risk and land drainage

- 15.4.36 Detailed fluvial hydraulic analysis will be undertaken to more accurately determine the extent of the floodplain and quantify the change in flood level, if any, that would be caused by the encroachment of the southern end of the Bolsover North embankment into the floodplain of the River Doe Lea. The results of this analysis will be used to design an appropriate replacement flood storage strategy to ensure that any significant localised flood risk effects are reduced as far as reasonably practicable.

Summary of likely residual significant effects

- 15.4.37 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:
- a permanent moderate adverse effect due to the reduction of groundwater catchment on springs north-west of The Hurst and east of Harehill Wood, which are significant; and
 - a permanent moderate adverse effect on flood risk caused by the encroachment of the Bolsover North embankment into the floodplain of the River Doe Lea, which is significant.
- 15.4.38 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 (Section 16), 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 will 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 will 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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